3.1- COURSES IN ALL PROGRAMMES

(2017-18)

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I

YEAR

B.Tech.

BIOTECHNOLOGY

I SEMESTER

- 16HS101 - Basic Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS106 - Basic Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16BT102 - Bioproducts and Bioentrepreneurship
- 16ME103 - Workshop Practice

COURSE CONTENTS

I SEM AND II SEM

16HS101 BASIC MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

In this course the fundamental concepts of mathematics are introduced. A treatise of Matlab is also introduced in the practical session.

The objective of the course is to impart knowlege on progressions, partial fractions and binomial theorem. This course also deals with elementary concepts in geometry, trigonometry, differential and integral calculus. Numerical methods are also introduced for finding approximate solutions of algebraic equations. Besides, interpolation techniques and MATLAB environment are emphasized.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understanding progression, partial fractions, binomial theorem, trigonometry and geometry.

CO2: Evaluate limits, test the continuity and differentiability of functions.

CO3: Evaluate integrals of functions.

CO4: Apply numerical methods and interpolation techniques to find functional values.

CO5: Apply software tools to obtain and verify the solutions.

SKILLS:

- ✓ *Compute sum of terms of given progression.*
- ✓ *Differentiate the given function.*
- ✓ *Evaluate the integral of given function.*
- ✓ *Interpret interpolation techniques to estimate the functional values.*

UNIT - 1 **L-9, T-3**

MATHEMATICAL PRELIMINARIES: Progressions, partial fractions and binomial theorem.

UNIT - 2 **L-9, T-3**

TRIGONOMETRY AND GEOMETRY: Coordinate system, straight line, trigonometric functions and trigonometric identities.

UNIT - 3 **L-9, T-3**

DIFFERENTIAL CALCULUS : Limits, continuity and differentiability.

UNIT - 4 **L-9, T-3**

INTEGRAL CALCULUS: Concepts of integration - rules, integration by parts, integration by partial fractions and integration by inspection (standard forms).

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS: Bisection method, Newton-Raphson method, finite differences, forward and backward difference tables, interpolation by Lagrange's method, Newton's forward and backward methods, Gauss forward and backward methods.

ACTIVITIES:

- *Compute the derivative and compare with Matlab output.*
- *Evaluate the integral and compare with Matlab output.*
- *Interpet the given data and estimate the functional values at a given point.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Introduction to MATLAB environment.

Basic mathematical operations using MATLAB.

1. Solving simple expressions.
2. Trigonometric function values.
3. Limits.
4. Continuity.
5. Symbolic differentiation-1.
6. Symbolic differentiation-2.
7. Symbolic integration-1.
8. Symbolic integration-2.
9. Real roots of functions.
10. Newton-Raphson method.
11. Interpolation.

TEXT BOOKS:

1. C. W. Evans, “Engineering Mathematics, A Programmed Approach”, Stanley Thornes (Special Indian Edition) 2011.
2. P. S. Rao, “A text book of Remedial Mathematics”, 1st edition, Parma Med Press, Hyderabad, 2008.

REFERENCE BOOKS:

1. A.Jeffrey, “Mathematics for Engineers and Scientists”, 6th edition, (Special Indian Edition),CRC Press, 2013.
2. R. Pratap, “Getting started with MATLAB”, Oxford University Publication, 2009.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as lasers, optical fibres, photonics, nano and funcational materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Recognize the relevant applications of Ultrasonic waves by the grasp over their production and properties.

CO2: Analyze the characteristics of Laser for suitable applications in the field of industry, medicine and communication and to foster the knowledge on optical fibers to realize fiber optic communication and fiber optic sensors.

CO3: Apply the principles of quantum mechanics to learn the dynamics of free electrons in metals.

CO4: Evaluate efficiency of Solar cell and to understand the functioning of Photonic devices.

CO5: Demonstrate the knowledgeon fabrication and applications ofNano-materialsand latest advanced materials.

SKILLS:

- ✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*
- ✓ *Study the wavelengths of light sources and lasers.*
- ✓ *Estimate the efficiency of a given solar cell.*
- ✓ *Learn about the type of the optical fibre and their ability to propagate light waves from its numerical aperture.*
- ✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS : Introduction – production of ultrasonic waves, piezoelectric method, properties of ultrasonic waves, types of ultrasonic waves, determination of velocity of ultrasonic waves in solids and liquids; SONAR - medical applications.
NDT: Introduction- types, visual inspection and liquid penetrate testing; Ultrasonic testing systems; X - ray radiography.

UNIT - 2 **L-9**

LASERS : Characteristics of laser light – spontaneous and stimulated emission of radiation, He-Ne laser, CO_2 laser, semiconductor laser and applications.
HOLOGRAPHY: Holography and applications.
FIBER OPTICS : Principle of optical fibre – acceptance angle, numerical aperture, types of fibres, dispersion and attenuation in optical fibres, optical fibre communication system and fibre optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS : Introduction- matter waves, Schroedinger's time independent wave equation, physical significance of the wave function, particle in one dimensional potential well and tunneling phenomenon.
FREE ELECTRON THEORY OF METALS : Introduction – classical free electron theory, electrical conductivity of metal, quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature
PARTICLE ACCELERATORS: Introduction- cyclotron, synchrocyclotron, betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, photovoltaic effect, solar cells, efficiency of solar cell and solar thermal energy conversion systems.
PHOTONICS: LED, LCD, photo conducting materials, photo detectors, photonic crystals, non- linear optical behaviour of materials and applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, fabrication of nano materials, ball milling, sol-gel, physical and chemical properties of nano materials and applications.
FUNCTIONAL MATERIALS: Smart materials, shape memory alloys, chromic materials (thermo, photo and electro), metallic glasses, advanced ceramics, composites, fiber reinforced plastics/ metals and biomaterials.

TEXT BOOKS:

1. V. Rajendran, "Engineering Physics", 7th edition, TMH Publications, 2014
2. D.K. Bhattacharya and P. Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu and P.G. Kshirsagar, "Engineering Physics", 1st edition, S. Chand and Company Ltd, 1992.
3. S.P. Sukhatme, "Solar Energy", 2nd edition, TMH Publication, 2005.
4. Dr. Arumugam, "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimate acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluate thermal conductivity of materials.*
- *Measure temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The teaching efforts in this course will be directed towards making students develop their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand and apply the rules of grammar to speak in technical context.

CO2: Strengthen reading and listening comprehension skills to follow academic discussions in the engineering context.

CO3: Develop appropriate vocabulary for carrying out academic writing tasks.

CO4: Attain adequate proficiency to participate in the classroom discussions and make simple presentations.

CO5: Understand and apply the mechanics of writing to produce simple texts for academic purpose.

SKILLS:

- ✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*
- ✓ *Apply different sub skills like top down, bottoms up approachs to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*
- ✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*
- ✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*
- ✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **Environmental consciousness**

  (Climate change, green cover, pollution, renewable vs. non renewable energy sources (from energy unit)
- Grammar : Articles, prepositions, sentence types and construction
- Vocabulary : Root, prefixes and suffixes
- Composition : Paragraph writing (descriptive and narrative)
- Laboratory Practice : Introduction to phonetics (Organs of speech- consonants, vowels and diphthongs; Syllable, stress and intonation)

UNIT - 2 **L-9**

- Text : **Emerging technologies**
  (Solar power, cloud computing, nanotechnology, wind energy (to be covered from energy unit)
- Grammar : Time and tense (Present, past and future; Helping verbs; Modals)
- Vocabulary : Synonyms and antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **Travel and tourism**
  (Advantages and disadvantages of travel, tourism, *atithi devo bhava*- Tourism in India)
- Grammar : Subject-Verb agreement and sentence construction
- Vocabulary : Idioms and Phrases

  Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role plays (Introducing, greeting, enquiring, informing, requesting and inviting)

UNIT - 4 **L-9**

- Text : **Engineering Ethics**
  (Challenger disaster, biotechnology, genetic engineering, protection from natural calamities, how pertinent is the nuclear option? An environment of energy (from energy unit)) Avoiding sexist language (Gender sensitization)
- Grammar : Sentence transformation (Degrees, voice, speech and synthesis)
- Vocabulary : Phrasal verbs

  Composition : Note-making on Nandan Nilekani's "In search of our energy solutions" (from energy unit) Summarizing on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational conversations – Role plays (Emotions, directions, descriptions, agreements, refusals and suggestions).

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Complete graded grammar exercises in Rosetta Stone.*
- *Complete graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watch TED videos and making notes.*
- *Watch TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Prepare brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and group discussion.*

UNIT - 5 **L-9**

- Text : **Media matters:** (History of media, language and media, milestones in media, manipulation by media, thousands march against nuclear power in Tokyo (from energy unit), entertainment media and interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail, short message service (SMS), writing advertisements, reporting; Social Media- blogging, facebook, twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions (topics from energy unit) – Dumping of nuclear wastes, exploration of eco-friendly energy options, lifting of subsidies on petrol, diesel, LPG etc)

TEXT BOOK:

1 *"*Mindscapes - English for Technologists and Engineers*"*, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. N. Swamy*, "*Strengthen Your Writing", 1st edition, Orient Longman, 2003.
2. T. E. Berry*, "*The Most Common Mistakes in English Usage*"*, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, "A Textbook of English Phonetics for Indian Students*"*, Macmillan Ltd., 2000.
4. V. Sasikumar and P.V. Dhamija, "Spoken English: A Self-Learning Guide to Conversation Practice*"*, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. M. M. Maison, "Examine your English", 1st edition, Orient Longman, 1999.
6. A. Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes and components associated with computers and internet. Students will get exposure to building blocks of computers, operating systems, application software, networking, internet, world wide web, security, maintenance, information systems and the application development processes.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Demonstrate the disassembling and assembling of a personal computer system.

CO2: Install the operating system and other software required in a personal computer system.

CO3: Analyze and visualize the data using various operations in Excel.

CO4: Identify the various threats to users and data.

CO5: Understand the concept of cyber security

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and their peripherals.*
- *Disassemble and assemble of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an ethernet and configure the same.*
- *Prepare an MS word document.*
- *Prepare a spread sheet with various mathematical operations, charts, sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L- 10**

COMPUTING SYSTEMS : Introduction to computer, computers for individuals, importance of computers, parts of computer system, memory devices, input and out devices, types of monitors, types of printers, number systems, bits and bytes, text codes and types of processors.

UNIT - 2 **L- 10**

OPERATING SYSTEMS : Types of operating systems, user interfaces, PC operating systems, network operating systems, types of software, programming languages, compiler and interpreter, program control flow and algorithm.

UNIT - 3 **L- 08**

NETWORKS AND DATABASES : Networking basics, uses of network, types of networks, network hardware, introduction to data bases and database management systems.

UNIT - 4 **L- 8**

INTERNET AND WWW : Internet's services, world wide web, browser setups, using search engine, email and other internet applications.

UNIT - 5 **L- 9**

CYBER SECURITY : The need of computer security, basic security concepts, threats of users, online spying tools, threats to data, cybercrime and protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours: 30

1. Demonstrate the personal computer peripherals and get a report on each peripheral.
2. Demonstrate the personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate network interface card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java development kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort and filter using powerpoint tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. P. Norton, "Introduction to Computers", 7th edition, Tata-McGraw Hill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, "Introduction to Computer Science", 2nd edition, Pearson Education, 2011.
2. E. Maiwald, "Fundamentals of Network Security", 3rd edition, Tata-McGraw Hill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files and the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understanding of how to write simple, but complete C programs.

CO2: Identification of suitable data types for operands and design of expressions having right precedence.

CO3: Application of decision making and iterative features of C Programming language effectively.

CO4: Design and development of problem specific data structures and accessing methods to build large modular programs.

CO5: Development of C programs that is understandable, debuggable, maintainable and more likely to work correctly in the first attempt.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static and dynamic memory allocation.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO C PROGRAMMING : Structure of C program- comments, processor statement, function header statement, variable declaration statement and executable statement; C character set - constants, identifiers, operators, punctuations, keywords, modifiers, identifiers, variables, c scopes, basic data types, type qualifiers, storage classes, reading and writing characters and formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS : Operators- assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, size of, dot, arrow and parentheses operators; Expressions precedence of operators and associative rules; Control statements- category of statements, selection, iteration, jump, label, expression and block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS : Function- declaration, prototype, definition, calling by value and call by address, standard library functions and recursive functions; Array- declaration, initialization, reading, writing, accessing and passing as a parameter to functions, 2D-arrays and multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS : Strings- declaration, string library functions, array of strings and command line arguments; Pointers- declaration, initializing pointers, multiple indirection, relationship between arrays and pointers; Scaling up- array of arrays, array of pointers, pointer to a pointer, pointer to an array; pointer to functions and dynamic memory allocation functions.

UNIT - 5 **L-9, T-3**

STRUCTURES AND FILES : Structures - declaration, initialization and accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- choose programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours: 30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.

ACTIVITIES:

- o *Implement matrix operations.*
- o *Implement malloc and calloc functions.*
- o *Copy the content of one file into the other.*
- o *Implement string manipulations functions.*

7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0’s and 1’s as input and the array should consist of all 0’s first and then 1’s.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student’s information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

TEXT BOOK:

1. A. Mittal, “Programming in C - A Practical Approach”, Pearson Education, India, 2015

REFERENCE BOOKS:

1. R. Thareja, “Introduction to C Programming”, 2nd edition, Oxford University Press India, 2015.
2. C. H. Schildt, “The Complete Reference”, 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, “Programming in ANSI C”, 4th edition, Tata McGraw-Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Describe the working principle of Refrigeration and Air conditioning systems.

CO2: Gain awareness on choosing appropriate construction materials.

CO3: Operate and maintenance of basic electrical engineering appliances.

CO4: Analyze the different lighting sources and its features.

SKILLS:

- ✓ *Identify UPS requirements for a given load.*
- ✓ *Provide a lighting scheme for specific working environment.*
- ✓ *Design a composition of hHeating element for a particular application.*
- ✓ *Troubleshoot issues relating to immersion heater and induction heater.*
- ✓ *Provide an earthing for domestic outlet.*
- ✓ *Select, configure and maintain a few engineering appliances such as TV, radio, telephone, mobile phone, wifi router, micro oven, PA system, etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassemble and Assemble of Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design Electric Wiring system for a prototype house.*
- *Design UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of air-conditioner and refrigerator- components, assembly and disassembly, working principle of centrifugal and reciprocating pumps; Types, parts and applications, working principle of screw jack and its components; Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS : General, qualities and classification of bricks; Tests for bricks; Size and weight of bricks; Timber- definition, qualities of good timber, decay of timber and advantages of timber in construction.

CEMENTS : Types and composition of cement, setting of cement, tests for physical properties of cement, and different grades of cement.

AGGREGATES : Classification of aggregates, source, size and shape of aggregates; Tests for aggregates.

STEEL: Types of steel, physical properties and mechanical properties of steel. Simple layout design, paints, tiles, fittings, ventilation, furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS : Overview of power system structure; Conventional and non conventional generations - types of turbines, generators, substations, towers, earthing procedure, protection schemes, single phase and three phase systems.

Methods of electrical wiring systems - wiring procedure and calculations; Wiring methods.

Uninterruptible power supply (UPS)- components in UPS, its functionality and calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT : Light energy, evolution of light sources, working of incandescent, fluorescent, MV, SV and LED lamps, comparison and applications.

HEAT : Heat energy, modes of heat transfer, resistance and induction heating, comparison and applications.

MOTOR : Electric motors, classification, construction and working principles of motors used in domestic applications, mixer grinder, ceiling and exhaust fan, hair dryer, washing machine, water pump, air coolers, vacuum cleaner, computer cooling motor and electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, radio, remote control, telephone, microwave oven, cell phone, PA system, induction stove, wifi router and DTH.

LABORATORY EXPERIMENTS

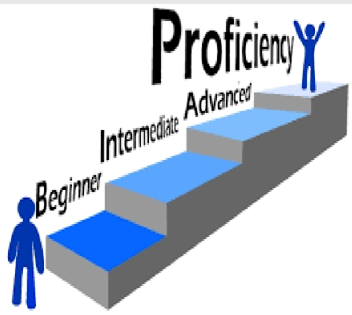
LIST OF EXPERIMENTS Total hours: 30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box.
13. Ceiling Fan and Mixer.
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition., Charotar Publishing House, Anad, 2009.
3. Govindasamy, A. Ramesh et al, "Electrical engineering - Electrical machines and Appliances Theory, 1st edition, Tamilnadu Textbook Corporation, 2010.
4. Janakaraj, A Sumathi et al, "Electrical engineering - Electrical machines and Appliances Theory", 1st edition, Tamilnadu Textbook Corporation, 2011.
5. M. Brain, "How Stuff Works", 1st edition, John Wiley and Sons, 2001.
6. P. Kumar, "Basic Mechanical Engineering", 1st edition, Pearson Publishers, 2013.



16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Course Description and Objectives:

To equip students with functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. Students will strengthen their comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Can understand routine information and factual articles in the news papers and understand general instructions, notifications, announcements, monologues and conversations. (Understand)

CO2: Use functional English to speak and express themselves in everyday social contexts. (Apply & Create)

CO3: Applying sentence structures and word collocations to produce simple and accurate sentences and create short compositions.

CO4: Analyse complex reading and listening materials and draw inferences to evaluate the intentions of the writers and speakers.

CO5: Creating concise and precise communication by analysing the relevance of the context and applying suitable formats.

SKILLS:

- ✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*
- ✓ *Read and extract information from different texts & draw inferences by understanding elements like tone and transitional words.*
- ✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*
- ✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

Functions : Introducing self/others; Expressing needs/feelings/opinions (SWOT Analysis)

Skill Focus:

Reading - Understanding factual information

Writing - Word order and sentence formation

Listening - Decoding for meaning following elements of stress, intonation and accent

Speaking - Articulating syllables clearly, speaking fluently with correct pronunciation

Vocabulary - Discerning to use right word for the given context

Grammar - Spellings, use of nouns, adjectives, verbs, prepositions in the sentence structure

Practice: Objective PET Units 1 - 6

UNIT - 2 **P-6**

Functions : Defining and describing people, places, things and process.

Skill Focus:

Reading - Inferences from sentences and short messages – true/false

Writing - Rewording, sentence transformation and convincing

Listening - Understanding the short messages and conversations

Speaking - Role plays and short conversations

Vocabulary / Grammar – Use of adjectives/adverbs, comparatives and superlatives

Practice : Objective PET Units 7 – 12

UNIT - 3 **P-6**

Functions : Describing spatial and temporal relations; Giving directions/ instructions

Skill Focus :

Reading - Reading between the lines, inferences, true/false

Writing - Developing hints - Writing short messages/paragraphs

Listening - Searching for factual information - Gap filling

Speaking - Snap talks, JAM and elocution

Vocabulary / Grammar - Prepositions, phrasal verbs; PET word list

Practice: Objective PET Units 13 - 18

UNIT - 4 **P-6**

Functions : Narrating, predicting, negotiating and planning

Skill Focus:

Reading - Reading for evaluation and appreciation, comprehension

Writing - Letters – e-mails – 7 C's

Listening - Following long conversations/interviews

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Speaking - Discussions, debate and descriptions

Vocabulary / Grammar - Modals, conditionals and verb forms (time and tense)

Practice: Objective PET Units 19 – 24

UNIT - 5 **P-6**

Functions: Requesting, denying, suggesting and persuading

Skill Focus:

Reading - Understanding factual information

Writing - Short stories and explanatory paragraphs

Listening - Inferences from long speeches/conversations

Speaking - Announcements and presentations

Vocabulary / Grammar - Punctuation and cloze tests

Practice: Objective PET Units 25 – 30

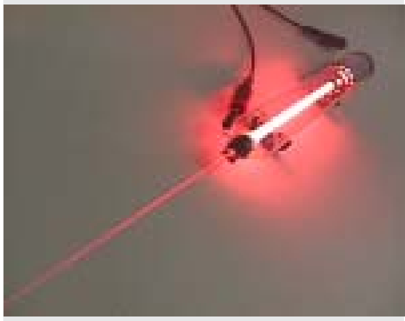
TEXT BOOK:

1. L. Hashemi and B. Thomas, “Objective PET”, Student’s Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.

2. A. Capel and R. Nixon, “Introduction to PET”, Oxford University Press.



16HS110 ENGINEERING PHYSICS LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Course Description and Objectives:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the following experiments.The students have to perform at least 10 experiments from the list of experiments.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Realize the concept of resonance by conducting the experiments of AC sonometer and Melde'sexperiment.

CO2: Acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments,

CO3: Understand Magnetic field along the axis of a circular coil and thermal conductivity of bad conductor through experiments.

CO4: Understand the concepts of light by conducting the experiments of determination of wavelength,

CO5: Understand the numerical aperture of an optical fibre and also from V–I characteristics of Solar celland LED.

LIST OF EXPERIMENTS

1. Determination of velocity of ultrasonic waves in liquids.
2. Melde's experiment - transverse and longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect.

REFERENCE BOOKS :

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics Laboratory Manual – Department of Physics, VFSTR University, 2016.

16HS106 BASIC MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

This course offers basic concepts on matrices, system of equations, differential equations of first and higher order. Further, numerical methods to solve differential equations are introduced.

The objective of the course is to provide the knowledge on the properties of matrices and solving system of equations using matrices. It is also aimed to offer various methods (analytical as well as numerical) to solve first and second order ordinary differential equations.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understanding the algebra of matrices, rank of matrix.

CO2: Apply various methods to solve system of linear equations.

CO3: Solve ordinary differential equationsof first and second order.

CO4: Apply numerical methods to solve integrals and ordinary differential equations.

CO5: Use software tools to obtain and verify the solutions.

SKILLS:

✓ *Compare the inverse of matrix.*

✓ *Solve given system of linear equations.*

✓ *Solve given differential equations.*

UNIT - 1 **L-9, T-3**

MATRICES: Definition, types of matrices, algebra of matrices, determinant, minor, cofactor, adjoint, and inverse of a matrix; Elementary row operations, inverse by row operations, rank, determination of rank using Echelon form and normal form.

UNIT - 2 **L-9, T-3**

SYSTEM OF EQUATIONS: System of linear equations, consistency of system of equations, solution by Cramer's rule, matrix inversion method, Gauss-Jordan method and Gauss elimination method.

UNIT - 3 **L-9, T-3**

FIRST ORDER ORDINARY DIFFERENTIAL: Introduction, variable separable, linear equations, Bernoulli equation, homogenous equations and non-homogenous equations.

UNIT - 4 **L-9, T-3**

SECOND ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations of second order with constant coefficients with RHS of type e^{ax}, $\sin ax$, $\cos ax$, x^n.

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS - II: Numerical integration by trapezoidal rule and Simpson's rules; Numerical solutions to Differential equations - Euler's method and Runga-Kutte method.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Matrix algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's rule).
5. System of equations (Matrix inversion method).
6. Solutions of first order ODE.
7. Trapezoidal rule.
8. Simpson's one-third rule.
9. Simpson's three-eight rule.
10. Euler's method.
11. RK Method.

Text BOOKS :

1. H. K. Dass and Er. R. Verma, "Higher Engineering Mathematics", S. Chand and Co., 3rd edition, 2014.
2. B. S. Grawel, "Engineering Mathematics", Khanna Publishers, 44th edition, 2014.

Reference BookS :

1. K. S. Rao, "Numerical Methods", 3rd edition, PHI Publishers, 2007.
2. R. Pratap, "Getting started with MatLab", Oxford University Publication, 2009.

ACTIVITIES:

- *Compute the inverse of matrix and compare with MATLAB output.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Solve given differential equations and compare with MATLAB output.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Analyze the quality of the water and design a suitable water purification mechanism.

CO2: Apply the principle of electrochemistry for designing various batteries and fuel cells.

CO3: Analyze various factors effecting corrosion and apply proper corrosion control and prevention methods.

CO4: Familiarize the preparation, properties and applications of various polymers.

CO5: Apply the electromagnetic radiation to the spectroscopic methods for the analysis of engineering materials.

SKILLS:

- ✓ *Analyse the total hardness of water sample.*
- ✓ *Understand the basic principles involved in various batteries.*
- ✓ *Understand the mechanisms of corrosion and various controlling methods.*
- ✓ *Synthesize various polymers.*
- ✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY : Introduction, WHO, BIS standards of water; Hardness of water-determination of hardness by EDTA (numerical problems), disadvantages of hard water, scales and sludges, caustic embrittlement, boiler corrosion, priming and foaming; Softening methods - zeolite process, ion exchange process; Desalination of brackish water- reverse osmosis and electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential; Electrochemical series; Nernst equation; Reference electrodes - Calomel and standard hydrogen electrode, ion selective electrode and glass electrode; Determination of pH by pH meter, primary cell and secondary cell (lead-acid storage cell and lithium ion battery); Fuel cell - hydrogen oxygen and methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION : Introduction, dry corrosion, wet corrosion and mechanisms of wet corrosion; Bimetallic corrosion - concentration cell corrosion; Factors influencing the rate of corrosion; Corrosion control methods - cathodic protection, electroplating, electrolessplating and corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction; Types of polymerization - preparation, properties and applications of polyethylene, PVC, teflon, bakelite, urea, formaldehyde and silicones; Rubber – vulcanization; Synthetic rubbers - buna-S, buna-N and neoprene; Introduction to conducting polymers - poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV - Visible Spectroscopy, Beer - Lambert's law, qualitative and quantitative analysis; Block diagram of UV-Visible spectrophotometer; IR Spectroscopy - types of vibrations and block diagram of IR spectrophotometer.

TEXT BOOKS :

1. P.C Jain and M. Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. S. Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and M. Chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and DeMerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. G. Raj and C. Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
5. J.D. Bares, M.Thomas, B. S. Sankar, J.Mendham and R.C Denney, "Vogel's Text book of Qualitative Chemical Analysis", 6th edition, Pearson Publications, 2009.
6. Dr.S. Rattan, "Experiments in Applied Chemistry", S.K. Kataria and Sons Publications, 2008.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in 2D and 3D format.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Communicate the ideas and thoughts to other in the form of pictures.

CO2: Develop the drawing skills while drawing engineering objects

CO3: Implement the concept of quadrant system in drawing practice.

CO4: Construct different engineering objects using drawing tools.

CO5: Sketch simple objects and their pictorial views using Auto CAD.

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT - 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Introduction to engineering drawing- types of lines, lettering, dimensioning, construction of polygon and conics (ellipse, parabola and hyperbola by general method) and ellipse by oblong method.

UNIT - 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection-planes of projections, projections of points, projection of straight lines; Inclined to one plane and both the planes; Projections of planes; Simple planes; Planes inclined to one reference planes.

UNIT - 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, pyramids, cylinders, cones and solid axis inclined to one plane.

UNIT - 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects; Isometric view of prisms; Pyramids; Cone and cylinder; Simple orthographic views into isometric views through AutoCAD.

UNIT - 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS :

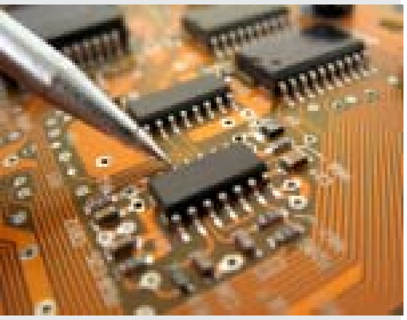
1. N.D.Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. B.Agrawal and C.M.Agrawal, "Engineering Drawing" , 2nd edition, Tata McGraw Hill, 2014.

REFERENCE BOOKS :

1. J. Hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both DC and AC machines. It also deals with the basic electronic components like P-N junction Diode, Zener diode, transistor and their characteristics.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Analyse the resistive circuits and solution of resistive circuits with independent sources.

CO2: Solve the AC (single and three phases) and DC circuits using different methods.

CO3: Familiarize the concepts of electro magnetism and it's applications.

CO4: Explain the types of electrical equipment, machines and its applications.

CO5: Acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor.

SKILLS:

✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*

✓ *Develop a simple loop generator.*

✓ *Design a voltage regulator using Zener diode.*

✓ *Design a half wave rectifier using PN junction diode.*

✓ *Design a full wave rectifier using PN junction diodes.*

UNIT - 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts; Concepts of network- active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law; Kirchhoff's Laws; Application to simple series, parallel circuits, mesh and nodal analysis of simple resistive circuits (simple numerical problems).

UNIT - 2 **L-9**

FUNDAMENTALS OF AC CIRCUITS: Generation of AC voltage - frequency, average value, RMS value, form factor, peak factor for sinusoidal only; Phasor representation of alternating quantities; Analysis of simple series and parallel AC circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (elementary treatment only).

UNIT - 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of magneto motive force, reluctance, flux and flux density, concept of self Inductance and mutual Inductance, coefficient of coupling (only elementary treatment and simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, constructional features, EMF equation (simple numerical problems).

UNIT - 4 **L-9**

DC MACHINES: Constructional details of a DC machine, DC generator, principle of operation; EMF equation, types of DC generators (simple numerical problems).

DC motor- principle of operation, torque equation, types of DC motors (simple numerical problems)

AC MACHINES: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, torque equation, constructional details of synchronous machine.

UNIT - 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory; Intrinsic and extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics; Half and full wave rectifiers; Zener diode and its characteristics; Voltage regulator; Bi polar junction transistor, operation, types and applications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.

ACTIVITIES:

- *Decode the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of half wave rectifier without filter.
10. Implementation of full wave rectifier without filter.

TEXT BOOKS:

1. V.K. Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P. Kothari, “Basic Electrical and Electronics Engineering”, 1st edition, TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman and Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, “Electrical Technology”, Vol– II, S. Chand Publications, 2007.
3. U. Bakshi and A. Bakshi, “Basic Electrical Engineering”, 1st edition, Technical Publications, Pune, 2005.

WEB LINKS:

1. http://nptel.ac.in/courses/108108076/
2. https://books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Course Description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Analyse the quality of the water by volumetric methods.

CO2: Apply the principle of electrochemistry to determine the relative strength of oxidizing/ reducing agents for the sample analysis.

CO3: Analyse various factors effecting the rate of corrosion by using weight loss method

CO4: Synthesize and analyse various polymers useful for engineering applications.

CO5: Apply instrumentation methods for chemical analysis.

LIST OF EXPERIMENTS

1. Determination of total alkalinity of water.
2. Estimation of total hardness of water.
3. Find the percentage of available chlorine in bleaching powder.
4. Estimation of Fe (II) by dichrometry method.
5. Preparation of phenol - formaldehyde resin.
6. Synthesis of urea- formaldehyde resin.
7. Estimation of concentration of acid by pH metry.
8. Determination of strength of acid by conductometry.
9. Measurement of Mn^{+7} by colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-visible spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS :

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.S. Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Volume I, Pearson Publications, 2009.
2. Dr. S. Rattan, “Experiments in Applied Chemistry”, S.K. Kataria and Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Course Description and Objectives:

Environmental science and technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Observation and integration of diverse information from variable sources outside of the classroom and helps students to think critically, creatively, resourcefully, and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness

CO2: Collaborating across diverse disciplines and practices to identify and create solutions that conserve and help manage biodiversity for the long term

CO3: Analyze the sources of pollutants and their effects on atmosphere and Adapting eco-friendly technologies and maintain hygienic conditions

CO4: Identify the evidence of Global warming, Ozone depletion and acid rain

CO5: Recognize safe receiving storing and handling of raw and prepared food and maintain hygienic conditions.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES : Environmental Studies- definition, scope and its importance; Need for public awareness, natural resources, forest resources and deforestation; Water resources - properties and conflicts; Mineral resources - extraction and impacts; Food resources - modern agriculture methods, fertilizer-pesticide problems, water logging and salinity; Energy resources - renewable and non-renewable energy resources, harness technology, solar energy technologies; Land resources - land degradation, soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY : Ecosystem - concept, structure and functions of an ecosystem; Food chains, food webs, ecological pyramids, energy flow, energy regulation and succession; Biogeochemical cycles; Aquatic ecosystems; Biodiversity - introduction, bio-geographical classification, values of biodiversity, biodiversity at global, national and local levels, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India and conservation of biodiversity.

UNIT - 3 **L -6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY : Solid waste management - causes, effects and control measures of municipal and industrial wastes; Pollution - air, water, thermal, soil and noise pollutions; Role of an individual in prevention of pollution; Remote sensing / GIS - introduction, definitions, applications of the remote sensing; Innovative practices-objectives, innovative practices in agriculture, forest-community and bio-villages; Green technology for sustainable development, life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA : Sustainable development, water conservation, cloud seeding, rainwater harvesting methods, watershed management, global warming, acid rain, ozone layer depletion; Environmental legislation; wildlife protection act, water act, forest conservation act, air act, environmental protection act; Environmental impact assssment (EIA) - introduction, definition of EIA and EIS, scope and objectives, importance of EIA in proposed projects/industry/developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION : Food sanitation **-** food and drugs act, food preservations, milk sanitation, tests for milk, pasteurization of the milk; Water, air, soil and food borne diseases; Maintenance of sanitary and hygienic conditions; Role of youth in the development; Promoting activities -youth as initiators and activities; Field work/environmental visit - visit to a local area to document environmental assets river/ forest/grassland/hill/mountain; Study of local environment - common plants, insects, birds; Study of simple ecosystems - pond, river, hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. A. Kaushik and C.P. Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016.
2. B. Joseph, “Environmental studies”, 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008.
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.Chand and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004.
7. K. Joseph and R.Nagendram, “Essentials of environmental studies”, Pearson Education Pt Ltd, Delhi, 2007. Education Pt Ltd, Delhi, 2007.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

Source:
Prof. S. Krupanidhi, HoD, BT

16BT102 BIOPRODUCTS AND BIOENTREPRENEURSHIP

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

The course offers knowledge on various bio-products and their marketing. The objective of the course is to create awareness on a wide array of biologically derived products. In addition, it also encourages students to explore entrepreneurship in the arena of bioproducts.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand the importance of wide range Bio-products from renewable biological resources.

CO2: Apply the knowledge for development of new Bio-products for food, nutraceuticals, and pharmaceuticals.

CO3: Develop new methods for the production of Bio-products.

CO4: Analyze and perceive green entrepreneurship and awareness on start-ups.

CO5: Design small scale industry setup.

SKILLS:

- ✓ *Evaluate the scope for bioentrepreneurship.*
- ✓ *Recycle and reuse biowaste.*
- ✓ *Design small scale industry setup.*
- ✓ *Analyze bioproducts market trend.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO BIOPRODUCTS: Definition of bioproducts; Categories of bioproducts; Importance of bioproducts; Bioproducts industry - strategies and action plans, global trends and current situation; Bioproducts used for decoration; Biofertilisers; Examples of clonal propagation of plants; Socio-economic and environmental impact of bioproducts.

UNIT - 2 **L-9, T-3**

ENERGY RELATED BIOPRODUCTS: Liquid fuels - ethanol and biodiesel; Carbon neutrality; Conversion mechanisms; Solid biomass for combustion to generate heat and power; Gaseous fuel such as biogas; Renewable energy opportunities for Indian entrepreneurs.

UNIT - 3 **L-9, T-3**

BIOMATERIALS: Bioplastics from plant oils and sugars; Biofoams and biorubber from plant oils and latex; Biocomposites manufactured from agricultural (e.g., hemp, flax, kenaf) and forestry; Biofibres.

UNIT - 4 **L-9, T-3**

BIOCHEMICALS: Industrial - basic and specific chemicals, resins, lubricants and solvents; Pharmaceuticals - examples of monoclonal therapeutic antibodies, interleukins, enzymes (therapeutic and detergent), hormones and vaccines; Antibiotics; Omega 3 fatty acids; Biocosmetics - soaps, body creams and lotions; Biorepellents - case study; Trichoderma.

UNIT - 5 **L-9, T-3**

ENTREPRENEURSHIP RELATED TO BIOPRODUCTS: Entrepreneurship ecosystem and bioeconomy; Perception and analysis of green entrepreneurship ecosystem by its stakeholders; Green entrepreneurship - case studies; Bioproducts manufacturers and suppliers in India.

TEXT BOOKS :

1. N.T. Dunford, "Food and industrial bioproducts and bioprocessing", Wiley-Blackwell publishers, 2012.
2. J.C. Philp and K.C. Pavanan, "Perspectives- bio-based production in a bioeconomy", Asian Biotechnology and Development Review, Vol. 15, No.2, pp 81-88, 2012.

Reference Books :

1. J. W. Lee, "Advanced Biofuels and Bioproducts", Springer New York, 2013.
2. C. T. Hou and J.F. Shaw, "Biocatalysis and Bioenergy", Wiley publishers, 2008.

ACTIVITIES:

- *Models on renewable energy- biomass, biofuels, biogas.*
- *Prepare vermicompost.*
- *Case studies on green entrepreneurship.*

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Course Description and Objectives:

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.

CO2: Fabrication of wooden joints and understanding joining of metals.

CO3: Make metal joints and sheet metal work.

CO4: Understand various advance machine tools and its components; make metal tools like knives, needles, swords, arrows etc.

CO5: Develop methodology as per specifications of the product.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs, etc.*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims, etc.*
- ✓ *CNC machines and various machining operations and processes.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin Smithy and Black Smithy.
4. House Wiring.
5. Foundry and Welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS :

1. S.K. Hazra Choudhury, "Elements of workshop Technology", 11^{th} edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice: Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

II

YEAR

BIOTECHNOLOGY

B.Tech.

I SEMESTER

16HS202	-	Probability and Statistics
16MS201	-	Management Science
16BT201	-	Biochemistry
16BT202	-	Cell Biology
16BT203	-	Microbiology
16BT204	-	Process Engineering Principles
	-	Employability and Life Skills Elective

II SEMESTER

16BT205	-	Genetics
16BT206	-	Heat and Mass Transfer
16BT207	-	Instrumental Methods of Biological Analysis
16BT208	-	Molecular Biology
16EL102	-	Soft Skills Laboratory
	-	Department Elective
	-	Department / Open Elective
	-	Employability and Life Skills Elective

COURSE CONTENTS

I SEM AND II SEM

16HS202 PROBABILITY AND STATISTICS

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course deals with descriptive statistics, correlation, regression, and their applications, probability, theoritical distributions and testing of hypothesis. The objective of this course is to enable the student to understand and apply statitical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Determine values of various measures of central Tendencies.

CO2: Learning the concept of curve fitting process and apply it in correlation and regression.

CO3: Apply the concept of random variable in probability theory.

CO4: Learning and apply various probability distributions and their properties to a given situation.

CO5: Analyze a given hypothesis for acceptance or rejection.

UNIT - 1 **L-12**

DESCRIPTIVE STATISTICS: Basic definitions, frequencies, graphical representation, histogram, Ogive curves; Measures of central tendency - arithmetic mean, median, mode, mean deviation and standard deviation; Symmetry and skewness, Karl Pearson's coefficient of skewness.

UNIT - 2 **L-12**

CURVE FITTING, CORRELATION AND REGRESSION: Least squares method, curve fitting (straight line and parabola only), covariance, correlation, types, Pearson's coefficient of correlation, rank correlation, Spearman's rank correlation, regression and regression lines.

UNIT - 3 **L-12**

PROBABILITY: Introduction, definition (classical and axiomatic approach), addition theorem, conditional probability, multiplication theorem, total probability, Bayes theorem.

UNIT - 4 **L-12**

DISTRIBUTIONS: Random variables, discrete and continuous variables, introduction to distributions.

BINOMIAL DISTRIBUTION: Definition, mean and standard deviation, recurrence relation, applications, fitting of binomial distribution.

POISSON DISTRIBUTION: Definition, mean and standard deviation, recurrence relation, Poisson distribution is an approximation of binomial distribution, applications, fitting of Poisson distribution.

NORMAL DISTRIBUTION: Definition, normal curve, mean and standard deviation, median, mode, normal distribution applications.

UNIT - 5 **L-12**

TESTING OF HYPOTHESIS: Population and sampling, parameters and statistics, types of sampling; Test of hypothesis and test of significance - null hypothesis, errors, level of significance, confidence limits, testing large samples, sample distribution of proportion**,** t-distribution for small sample, difference between means of small sample; Chi square test for goodness of fit, chi-square test for test of independence.

TEXT BOOKS:

1. Miller and Freund, "Probability and Statistics for Engineers", 8th edition, Pearson publishers, 2013.
2. H. K. Dass and Er. R. Verma, "Higher Engineering Mathematics", S. Chand and Co., 3rd revised edition, 2014.

REFERENCE BOOK:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", S.Chand and Co., New Delhi, 2005.

16MS201 MANAGEMENT SCIENCE

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

This course offers the framework for improving managerial skills and leadership qualities. The objective of the course is to provide skills related to making decisions, organization structure, production operations, marketing, human resource management, product management and other management strategies.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand the economic principles and nature and scope of Managerial Economics and its role of economic environment in managerial decision making.

CO2: Estimate future demand for the product using survey and stastical methods.

CO3: Examine the factors affecting the demand for the product.

CO4: Differentiate long-run and short-run production function.

CO5: Interpret companies financial position using Break-Even-Analysis and cost output Relationship.

CO6: Design Competitive strategies like pricing, product differentiation etc. and marketing according to the market structure.

SKILLS :

- ✓ *Improve productivity and marketing through production, sales and time management techniques.*
- ✓ *Create better ambience in the shop floor using better interpersonal relationship.*
- ✓ *Conduct / organise meetings, seminars and conferences in a professional manner.*
- ✓ *Effective managment of human resources.*

ACTIVITIES:

- *Identify various operational functions of management using case studies.*
- *Analyze and improve marketing strategies.*
- *Estimate human resources requirement and understand the interpersonal relationships in industries.*

UNIT - 1 **L-9**

INTRODUCTION TO MANAGEMENT: Concepts of management and organization; Nature, importance and functions of management; Systems approach to management; Taylor's scientific management theory, Fayol's principles of management, Mayo's Hawthorne experiments, Maslow's Theory of human needs, Douglas McGregor's theory X and theory Y, Herzberg's two-factor theory of motivation, leadership styles; Social responsibilities of management.

UNIT - 2 **L-9**

OPERATIONS MANAGEMENT: Principles and types of plant layout; Methods of production (job, batch and mass production); Work study - basic procedure involved in method study and work measurement.

UNIT - 3 **L-9**

MATERIALS MANAGEMENT AND STATISTICAL QUALITY CONTROL: Objectives, need for inventory control, EOQ, ABC analysis, purchase procedure, stores management and stores records; Statistical quality control - control charts for variables and attributes (simple problems), acceptance sampling.

UNIT - 4 **L-9**

HUMAN RESOURCES MANAGEMENT (HRM): Concepts of HRM, basic functions of HR manager; Manpower planning, recruitment, selection, training and development, placement, wage and salary, administration, promotion, transfer, separation, performance appraisal, grievance handling and welfare administration, job evaluation and merit rating.

UNIT - 5 **L-9**

MARKETING MANAGEMENT: Evolution of marketing, functions of marketing selling Vs marketing; 4 Ps of marketing – product mix, product life cycle, place mix, channels of distribution; Price mix – pricing methods, promotion mix and tools of promotions.

TEXT BOOKS :

1. P. V. Kumar, N. A. Rao and A. Chnalill, "Introduction to Management Science", Cengage Learning India, 2012.
2. Stoner, Freeman and Gilbert, "Management", 6th edition, Pearson Education, New Delhi, 2004.

REFERENCE BOOKS :

1. K. Philip and K. K. Lane, "Marketing Mangement" 12th edition, PHI, 2005.
2. Koontz and Weihrich, "Essentials of Management", 6th edition, TMH, 2005.

16BT201 BIOCHEMISTRY

Source: www.medipharmlab.com/

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides various chemical processes associated with living cell machinery. In addition, it offers a clear-cut idea about various molecular mechanisms, metabolic pathways and biochemical processes regulating the production of energy for the functioning of cells. The objective of this course is to familiarize students on the complex structures of biomolecules, their synthesis, interaction and metabolism.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand the structure and functions of biomolecules.

CO2: Interpret biochemical pathways for carbohydrates and their bioenergetics.

CO3: Classify structures of amino acids, protein and their metabolism.

CO4: Evaluate the role of fatty acid synthesis and their metabolism.

CO5: Depict the intermediary metabolism of biomolecules.

CO6: Carry out qualitative and quantitate analysis of macromolecules.

SKILLS:

- ✓ *Identify biomolecules by colorimetric and biochemical assays.*
- ✓ *Quantify macromolecules using UV-VIS Spectrophotometer.*
- ✓ *Proficiency in paper, thin layer and gel chromatographic techniques.*
- ✓ *Operation of HPLC.*

ACTIVITIES:

- *Analyze bio-molecules in food samples.*
- *Estimate macromolecules in biological fluids.*
- *Model exercises on building structures of macromolecules.*

UNIT - 1 **L-9**

CARBOHYDRATES: Structure and properties of mono-, di-, oligo- and polysaccharides, complex carbohydrates; Confirmation of pyranose and furanose ring, glycosidic bond; Structure and function of glycogen, starch, dextran, cellulose, glycoproteins, glycosaminoglycans and lectins.

UNIT - 2 **L-9**

BIOENERGETICS AND METABOLISM OF CARBOHYDRATE: Aerobic and anaerobic respiration-glycolysis, glucogenesis, glycogenolysis and gluconeogenesis; Entner–Doudoroff (ED) pathway; Pentose phosphate shunt and TCA cycle.

UNIT - 3 **L-9**

METABOLISM OF AMINO ACIDS: Amino acids - classifications, physico-chemical properties; Protein structure, folding and function; Nitrogen cycle; Nitrogen balance; Reductive amination; Transamination and urea cycle; Synthesis of amino acids - glutamate pathway, serine pathway and shikimate pathway.

UNIT - 4 **L-9**

LIPIDS AND THEIR METABOLISM: Classification, structure and roles of fatty acids; Synthesis and breakdown of fatty acid; Synthesis and metabolism of triglycerides; Cholesterol structure and function; Lipoproteins - classification and function.

UNIT - 5 **L-9**

NUCLEIC ACIDS AND INTERMEDIARY METABOLISM: Structure and properties of purines, pyrimidines, nucleosides and nucleotides; Biosynthesis and degradation of nucleic acids; Interconnection of pathways and metabolic regulation.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Preparation of buffers and pH measurement.
2. Qualitative and quantitative tests for carbohydrates by 3,5-dinitro salicylic acid (DNS) method.
3. Qualitative and quantitative tests for amino acids.
4. Protein estimation by Biuret / Lowry / Bradford methods.
5. Separation of different macromolecules by paper and thin layer chromatography.
6. Extraction of lipids through solvents.
7. Analysis of cholesterol by Zak method.
8. Estimation of RNA by orcinol methods.
9. Separation of proteins by electrophoresis.

TEXT BOOKS:

1. A.L. Lehninger, O.L. Nelson and M.M. Cox , "Principles of Biochemistry", 3rd edition, CBS Publications, 2005.
2. J.L. Jain , "Fundamentals of Biochemistry ", 7th edition, S. Chand Publishers, 2009.

REFERENCE BOOKS:

1. L. Stryer, J.M. Berg and J.L. Tymockzo, "Biochemistry", 5th edition, WH Freemen and Co., 2002.

2.K. Mathews, K.E. Van Holde, K. G. A. Hern, "Biochemistry", 3rd edition, Pearson education, 2005.

3. K. Wilson and J. Walker, “Techniques of Practical Biochemistry", 5th edition, Cambridge University Press, 2000.

16BT202 CELL BIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Source:
Prof. S.Krupanidhi, HoD, BT, VU

Course Description and Objectives:

This course provides an understanding of various cell organelles, their functions and inter-organellar interactions. The objective of the course is to impart knowledge on complexity involved in cell signaling and cell cycle. In addition, laboratory experiments are designed to familiarize students with the functioning of cell and its organelles.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand the basic structure of cell and their organelles.

CO2: Analyze various stages of cell cycle to regulate cell cycle and cancer.

CO3: Apply the knowledge in *in-vitro* fertilization.

CO4: Evaluate cell to cell communication.

CO5: Demonstrate various stages of embryo development.

SKILLS:

- ✓ *Differentiate various blood cells for hematological profile.*
- ✓ *Identify various stages of cell division and differentiation.*
- ✓ *Handle fluorescence microscope.*

ACTIVITIES:

- o *Demonstrate various stages of chick embryo development.*
- o *Culture different cell lines.*
- o *Assess cell viability.*
- o *Identify individual cell organelles by staining.*

UNIT - 1 **L-9**

STRUCTURE OF CELLS: Structure of prokaryotic and eukaryotic cells; Overview of organelles-mitochondria, chloroplasts, endoplasmic reticulum, golgi complex, nucleus; Cytoskeletal proteins - contractile proteins - actin, myosin and nebulin.

UNIT - 2 **L-9**

TRANSPORT ACROSS CELL MEMBRANES: Organization of plasma membrane; Passive and active transport; Na-K pump; Ca^{2+} ATPase pump; Lysosomal and vacuolar membrane; ATP dependent proton pumps - cotransport, symport, anti-port, ion-gated and ligand gated channels; Endocytosis and exocytosis.

UNIT - 3 **L-9**

REGULATION OF CELL CYCLE AND CANCER: Cell division- mitosis and meiosis; Cell cycle and regulation; Cancer- types, development and causes; Mutagenesis - tumor suppressor genes and oncogenes.

UNIT - 4 **L-9**

CELL SIGNALING: Intracellular signaling; types of signal receptors; signal transduction by hormones - steroid/peptide hormones; secondary messengers - cAMP, cGMP, protein kinases; G Proteins - receptor mediated tyrosine kinases.

UNIT - 5 **L-9**

GAMETE BIOLOGY: Heterogamy in eukaryotes; Leydig cells- morphology and differentiation; Spermatogenesis; Semen formation; Sperm bank; Artificial insemination; *in vitro* fertilization; Stages of development - zygote, blastula, gastrula and neurula.

LABORATORY EXPERIMENTS

List of Experiments Total Hours-30

1. Media Preparation for *in vitro* animal cell culture and propagation.
2. Microscopic analysis of cells and cell organelles.
3. In vitro primary cell culture and maintenance.
4. Quantitative assessment of cell attachment to different surfaces.
5. Trypsinization of cells from cell culture plates.
6. Cell Counting by Haemocytometer.
7. Passaging of cells for further culturing of cells *in vitro*.
8. Differential cell count by staining to differentiate between cell types.
9. Smear preparation for microscopy and immunohistochemistry.

TEXT BOOKS :

1. P. S. Verma and V.K. Agarwal, "Cell Biology, Genetics and Molecular Biology", S. Chand and company, New Delhi, 2000.
2. E.D.P. De Robertis and E.M.F. De Robertis, "Cell and Molecular Biology", 8th edition, B.I. Waverly Pvt. Ltd., New Delhi, 2006.
3. G.M. Cooper, "The Cell-A Molecular Approach", 3rd edition, Sinauer Publications, 2004.

REFERENCE BOOKS :

1. G. Karp, "Cell and Molecular Biology", 5th edition, Wiley Publishers, 2008.
2. B. Alberts, et al., "Molecular Biology of the Cell", 4th edition, Garland Science Publishers, 2002.

16BT203 MICROBIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Source: www.medipharmlab.com

Course Description and Objectives:

This course provides the classification of microorganisms, culturing methods and their control. The objective of this course is to impart knowledge on scope and relevance of microbes and microscopic examination. In addition, the course also imparts knowledge on microbial genetics and genetically modified microbes suitable for industries.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Ability to understand different characteristic features of microorganisms.

CO2: Maintain sterile conditions by applying knowledge of physical and chemical sterilization techniques.

CO3: Classify the microorganisms by using staining and 16S rDNA analysis.

CO4: Design media for isolation and cultivation of microorganisms.

CO5: Analyze the infectious diseases caused by pathogenic bacteria, viruses and parasites.

SKILLS:

✓ *Handle different microscopes.*

✓ *Isolate microbes.*

✓ *Differentiate between microbial species.*

✓ *Aseptic maintenance of lab and hood.*

✓ *Maintain stock cultures.*

ACTIVITIES:

- *Isolate microbes from different sources – air, soil and water.*
- *Identify pathogens from local hospitals and dairy farms.*
- *Purify different strains of bacteria and fungi.*
- *Carryout sterilization processes.*

UNIT - 1 **L-9**

INTRODUCTION TO MICROBIOLOGY: Discovery of microorganisms; Theory of spontaneous generation, Germ theory of diseases; Major contribution and events in the field of Microbiology; Scope and relevance of microbiology; Microscopy-types; Fixation of microorganisms; Principle dyes, principles of different staining techniques- simple staining, differential staining, spore staining, flagellar staining, acid fast and capsular staining.

UNIT - 2 **L-9**

MAJOR GROUPS OF MICROORGANISMS: Diversity classification proposed by Woese et al; Three Domains of life; Classification systems- phylogenetic, phenetic, genetic; Taxonomic ranks; Major characteristics used in taxonomy; Molecular approaches to microbial taxonomy.

UNIT - 3 **L-9**

NUTRITION FOR MICROORGANISMS: Nutritional classes of microbes, Macro and micronutrients, their sources and physiological functions of nutrients, growth factors and their functions in metabolism; aerobic and anaerobic metabolism; growth curve and kinetics.

CULTIVATION OF MICROORGANISMS: Culture media-synthetic and complex media; solidifying agents; types of media - selective, differential and enrichment media; Pure culture methods - spread plate, pour plate and streak plate; special techniques for cultivation of anaerobes.

UNIT - 4 **L-9**

MICROBIAL DISEASES AND HOST PATHOGEN INTERACTION: Classification of infectious diseases; Emerging infectious diseases; Molecular basis of pathogenicity and identification methods; Human diseases caused by viruses, bacteria and fungi.

UNIT - 5 **L- 09**

STERILIZATION AND CONTROL OF MICROORGANISMS: Sterilization processes- autoclaves, UV radiations, filter sterilization, disinfection; Physical agents - moist and dry heat; Chemical agents - characteristics and mode of action of antimicrobial agents; Classes of disinfectants - phenol, phenolics, alcohol, halogens (chlorine, chloramines, bromine, iodine, tinctures of iodine, iodophores), surfactants (soaps and detergents), alkylating agents (formaldehyde, glutaraldehyde, 3-propiolactone and ethylene oxide), heavy metals (mercury, silver and copper containing compounds); Evaluation of effectiveness of antimicrobial agents.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Sterilization techniques in microbiology: wet method, dry method and filter sterilization methods.
2. Study of Microscopes- dark field, bright field, phase contrast and fluorescence microscopy.
3. Microscopical identification of bacterial cells in permanent fixed slides.
4. Preparation of nutrient broth and agar for culturing *E. coli*.
5. Different inoculation methods of microorganisms in culture media.
6. Isolation of pure culture by streak plate and pour plate technique.
7. Gram staining of bacteria and observation under microscope.
8. Hanging drop method to observe bacterial motility.
9. Biochemical tests.

TEXT BOOKS:

1. L.M.Prescott, J.P. Harley and D.A.Klein, "Microbiology", 2nd edition, McGraw Hill, 2005.
2. A.Nigam and A. Ayyagari, "Lab manual in Biochemistry, Immunology and Biotechnology", 1st edition, Tata McGraw Hill, 2007.

REFERENCE BOOKS:

1. J.L.Ingraham and C.A.Ingraham, "Introduction to Microbiology - A Case History Approach" 3rd edition, Thomson Publications, 2004.
2. K.R. Aneja, "Experiments in Microbiology, Plant Pathology and Biotechnology", 4th edition, New Age International Publishers, 2007.
3. M.J.Pelczar, E.C.S.Chan and N.R. Krieg, "Microbiology", 5th edition, Tata McGraw Hill, 2006.

Source:
http://tad-associates.com

16BT204 PROCESS ENGINEERING PRINCIPLES

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course offers the basic engineering principles and calculations used in bioprocess engineering. This will offer them a clear-cut idea about basic concepts of fluid flow and its applications in biotech industries. The main objective of the course is to familiarize students about the basic unit operations, fluid mechanics, fluid measuring devices, size reduction machinary and estimation of average particle size.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand the application of engineering principles in Biotech industry.

CO2: Solve material and energy balance problems by using the principles of chemical reaction stoichiometry

CO3: Determine energy losses for fluid flowing through solid boundaries.

CO4: Evaluate the design parameters of packed beds and settling operations.

CO5: Investigate various fluid transport machinery, valves and fittings.

SKILLS:

- ✓ *Determine types of fluid flow.*
- ✓ *Estimate pressure drop and frictional losses in pipe flow.*
- ✓ *Estimate average particle size.*

UNIT - 1 **L-9, T-3**

BASIC CONCEPTS AND CALCULATIONS: Application of engineering principles in biotech Industries; Introduction to unit operations and unit processes; Units and dimensions, basic quantities and derived units; Conversion of units; Chemical reaction, stoichiometry, conversion, yield; Analysis of degrees of freedom; Material and energy balances for physical and chemical processes, recycle, bypass, purge calculations, excess air and theoretical oxygen requirement.

UNIT - 2 **L-9, T-3**

FLUID STATICS AND DYNAMICS: Nature of fluids, hydrostatic equilibrium, barometric equation, manometers; Newton's law of viscosity; Concept of Newtonian and Non - Newtonian fluids; Different types of Non-Newtonian fluids with examples in bioprocesses; Reynolds number, flow in boundary layers, boundary layer formation and separation.

UNIT - 3 **L-9, T-3**

FLUID MECHANICS: Bernoulli's equation and its application; Calculation of power required for pumping fluids; Examples from bioprocesses systems; Flow through pipes; Laminar and turbulent flow characterization by Reynolds number; Average velocity pressure drop due to skin friction and foam friction, friction factor chart; Hagen- Poiseuille equation.

UNIT - 4 **L-9, T-3**

FLOW PAST IMMERSED BODIES: Definition of drag and drag coefficient; Introduction of packed beds; Friction in flow through beds of solids, derivation of friction factor equations and pressure drop expressions; Motion of particles through fluids, terminal velocity.

UNIT - 5 **L-9, T-3**

FLUID TRANSPORTATION MACHINERY: Different types of pumps; Calculation of pump horse power; Flow measuring devices- orifice meter, venturi meter and rotameter; Size reduction unit operations, calculation of average particle size, efficiency of size reduction and screening; Different types of valves used in bioprocess industries.

TEXT BOOKS :

1. P. M.Doran, "Bio-Process Engineering Principles", 1st edition, Academic Press, 2007.
2. W.L. McCabe, J.C. Smith and P. Harriot, "Unit Operations of Chemical Engineering", 7th edition, McGraw Hill Publications, 2005.

REFERENCE BOOKS :

1. D.G.Rao, "Introduction to Biochemical Engineering", 1st edition, Tata McGraw Hill Publications, 2005.
2. S. K. Ghosal, S. K. Sanyal and S. Dutta, "Introduction to Chemical Engineering", 1st edition, Tata McGraw Hill Publications, 2007.

ACTIVITIES:

- *Verify Bernoulli's theorem.*
- *Estimate centrifugal pump efficiency.*
- *Measure fluid velocity in a pipe.*
- *Estimate pressure drop in fluidized bed reactor.*

Source:
www.sparticl.org

16BT205 GENETICS

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

The course introduces basic principles of Mendelian laws of Genetics and organization of genetic material. It also describes fine structure and function of chromosomes. The objective of this course is to provide insight into Laws of inheritance, chromosomes, genetic aberrations, genetic linkage and extra-chromosomal inheritance.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Accomplish the genetic basis of heredity by linkage mapping.

CO2: Attain knowledge on organization and packing of chromosome and its functions.

CO3: Enable to understand the structure of DNA, mutations and cloning strategy.

CO4: Enable to understand the detail structure of Phages and its mechanism of infection.

CO5: Comprehend the basics of population genetics and epigenetics.

SKILLS:

- ✓ *Solve genetics problems related to Mendelian Laws of inheritance.*
- ✓ *Disease mapping by pedigree.*
- ✓ *Karyotype human chromosome.*
- ✓ *Map chromosome.*

UNIT - 1 **L-9, T-3**

PHYSICAL BASIS OF HEREDITY: Historical perspectives of genetics; Mendelian laws/Basic laws of inheritance- monohybrid, dihybrid and trihybrid cross; Modification of Mendel's ratios due to gene interactions; Multiple alleles and lethality; Multiple factors of inheritance; The concept of linkage, crossing over and recombination; Two point, three-point test crosses and gene mapping; Probability in Mendelian inheritance.

UNIT - 2 **L-9, T-3**

GENETIC MATERIAL AND ITS ORGANIZATION: Identification of the genetic material; Classical experiments- Hershey-Chase, Avery–MacLeod–McCarty and Meselson-Stahl. Packing and organization of genetic material in prokaryotes and eukaryotes; Chromosome morphology, classification and karyotyping; Special chromosomes.

UNIT - 3 **L-9, T-3**

BACTERIAL GENETICS AND EXTRA CHROMOSOMAL INHERITANCE: Conjugation, transformation and transduction; Phages and their life cycles; Retroviruses; Introduction to extra chromosomal inheritance with examples; Petite phenotypes in yeast; Uniparental inheritance in algae.

UNIT - 4 **L-9, T-3**

GENE STRUCTURE AND MUTATIONS: Spontaneous and induced mutations; Selection of mutants-Ames test; Chromosomal aberrations; Fine structure of genes in prokaryotes and eukaryotes; Genetic control of development in Drosophila.

UNIT - 5 **L-9, T-3**

CONCEPTS OF HUMAN GENETICS (SEX DETERMINATION, LINKAGE AND DOMINANCE): Introduction - population genetics, eugenics and euthenics; Mechanisms of sex determination and differentiation; Sex influenced dominance; Sex linked inheritance and sex limited gene expression; Molecular basis of genetic diseases and applications.

TEXT BOOKS:

1. P.K. Gupta, "Genetics", 3rd edition, Rastogi Publications, 2005.
2. E. J. Gardner, M.J. Simmons and D. P. Snustad, "Principles of Genetics", 8th edition, Wiley India, 2007.

REFERENCE BOOKS:

1. M.W. Strickberger, "Genetics", 3rd edition, Prentice Hall of India Publications, 2006.
2. W. H. Elliott and D.C. Ellioit, "Biochemistry and Molecular Biology", 3rd edition, Oxford University Press, 2007.

ACTIVITIES:

- *Examine Mendelian Laws using pea plant by applying Punnett squares.*
- *Design Ames test to understand mutation.*
- *Solve the crossover problems using Drosophila as an example.*
- *Conduct conjugation experiment using E. coli model.*

Source:
http://www.engineersindia.com

16BT206 HEAT AND MASS TRANSFER

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

The course provides the basics of major heat and mass transfer operations. The objective of this course is to impart knowledge on design of heat and mass transfer equipments . In addition, it also imparts knowledge on optimization of the cost of heat transfer operations used in bioprocess industries.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand the basic modes of heat and mass transfer.

CO2: Apply principles of heat and mass transfer to predict transfer coefficients

CO3: Analyze working of various heat transfer equipment

CO4: Design heat and mass transfer equipment.

CO5: Evaluate no. of stages required for given mass transfer problem.

SKILLS:

✓ *Design heat exchangers.*

✓ *Estimate heat and mass transfer coefficients.*

✓ *Estimate Log Mean Temperature Difference (LMTD) in heat exchangers.*

UNIT - 1 **L-9**

MODES OF HEAT TRANSFER: Modes of heat transfer; Fourier's law, thermal conductivity, steady state conduction in plane wall and composite walls; Heat flow in cylinder and spheres, countercurrent and parallel current flows; Energy balances, rate of heat transfer, overall heat transfer coefficient, logarithmic mean temperature difference, individual heat transfer coefficients, and fouling factors.

UNIT - 2 **L-9**

HEAT TRANSFER TO FLUIDS WITHOUT PHASE CHANGE AND WITH PHASE CHANGE: Thermal boundary layer, heat transfer by forced convection in laminar flow and turbulent flow; Natural convection to air from vertical and horizontal planes, heat transfer from condensing vapors and heat transfer to boiling liquids.

UNIT - 3 **L-9**

DESIGN OF HEAT TRANSFER EQUIPMENTS: General design of heat exchange equipment, heat exchangers, condensers, boilers and calandrias; Liquid characteristics, types of evaporators, performance of tubular evaporators, enthalpy balances for single effect evaporator.

UNIT - 4 **L-9**

DIFFUSION AND MASS TRANSFER: Mass transfer operations, molecular diffusion in fluids, binary solutions, Fick's law of diffusion, equation of continuity, steady state equimolar counter current diffusion, Stefan's estimation of diffusivity in gases and liquids, application of molecular diffusion, theories of mass transfer.

UNIT - 5 **L-9**

MASS TRANSFER OPERATIONS: Introduction, counter and cocurrent isothermal absorption and stripping of single component, operating lines, minimum flow rate, determination of number of transfer units and height of continuous absorber, determination of number of plates; Steam distillation, flash vaporization and differential distillation for binary and multi component mixtures.

ACTIVITIES:

- *Handle sterilizers.*
- *Estimate heat transfer area for condensers, evaporators and boilers.*
- *Control temperature in bio-reactors.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Bernoulli's equation for variable cross sectional pipe.
2. Determination of coefficient of discharge for Venturi meter.
3. Estimation of coefficient of discharge for Orifice meter.
4. Determination of pressure drop for fluidized bed reactor.
5. Determination of various characteristic curves of single stage centrifugal pump.
6. Determination of minor losses for flow through pipes.
7. Calculation of heat transfer coefficient through natural convection.
8. Calculation of heat transfer coefficient through forced convection.
9. Assessment of LMTD and rate of heat transfer for double pipe heat exchanger in cocurrent and counter current pattern.

TEXT BOOKS:

1. A. Suryanarayana, "Mass Transfer Operations", 1st edition, New - Age, International, 2006.
2. McCabe, W.L. Smith J.C. and Harriot P., "Unit Operations of Chemical Engineering", 7th edition, McGraw Hill, 2004.

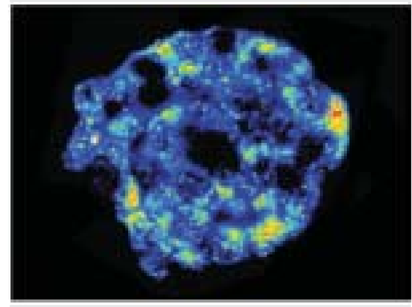
REFERENCE BOOKS:

1. D. Q. Kern, "Process Heat Transfer", McGraw-Hill, 2001.
2. C. J. King, "Separation Processes", 2nd edition, McGraw Hill, 2014.
3. P.M. Doran, "Bioprocess Engineering Principles", 2nd edition, Academic Press, 2012.
4. R.E.Treybal, "Mass Transfer Operations", 3rd edition, Mc-Graw Hill, 2012.

16BT207 INSTRUMENTAL METHODS OF BIOLOGICAL ANALYSIS

Hours Per Week :

L	T	P	C
3	-	2	4



Source:
http://cdn.phys.org

Course Description and Objectives:

The course provides an understanding of principles and functions of various scientific instruments used for analysis of biological molecules. The objective of this course is to impart technical knowledge on applications, advantages and limitations of the various analytical and separation tools and techniques.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Understand the basic principles of different bio analytical methods.

CO2: Analyze error, repeatability, precision and accuracy of instruments.

CO3: Understand the advantages and limitations of various analytical techniques.

CO4: Knowledge about techniques related to centrifugation and electrophoresis.

CO5: Separate biomolecules using membrane and chromatographic techniques.

SKILLS:

- ✓ *Skilled handling of microscope.*
- ✓ *Handling of UV Visible spectrophotometer.*
- ✓ *Chromatography techniques.*
- ✓ *Experience in working with data sets.*

ACTIVITIES:

- *Qualitative and quantitative analysis of biomolecules.*
- *Purify biomolecules from plants.*
- *Disrupt differnt cells using sonicator.*
- *Compare different analytical methods to estimate enzymes.*

I UNIT **L- 09**

INTRODUCTION TO IMA AND MICROSCOPY: Types of analytical methods; Instruments used for analysis; Uncertainties in instrumental measurements - sensitivity and detection limit for instruments; Microscopy- bright field, dark field, fluorescent, phase contrast, confocal microscopy, SEM and TEM; Flow cytometry.

II UNIT **L- 09**

UV-VISIBLE AND IR SPECTROSCOPY: General principles; Types of spectra and their biochemical applications; Basic laws of light absorption; Electromagnetic radiation, Beer-Lambert's Law and apparent deviations; UV-Visible spectrophotometer and Infra-Red spectroscopy.

III UNIT **L- 09**

NMR AND X-RAY SPECTROSCOPY: NMR- chemical shift, spin-spin coupling, applications of proton NMR, quantitative analysis and qualitative analysis, application of NMR in biology; Principle mode of operation and applications of X-ray spectroscopy.

IV UNIT **L- 09**

CENTRIFUGATION AND ELECTROPHORESIS: Centrifugation-introduction, types of centrifuge rotors, RPM-RCF, ultra centrifugation, velocity sedimentation, density gradient centrifugation; Electrophoresis - principles, types (disc, isoelectric focusing, immuno-electrophoresis, isotachophoresis) and supporting materials-paper, starch, agarose and polyacrylamide.

V UNIT **L- 09**

SEPARATION EQUIPMENTS - PRINCIPLES AND OPERATIONS: HPLC, gas chromatography, ion-exchange chromatography, gel - filtration chromatography, affinity chromatography, membrane separations, ultra filtration and reverse osmosis.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

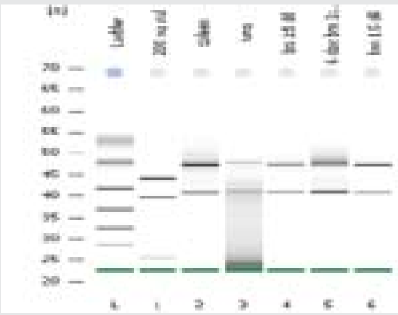
1. Verification of Lambert -Beers Law by UV -VIS spectrophotometer.
2. Estimation of reducing sugars (Benedict's method).
3. Estimation of proteins and nucleic acids by U.V. method.
4. Separation of different macromolecules by HPLC.
5. Estimation of vitamin B by turbidometry method.
6. Estimation of turbidity by U.V. method.
7. Estimation of chlorophyll by colorimetric method.
8. Determination of lambda max.
9. Calibration of pH meter.

TEXT BOOKS:

1. J. Jayaraman, "Laboratory Manual in Biochemistry", 1st edition, New Age International Publications, 2007.
2. K. Wilson and J. Walker, "Principles & Techniques of Practical Biochemistry", 6th edition, Cambridge University Press, 2007.
3. R.F. Boyer, “Modern Experimental Biochemistry”, 3rd edition, Pearson Education, 2001.

REFERENCE BOOKS:

1. K.Wilson, K. H. Goulding, "A Biologist Guide to Principles and Techniques of Practical Biochemistry", 3rd edition, ELBS Series 2006.
2. A. Douglas, Skoog & West, "Fundamentals of Analytical Chemistry", 8th edition, Harcourt Publications, 2006.
3. F. Settle, "Hand Book of Instrumental Techniques for Analytical Chemistry", Prentice Hall Publications, 1997.
4. H. H Willard, D. L. Merritt and J. R. J. A. Dean, "Instrumental Methods of Analysis", CBS Publishers and Distributors, 1992.
5. G. Chatwal and K. Anand, "Instrumental Methods of Chemical Analysis", 5th edition, Himalaya Publications, 2006.



Source:
Dr. D. Vijaya Ramu, BT, VU

16BT208 MOLECULAR BIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course describes the structure, synthesis and processing of nucleic acids and protein synthesis in prokaryotes and eukaryotes. The objective of this course is to impart the concepts of genetic materials, central dogma, mutations and DNA repair.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Appreciate the structure of genetic materials.

CO2: Interpret the concepts of central dogma of life.

CO3: Analyze biochemical synthesis and molecular processes that occur during cell growth.

CO4: Apply concepts of genetic code in recombinant technology.

CO5: Create the bacterial mutants using physical or chemical mutagens.

SKILLS:

- ✓ *Determining purine-pyrimidine complementation.*
- ✓ *Handling of micro-pipette.*
- ✓ *Setting up chemical reactions in micro-volumes.*
- ✓ *Handling reagents, enzymes and biochemicals related to molecular biology.*

UNIT - 1 **L-9**

STRUCTURE OF DNA AND RNA: Discovery-structure of DNA; B, A and Z models; Denaturation and melting curves; m-RNA, r-RNA, t-RNA structures.

UNIT - 2 **L-9**

DNA REPLICATION: Models of DNA replication: semi-conservative model, mitochondrial (D-loop), viral DNA (Rolling circle); Single stranded- DNA phages (M13, phi-174); Mechanism of DNA replication in *E.coli* (bi- directional); Inhibitors of DNA replication; Enzymes involved in replication; Eukaryotic telomeres.

UNIT - 3 **L-9**

RNA BIOSYNTHESIS AND POST TRANSCRIPTIONAL PROCESSING: Transcription apparatus; Mechanism of transcription in prokaryotes and eukaryotes; RNA polymerases and proteins involved in transcription; Inhibitors of transcription; Post transcriptional processing of mRNA.

UNIT - 4 **L-9**

PROTEIN BIOSYNTHESIS IN PROKARYOTES AND EUKARYOTES: The genetic code and Wobble Hypothesis; Protein synthesis in prokaryotes and eukaryotes; Differences between prokaryotic and eukaryotic protein synthesis; Post translation modifications; Inhibitors of protein synthesis.

UNIT - 5 **L-9**

MUTAGENESIS: Types of mutagens and their actions; Types of mutations- spontaneous, induced and lethal; Characteristics of mutations and applications; Site- directed mutagenesis and reverse genetics; DNA damage and repair mechanisms; Nucleotide excision repair mechanisms; Mismatch repair mechanism and base excision repair mechanism.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Isolation of genomic DNA from plants.
2. Isolation of genomic DNA from animals.
3. Isolation of genomic DNA from bacteria.
4. Quantification of DNA by UV Spectrophotometer.
5. Isolation of RNA.
6. Quantification of RNA by UV Spectrophotometer.
7. Agarose gel electrophoresis to visualize and quantify DNA isolated from bacteria, plants or animals.
8. SDS-PAGE technique for separation of proteins.
9. Staining of PAGE gels with Coomassie brilliant blue.
10. Staining of PAGE gels with silver nitrate.

TEXT BOOKS :

1. D. Freifelder, "Molecular Biology", 2nd Edition, Narosa Publishing Home 1987.
2. Channarayappa, "Molecular Biotechnology: Principles and Practices", 1st Edition, Universities Press, 2006.
3. M.R.Green and J. Sambrook. "Molecular Cloning: A Laboratory Manual", 4th Edition, Cold Spring Harbor Lab. 2013.

REFERENCE BOOKS:

1. H.Lodish, A. Berk, S.L. Zipursky, P. Matsudaira, D. Baltimore and J. Darnell, "Molecular Cell Biology", 6th edition, W.H. Freeman & Company, 2007.
2. J.E. Krebs, E.S. Goldstein, S.T. Kilpatrick, "Lewin's Genes XI", 11st Edition, 2015.

ACTIVITIES:

- *Model the double-helix of DNA using ball and stick kit.*
- *Identify complements, palindromes, loops and bends.*
- *Predict DNA complexity by gel electrophoresis.*
- *Amplify gene using PCR.*

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Develop formal communication skills in a work place.

CO2: Acquire team skill by working in group activities, Present them confidently in job interviews.

CO3: Equip them with suitable language and speech patterns in a workplace.

CO4: Enhance the ability of critical & lateral thinking while addressing the issues at any situation.

CO5: Understand the usage of language at all the circumstances and can enhance his professionalism.

SKILLS:

- ✓ *Communicate and understand the difference between soft skills and hard skills.*
- ✓ *Professionalism and employability skills.*
- ✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*
- ✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*
- ✓ *Prepare resumé and learn how to face interview.*
- ✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - the process of communication, levels of communication, flow of communication, choice of diction and style with reference to setting (formal, semi-formal or informal); communication networks, barriers to communication, miscommunication, noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, need for soft skills, professionalism, employability skills.

C) CAREER PLANNING:

Job vs. career, goal setting, SWOT analysis, planning and prioritization, four quadrant time management system, self-management, stress-management.

ACTIVITY: Johari Window for SWOT analysis; Setting a SMART goal using the provided grid; Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, roots, prefixes & suffixes, synonyms and antonyms, collocations, one-word substitutes, analogies, idioms and phrases, contextual guessing of unfamiliar words, task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student) – vocabulary exercises with hand-outs; Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, role plays (including small talk), self introduction, opening and closing a telephonic conversation, making an appointment, making a query, offering/ passing on information, communicating with superiors, expressing agreement/objection, opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, dynamics of group discussion, intervention, summarizing and conclusion, voice modulation, content generation, key word approach (KWA), social, political, economic, legal and technical approach (SPELT), view point of affected part (VAP), language relevance, fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics- controversial, knowledge, case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, preparing the resume, writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, understanding employer expectations, pre-interview planning, opening strategies, impressive self-introduction, answering strategies, other critical aspects such as body language, grooming, other types of interviews such as stress-based interviews, tele-interviews, video interviews, frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey time management matrix.*
- *Stress management techniques.*
- *Vocabulary flash cards.*
- *Situational dialogues.*
- *Group discussion.*
- *Resumé preparation.*
- *Mock interview.*
- *Reading comprehension activities.*
- *Listening comprehension activity by watching the american accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, techniques for speed reading, understanding the tone, skimming and scanning, appreciating stylistics, impediments for speed reading, eye fixation, sub-vocalization, critical reading, reading based on purpose, reading for information, reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (handouts); Newspaper activity with students divided into 4 groups; Each group looks at critical component of communication such as listening, speaking, reading and writing enabling them to be better communicators as well as be more aware about the current affairs, which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, different types of listening, active and passive listening, top-down approach, bottom-up approach, understanding the non verbal cues of communication; intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British and American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, cultural sensitivity, social awareness, emotional intelligence, good manners, self-grooming, positive body language, accepting and handling responsibility, assertiveness, problem solving, negotiating skills, networking and creating a good first impression.

Seven essential skills for a team player; attentive listening, intelligent questioning, gently persuading, respecting other's views, assisting others, sharing and participating actively.

ACTIVITY: Johari window, games and case studies.

Reference books:

1. E. Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. A. Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. J. A. K. Page, "Leadership for Innovation" 1st edition, Kogan, 2007.
4. M.A. Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. K. Mohan and N.P. Singh, "Speaking English Effectively" 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. R. K. Mishra, "Personality Development", Rupa and Co., 2004.

VFSTR UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

III Year B.Tech. Biotechnology I - Semester	**L**	**T**	**P**	**To**	**C**
	4	-	-	4	4

BT 301 MOLECULAR BIOLOGY

Course Description & Objective:

To acquaint the student about the structure, synthesis and processing of nucleic acids and protein synthesis in prokaryotes and eukaryotes. Also to make the students aware about the classification and types of mutations and how they effect the gene and its expression and how DNA will repair the damage.

Course Outcomes:

1. To provide an in-depth knowledge of the core principles of biological and/or medicinal processes to manipulate genes.
2. Imparts an understanding of biochemical synthesis and molecular processes that occur during cell growth.
3. Able to describe and explain processes that leads to the determination of characteristics of living organisms
4. Gives an insight into the most significant molecular and cell-based methods used in biotech industries.

UNIT I : Structure of DNA and RNA:

Detailed structure of DNA, variation from Watson & Crick model, Z - DNA, A & B DNA, Denaturation & melting curves, m-RNA, r-RNA, t-RNA structures.

UNIT II : DNA Replication:

Models of DNA replication: semi conservative model, Mitochondrial (D-loop), Viral DNA (Rolling circle), Single stranded- DNA phages (M13, ϕ174), Mechanism of DNA replication in E.coli (bi- directional), step by step process, Inhibitors of DNA Replication. Enzymes involved in replication, Eukaryotic telomeres and its replication.

UNIT III : RNA Biosynthesis and Post transcriptional processing:

Ribosomes,Transcription apparatus, Mechanism of transcription in prokaryotes and eukaryotes, RNA polymerases and proteins involved in transcription, Inhibitors of transcription, Post transcriptional processing of RNA ‘s t-RNA, r-RNA, m- RNA splicing..

UNIT IV: Protein Biosynthesis in Prokaryotes and Eukaryotes:

The genetic code and Wobble Hypothesis, Protein synthesis in Prokaryotes and Eukaryotes, Differences between prokaryotic and eukaryotic protein synthesis, Post translation modifications. Inhibitors of protein synthesis.

UNIT V : Mutagenesis:

Types of mutagens and their actions, Types of mutations-spontaneous, induced, lethal, characters of mutations and applications, Site - directed mutagenesis and reverse genetics. DNA damage and repair mechanisms.

TEXT BOOKS:

1. David Friefeldur - Molecular Biology, 2nd Ed., Norasa Publishing Home 1987.

2. Channarayappa - Molecular Biotechnology Principles and Practices, 1st Edition, 2006. University Press.

REFERENCE BOOKS:

1. Lodish & Baltimore, Molecular Cell Biology, 5th Ed., W.H. Freeman & Company, 2003.

2. Benjamin Lewin - Gene – VIII, 1st Edition,2004.

3. Gerald Karp - Cell and Molecular Biology, Concepts and Experiments, 5th Edition, John Wiley and Sons Pvt. Ltd., 2008.

III Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
4	-	-	4	4

BT 303 BIOCHEMICAL REACTION ENGINEERING

Course Description & Objectives:

Develop familiarity with chemical reaction kinatics, D e v e l o p familiarity with types of reactions,Giving basic concepts of reactor design. Making familiarity with reactor operation.

Course Outcomes:

Students will be able to

1. Familiar with types of reactions & chemical reaction kinetics.
2. Familiar with reactor design.
3. Acquire skills with various modes of reactor operations.
4. Analyze concepts of elemental and electron balances, yield and maintenance coefficients.
5. Understand about the structured and unstructured models.
6. Learn growth and inhibition models.
7. Understand concepts of RTD & scale-up.

UNIT I : Fundamentals of reaction engineering:

Concept of order, molecularity of a reaction, searching a mechanism for a reaction, evaluation of rate constants, temperature using Arrhenius equation. Irreversible unimolecular type first order reactions, irreversible bimolecular type second order reactions, Interpretation of batch reactor data.

UNIT II : Microbial growth kinetics

Stoichiometry of cell growth and product formation - elemental and available electron balances, degrees of reduction, maintenance coefficient. Kinetics of microbial growth: Monods model, inhibitory growth kinetics- substrate inhibition models, product inhibiton models, Logistic models, Mixied growh kinetics, Product production kinetics.

UNIT III : Bioreactor Design & Analysis:

Definition of bioreactor, Concepts of reactors based on flow characteristics, design of ideal reactors using material and energy balance. Performace equation for batch, continuous (chemostat &

turbidostat) and fed batch bioreactor. Multiple stage chemostat, recycle flow in chemostat, Design of plug flow reactors, comparison of productivity in plug flow and single stage single flow chemostat.

UNIT IV: Multiple Reactions:

Parallel series, *series – parallel reactions,* calculation of yield and selectivity, role of thermodynamic parameters, Design principles- non isothermal reactions and pressure effects.

UNIT V: Non- Ideal Reactors & Reactor Applications:

Concepts of residence time distribution, micro mixing and macro mixing, Reasons for non-ideality, concept of macro using – RTD analysis (E-C-F functions), diagnosing the ills of non-ideal bioreactors. Design and analysis of fed-batch and airlift bioreactors. Application in animal cell culture. Basic concept of scale-up, non - dimensional analysis.

TEXT BOOKS:

1. Octave Levenspiel- Chemical Reaction Engineering, 3 rd Edition, John Wiley and sons, 1999.

2. P.M. Doran- Bioprocess Engineering Principles, Academic press-1995.

REFERENCE BOOKS:

1. D.G. Rao – Introduction to Biochemical Engineering, 1 st Edition, Mc Graw-Hill, 2005.
2. M. L.Shuler and F Kargi – Bioprocess Engineering, Prentice Hall of India, 1992.
3. James F Bailey- Biochemical Engineering Fundamentals, 2 nd Edition, David F. Ollis, 1986.
4. H.S Fogler – Elements of Chemical Reaction Engineering, 2 nd Edition, PHI, 1992.
5. J.M. Smith – Chemical Engineering Kinetics, 3 rd Edition, Mc Graw Hill, 1981.

III Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
4	-	-	4	4

BT 305 GENETIC ENGINEERING

Course Description & Objectives:

The course is oriented at making the student understand about the process of gene expression and its regulation. Also to give awareness about different vectors used for gene transfer, enzymes, cloning methods, expression and detection of clones, molecular methods and markers and applications of r-DNA technology.

Course Outcomes:

Students gain knowledge on

1. Gene expression and regulation
2. Structure and organization of different vectors used in gene transfer
3. Enzymes used in gene manipulation
4. Cloning methods, expression and detection of clones
5. Molecular techniques, markers and applications of r-DNA technology

UNIT I : Gene Regulation in Prokaryotes and Eukaryotes:

Prokaryotes - Lactose, Arabinose and Tryptophan operons, Repressors and activators, Sigma switch in Bacillus subtilis., Eukaryotes - Gene regulation, Promoters, enhancer elements, Gene rearrangement , gene amplification.

UNIT II : Plasmids, Transposons / Vectors for Gene Transfers:

Plasmids: Definition, types, Identification, classification and purifications and transfer of Plasmids. Host restriction in transfer; Transposable elements: Definition, detection of transposition in bacteria, types of bacterial transposons, mechanisms of transposition and excision, applications of transposons, retrotransposons; enzymes involved in genetic engineering, different types of cloning vectors (Plasmid – pUC 19, l-phage, cosmid, M13, BAC,YAC & YEP).

UNIT III : Expression and Detection of clones :

Cloning strategies, sequencing, DNA fingerprinting; Blot analysis - Southern, Northern Western blot; dot and slot blot; PCR- Principles, designing of primers, methodology, Types of PCR, RT - PCR, multiplex PCR, identification of PCR product, application of PCR technology.

UNIT IV : Molecular Techniques :

Purification of genomic DNA from living cells, Manipulation of purified DNA; Introduction of DNA into living cells - methods of Gene transfer, DNA methylation, DNA hybridization, DNA sequencing, DNA fingerprinting; Blot analysis - Southern, Northern & Western blot; dot and slot blot; PCR- Principles, designing of primers, methodology, Types of PCR, RT - PCR, multiplex PCR, identification of PCR product, application of PCR technology.

UNIT V : Molecular Markers and Applications of r-DNA Technology:

Molecular markers: RFLP, RAPD, AFLP, Restriction mapping, 16s r-RNA typing, gene chip and microarray; applications in disease profile; Gene cloning in medicine (Insulin, Blood clotting factor VIII), High level expression of proteins in different host systems (E. coli, yeast, Insect, mammalian cells), Introduction to Gene therapy (Ex vivo & In vivo), case study of ADA as an example., Advantages and limitations of Gene therapy and novel technologies.

TEXT BOOKS :

1. T.A.Brown - Gene Cloning & DNA analysis, 5th Ed., Balckwell, 2006.

2. B.D. Singh,m Plant Biotechnology, 1st Edtion.Kalyani Publishers.

REFERENCE BOOK :

1. Primrose SB - Principles of Gene manipulation and Genomics, 5th edition, Blackwell Scientific Publications, 2006.
2. David Friefelder- Essentials of Molecular Biology, 4th ed., Noragam Publishing house, 1995.

III Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
4	-	-	4	4

MS 310 MANAGERIAL ECONOMICS

Course description and Objectives:

To make the students familiar with Economic, Accounting & Financial concepts used to help the managers in taking Business Decisions.

Course Outcomes:

1. Student will be able to undesrastand the basic concepts of managerial economics
2. They will gain adequate knowledge in cost analysis
3. They will acquire sufficient skills to interpret pricing and profit management
4. They will be able to perform various ratio analyse

UNIT – I : Introduction to Managerial Economics :

Nature & Scope relation of Managerial Economics with the functional areas of business organization. Role of Managerial Economist

Demand Analysis: Types of Demand, Demand determination, Demand elasticities, Demand forecasting, Survey & Statistical methods.

UNIT – II : Production and Cost Analysis production function:

Marginal rate of technical substitution, iso-quants and iso-costs, production function with one/two variables, cobb-douglas production function, Factor productivities and returns to scale.

Cost Analysis: Cost concepts, cost determinants, cost output relationship in the short and long run.

UNIT – III : Pricing and Profit Management:

Features and types of different competitive situations – Perfect competition, monopoly, monopolistic and oligopoly, pricing methods in practice.

UNIT – IV : Profit Management:

Nature and theories of profit. Cost – Volume – Profit Analysis.

UNIT – V

Ratio Analysis – Introduction to ratios, Advantages and disadvantages of ratio analysis, Types of ratios – liquidity, solvency, turnover and profitability ratios.

TEXT BOOKS:

1. Gupta, "Managerial Economics" TMH, 1/e, 2005.
2. M.E. Thukaram, "Accounting for Managers" TMH, 2/e, 2006.

REFERENCE BOOKS:

1. Dominic Salvatore, "Managerial Economics", Thomson, 3/e, 2006.
2. Mote Paull, "Managerial Economics" TMH, 1/e, 2004.
3. S.N.Maheswari, "Financial Accounting" Thomson, 2/e, 2006.

III Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 307 PLANT BIOTECHNOLOGY (ELECTIVE - I)

Course Description & Objectives:

The Course is designed to provide concepts and industrial applications in the field of agricultural biotechnology. Production of high yielding,disease resistant crop varieties by using plant transformation technology. Concepts of Plant Molecular farming and production of plantibodies from Genetically modified organisms. To enable students to participate in R&D projects, develop laboratory and research skills.

Course Outcomes:

The students will develop fundamental knowledge in Plant Biotechnology and its application in laboratory and industry settings.

The students will:

1. Acquaint with principles, technical requirement, scientific and commercial applications in Plant Biotechnology,
2. Become familiar with sterile techniques, media preparation, DNA extraction methods, gene isolation and sequence analysis,
3. A knowledge of *Agrobacterium* and its development as a transformation vector & critically assess various plant genetic modification strategies
4. Knowledge of how plants can be transformed with respect to pest resistance, herbicide tolerance,
5. Support methodologies in plant tissue/cell culture to plant improvement, understanding how breeding strategies can be targeted to crops
6. Become motivated to set goals towards pursuing graduate school and higher level positions, such as lab manager and key scientist in plant biotechnological research institutes and industries.

UNIT I : INTRODUCTION TO TISSUE CULTURE & APPLICATIONS:

Introduction to cell and tissue culture; Tissue culture media (composition, preparation); Initiation and maintenance of callus and cell suspension culture, organogenesis; Protoplast isolation culture and fusion;Production of haploids, Somaclonal variations,Germplasm conservation (Cryopreservation); Hardening & Field transformation of cultured Plants; Bioreactors systems and models for mass cultivation of plant cells.

UNIT II: PLANT TRANSFORMATION TECHNOLOGY:

Agrobacterium mediated gene transfer; Agrobacterium based vectors, viral vectors and their application. Direct gene transfer methods; chemical methods, electroporation, microinjection, particle bombardment.

UNIT III:PLANT GENETIC ENGINEERING FOR PRODUCTIVITY AND PERFORMANCE (BIOTIC STRESS & ABIOTIC STRESS):

Herbicide resistance, Insect resistance, Disease resistance, virus resistance,. Abiotic stress tolerance ;(Drought, temperature, salt).

UNIT IVII MOLECULAR FARMING & INDUSTRIAL PRODUCTS:

Application of Plant biotechnology for the production of quality oil, Industrial enzymes, Therapeutic Proteins ,Antigens (edible vaccine) and plantibodies.

UNIT V: METABOLIC ENGINEERING:

Concepts of Production of secondary metabolites from plant; Metabolic engineering for plant primary metabolites and secondary metabolites.

TEXT BOOKS:

1. H.S. Chawla, A Text Book of “Plant Biotechnology”, 2nd ed., Oxford & IBH, New Delhi, 2002.
2. H.K.Das, Text Book of Biotechnology -Wiley India, (P) Ltd. New Delhi, 5th edition, 2007.

REFERENCEBOOKS:

1. Roberta Smith, Plant Tissue Culture: Techniques and Experiments. 2nd ed.Academic Press, 2000.
2. Freifelder D, Molecular Biology, Jones and Bartlett Publishers inc. 1987.
3. Bhojwani, S.S. and Rajdan, Plant Tissue Culture: Theory and Practice. 2004
4. R.C., Dubey, “A Text Book of Biotechnology” 4 th ed. S. Chand , Publishers,2006
5. Primrose, S B, Twyman, Richard M Old, R W, Principles of gene manipulation, Blackwell Scientific publishers, 2001

III Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 309 PLANT METABOLISM (ELECTIVE - I)

Course Description & Objectives:

The course is intended for students in the plant sciences. All topics are taught in the context of plant biology. Successful completion of this course will provide students with fundamental knowledge of biochemistry and specific knowledge of compounds and biochemical pathways that occur in plants.

Course Outcomes:

1. Students will learn the structure, function and biosynthetic pathways of essential biochemical molecules including their key chemical and physical properties.
2. Students will learn how membranes form and function and how the building blocks of membranes are made
3. Students will learn amino acid structures and relate their chemical properties to the synthesis and function of proteins, enzymes and other metabolites.
4. Students will learn about the rich diversity of secondary compounds and metabolism in plants and how such compounds contribute to human health.

Unit –I: Structure and biochemical aspects of specialized plant cell organelles Cell plate, primary and secondary cell walls, plasmodesmata, importance of vacuoles, characteristics of meristematic cells Cell division - Mitosis, Meiosis, extension, differentiation and their controls. Water relations of plants - role of water, absorption, adsorption, conduction and transpiration, guttation water balance and stress.

Unit-II Photosynthesis :

Structure of organelles involved in Photosynthesis of plants and bacteria. Electron transfer in chloroplasts of plants difference from mitochondria. photophosphorylation and reduction of CO_2; differences in C_3,C_4 & CAM Photosystems (PS I & PS II) light receptors and light harvesting ferrodoxin, Plastocyanin plasto quirone, carotenoids; Hill reaction, plants.Nitrogen assimilation and Biological nitrogen fixation.

Unit-III: Plant Hormones :

Growth regulating substances and their mode of action. Role of auxins, gibberelic acid, abscisic acid, cytokinins and brassinosteriods in the regulatory cell extension, germination, growth and development. Signal transduction and gene expression Secondary metabolism-Special features of secondary plant metabolism formation and functions of phenolic acids, tannins lignins, flavonoid pigments, surface waxes, cutin and suberin - the plant protective wats, terpenes Mineral metabolism - role of different minerals absorption and translocation of inorganic and organic substances.

Unit-IV: Photomorphogenesis :

Physiology of flowering & Vernalization Responding to light: Photomorphogenesis: Phytochrome, Phytochrome in dark grown seeding, Physiological effects of Phytochrome, Phytochrome in green plants, Phytochrome under natural conditions, mechanism of Phytochrome action. Temperature and Plant Development: Temperature in the Plant environment, Influence of temperature on growth and plant distribution, and development.

Unit-V: Photoperiodism and Rhythmic Phenomena :

Photoperodism; the Biological Clock,Genetic approaches to photoperiodism, and rhythms; Photoperiodism in nature. Biochemistry of fruit ripening, senescence and abscission; Seed Germination and Dormancy Defence system in plants (ethylene, Jasmonic acid and Salicylic acid), Pathogenesis Related (PR) Proteins.

Text Books:

1. Heldt, H. 2005. Plant Biochemistry (3rd Edn.) Indian Reprint, Elsevier, New Delhi.
2. Hopkins, W. G., Introduction to Plant Physiology. 3rdEdition. John Wiley & Sons, New York.2009.

Reference Books:

1. Dey, P. M. & Harborne, J. B. (Eds.) 1997. Plant Biochemistry, Academic Press, London
2. Salisbury, F.B., & C.W. Ross,”Plant Physiology”, 4th ed., Thomson Wadsworth Pub., 2007. California.

III Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 311 PLANT PHYSIOLOGY (ELECTIVE - I)

Course Description & Objectives :

To make the student to understand about the uptake of water, absorption of minerals and different transport mechanisms in plants. To acquaint the student with biochemical processes like photosynthesis, respiration, nitrogen fixation; biosynthesis of secondary metabolites and strategies to improve their production. To gain knowledge on growth, differentiation, morphogenesis, development, mineral nutrition, plant movements and plant hormones; effect of different stresses on plant growth and development and responses of plants to stress.

Course Outcomes :

1. Absorption of water and minerals; transport mechanisms
2. Biochemical processes like photosynthesis, respiration, nitrogen fixation and biosynthesis of secondary metabolites
3. Growth, differentiation, morphogenesis, development, plant hormones, plant movements, photoperiodism
4. Effect of different types of stresses and response of plants to stresses.

Unit - I: Water Potential :

Plants and water, Diffusion, bulk flow, chemical and water potential; osmosis, transpiration, Ascent of Sap, mineral nutrition, absorption of mineral salts, nature of membranes, solute absorption, passive and active transport, ATPase pumps, proton pumps, carriers and channels, transport in phloem.

Unit - II: Plant Biochemistry :

Photosynthesis – chloroplasts, Emerson effect, Photosystem I and II, Electron transport, Calvin cycle,c4 pathway, photorespiration, CO_2 fixation, factors affecting photosynthesis; Respiration - Respiratory Quotient, glycolysis, fermentation, Krebs cycle, electron transport system and their energitics, Pentose phosphate pathway, factors affecting respiration; Nitrogen cycle, fixation, assimilation of nitrates and ammonium.

Unit-III : Plant secondary metabolites :

Definition of stress , stressful environments, water stress – drought, cold and salt; chilling injury, high temperature stress, oxidative stress, Mechanisms of plant response to water and related stresses, plant defense systems. Introduction; Classification, structure, function and biosynthesis of secondary metabolites ; important pathways of biosynthesis - phenyl propanoid pathway; Mevalonate pathway and acetate 6mevalonate pathway. Strategies and approaches for the over production of plant secondary metabolites – plant cell suspension cultures, hairy root cultures, metabolic engineering, bioreactors.

Unit-IV : Plant growth, Development and Regulation :

Growth, patterns of growth and development, growth kinetics, morphogenesis, principles of differentiation, dormancy, germination, flowering and senescence. Concepts of hormones and their action, Biosynthesis and physiological significance of auxins, cytokinins, gibberellins, abscisic acid, ethylene; Basic principles of plant movements-nastic movements, tropisms, photomorphogesis, photoperiodism

Unit- V : Stress Physiology :

Definition of stress , stressful environments, water stress – drought, cold and salt; chilling injury, high temperature stress, oxidative stress, Mechanisms of plant response to water and related stresses, plant defense systems.

TEXT BOOKS:

1. Plant Physiology , Frank B. Salisbury and Cleon W. Ross 2004, 4th Edition, Thomson Asia Pte Ltd., Singapour
2. Plant Biochemistry; P. M. Dey and J. B. Harborne, Academic Press (1997).

REFERENCE BOOKS

1. Plant Biochemistry, P.M. Dey & J.B. Harborne(2000) Hart Court Asia Pte Ltd.
2. Introduction to plant Biochemistry. Goodwin and Mercer, CBS Publisher (2000).
3. Biochemistry and Molecular Biology of Plants. Buchanan, Greussem and Jones, AAPS (2000).

II Year B.Tech. Biotechnology I - Semester	L	T	P	To	C
	-	-	1	1	1

SR004 SEMINAR

III Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
-	-	3	3	2

BT313 BIOCHEMICAL REACTION ENGINEERING LAB

Course Description & Objectives:

Provides practical knowledge of different chemical reactors used in chemical engineering industries.

Course Outcomes:

1. Able to determine the kinetics of a given reaction in different types of reactors
2. Would be familiar with the working models of various types of reactors
3. Able to Characterize lab reactors through residence time distributions (measured or model based).
4. Gain knowledge on effects combined reactors on kinetics of the reaction.

List of Experiments:

1. Kinetic Studies in C.S.T.R
2. Kinetic Studies in P.F.R
3. Kinetic Studies in Combined Reactor
4. Kinetic Studies in Batch Reactor
5. Adiabatic Batch Reactor
6. R.T.D Studies in C.S.T.R
7. R T D Studies in C.S.T.R's in Series
8. R.T.D Studies in Plug Flow Reactor
9. R.T.D Studies in Combined Reactor.

TEXT BOOKS:

1. Octave Levenspiel - Chemical Reaction Engineering , 3rd Ed. John Wiely & Sons,1999.
2. H.S. Fogler - Elements of Chemical Reaction Engineering, 2nd ed. PHI, 1992.

III Year B.Tech. Biotechnology I - Semester	**L**	**T**	**P**	**To**	**C**
	-	-	3	3	2

BT 329 CELL & TISSUE CULTURE LABORATORY

Course Description & Objectives:

To introduce the advanced laboratory skills that reinforce basic principles and techniques learned in introductory biology, chemistry of various cells and tissue systems. The enhancement of general and advanced laboratory experiences, facilitates that further for future independent research. To provide research outcomes that develops critical thinking and analytical skills. towards the changing trends in technology and the modern aspects of biochemical and molecular biology questions asked in plant biology and allied areas.

Course Outcomes:

1. The laboratory teaching of this course will provide students an opportunity to get hands on training with some of the most basic, yet widely utilized techniques in micropropagation etc.
2. Become familiar with sterile techniques, media preparation, methodologies in plant tissue/cell culture, effect of PGH on plant tissues etc.

List of Experiments:

1. Introduction to Cells, plant tissues
2. Observation of Algal & Fungal cultures,Mitotic & Meiotic Cells
3. Preparation of different Media for plant cell/tissue culture
4. Surface sterilization
5. Raising of Aseptic Seedlings
6. Callus induction
7. Organogenesis

8. Effect of Auxins on root induction

9. Effect of Cytokinins on shoot induction

10. Protoplast isolation & culture

11. Hardening & Field transformation of cultured Plants

12. Agrobacterium mediated gene transfer, selection of transformants, reporter gene (GUS) assays.

TEXT BOOKS:

1. C.C.Giri &ArchanaGiri, Plant Biotechnology Practical Manual, 2007.

2. Bhojwani, S.S. and Rajdan, Plant Tissue Culture: Theory and Practice.,Elsevier Publishers, Amsterdam, 2004.

REFERENCE BOOK:

1. Laboratory manual for Microbiology by P Gaunasekharan,Newage International Publishers. 2004.

III Year B.Tech. Biotechnology II - Semester

L	T	P	To	C
-	-	3	3	2

BT 331 BIOLOGICAL DATABASE LABORATORY

Course Description & Objectives:

The data pertaining to Biology is diverse and numerous. Hence a few data banks with details on genes, proteins, ligands, SNP etc.... are being maintained by Governmental and non-governmental agencies for the percolation of information. These data bases are to be practiced in the lab.

Course Outcomes:

1. Students will be able to retrieve data from online databases
2. They will understand the significance of biological databases
3. They will be able to submit annotated data to the databases
4. They will understand the importance of accession IDs
5. They will be able to utilize various tools in databases for research works in future.

Explaining and mining of the following Data Banks

a) NCBI
b) DDBJ
c) UCSC GENOME BROWSER
d) Biogrid (India)
e) Protein Data Bank
f) EMBL-EBI
g) HLA / IMGT data base
h) SNP database

TEXT BOOK :

1. Bioinformatics: Sequence and Genome Analysis, Second Edition, David Mount, 2004.

III Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

BT 302 ANIMAL BIOTECHNOLOGY (ELECTIVE-II)

Course Description & Objectives:

The course provides an overview of current developments in different areas of animal biotechnology. It imparts in vitro reproductive techniques for sperm, ovum and embryo manipulation.It helps in ellucidating structural, functional and comparative genomics of farm animals and its application for livestock improvement.The course comprehends the application of immunological techniques in biotechnology and appreciates the principles of animal cell culture and its application.

Course Outcomes:

At the end the students will demonstrate the ability in / to

1. Development of primary cultures
2. Development of established cell culture.
3. Assess the effect of factors and their role in cell functions.
4. Develop awareness in interlinking of different fields for the development of biological organs.

UNIT- I: Animal cell culture techniques and media :

Cell culture techniques including primary and secondary culture, cell lines, suspension culture, organ culture etc. Different type of cell culture media, growth supplements, serum free media, balanced salt solution, culture of different tissues and its applications. Behavior of cells in culture conditions, division, growth pattern and metabolism, estimation of cell number and cell viability, MTT assay. Quantification of cells by trypan blue dye exclusion method.

UNIT-II: Development and maintenance of Cell Lines

Development of cell lines, characterization and maintenance of cell lines, stem cells, cryopreservation, common cell culture contaminants. Cryopreservation of primary cell cultures and cell lines. Effect of viruses on cultured mammalian cells. Cloning of domestic animals. Conservation of endangered species.

UNIT-III: Immunodiagnostics :

Somatic cell hybridization, hybridoma technology, commercial production of antibodies using monoclonal antibodies, screening of hybrids for production of monoclonal antibodies. Application of antibodies in chemiluminescence and fluorescence assay used, antibody based nucleic acid probes and their applications in ELISA.

UNIT-IV : Reproductive Technology

Assisted reproductive biotechnology in man and animal, introduction to embryo biotechnology, endocrine therapeutics. methodology of super ovulation, *in vitro* fertilization, embryo culture and micromanipulation, preparation of sperm for IVF. Different methods of gene transfer and their limitations, sperm mediated gene transfer, embryo splitting, production of transgenic livestock by nuclear transfer and its application, regulatory issues.

Unit-V : Animal Genomics

Characterization of animal genomes, SNP, STR, QTL, RFLP, RAPD, genetic basis for disease resistance, transgenic animal production and application in expression of therapeutic proteins. Nucleic acid based methods for identification of animal species, detection of meat adulteration using DNA based methods, identification of wild animal species using DNA based methods. Brief introduction on Software tools for molecular phylogeny.

TEXT BOOKS:

1. M M Ranga (2014) Animal Biotechnology, 2nd Ed. Riddhi International.
2. P C Trivedi (2014) Advances in Biotechnology, Riddhi International

REFERENCE BOOKS:

1. Gordon I. 2005. Reproductive Techniques in Farm Animals, CABI.
2. Kindt TJ, Goldsby RA & Osbrne BA. 2007. Kuby Immunology. WH Freeman.
3. Kun LY. 2006. Microbial Biotechnology, World Scientific.

III Year B.Tech. Biotechnology II - Semester

L	T	P	To	C
4	-	-	4	4

BT 304 THERMODYNAMICS FOR BIOTECHNOLOGISTS

Course Description & Objectives:

Develop familiarity with thermal energy concept..To estimate properties of chemical compounds and biomass.Develop familiarity with heat of reactions.Develop familiarity with phase and chemical equilibria.

Course Outcomes

1. Understand the terminology associated with engineering thermodynamics.
2. Reiterate the first and second laws of thermodynamics, and understand the practical implications of these laws in engineering design.
3. Understand the concepts of heat, work and energy conversion, and can calculate heat and work quantities for industrial processes.
4. Calculate the properties of ideal and real mixtures based on thermodynamic principles.
5. Explain the underlying principles of phase equilibrium in two-component and multi-component systems.
6. Apply mass, energy and entropy balances to flow processes.

UNIT - I : The first law and other basic concepts:

The scope of thermodynamics. The first law of thermodynamics, thermodynamic state and state functions, enthalpy, steady-state steady flow process, equilibrium, phase rule, reversible process, constant - V and constant - P processes, heat capacity. Calculation of Work, energy and property changes in reversible processes.

UNIT - II : Behavior of Fluids :

The PVT behavior of pure substances, virial equations, ideal gas, applications of the virial equations, second virial coefficients from potential functions. Thermodynamics of flow processes; principles of conservation of mass and energy for flow systems.

UNIT - III : Second Law of Thermodynamics :

Statements of the second law, thermodynamic temperature scales Entropy, Entropy changes of an ideal gas, third law of thermodynamics, entropy from the microscopic view point.

UNIT - IV : Thermodynamic Properties of Fluids & Solution Thermodynamics :

Estimation of thermodynamic properties using equations of state; Maxwell relationships and their applications; Calculation of flow processes based on actual property changes, Partial molar properties, concepts of chemical potential and fugacity, Ideal non ideal solutions, Gibbs Duhem equation; Excess properties of mixtures; Activity Coefficient.

UNIT - V : Phase Equilibria & Chemical Reaction Equilibria :

Criteria for phase equilibrium; Vapor-liquid equilibrium calculations for binary mixtures, Liquid – Liquid equilibrium and Solid-liquid equilibrium, Equilibrium criteria for homogeneous chemical reactions; Evaluation of equilibrium constant and effect of pressure and temperature on equilibrium constant; Calculation of equilibrium conversions and yields for single and multiple chemical reactions.

TEXT BOOKS:

1. J M.Smith,H.C.Van Ness and M.M. Abbott. “Introduction to Chemical Engineering Thermodynamics”, 5th ed., McGraw Hill, 2005.

2. Y.V. C.Rao, “Chemical Engineering Thermodynamics”, 1st ed., University Press, 2004.

REFERENCE BOOKS:

1. K. V. Narayanan, “A Text Book of Chemical Engineering Thermodynamics”, 1st ed., PHI Publications, 2001.
2. Y.V.C.Rao, “Engineering Thermodynamics”, 1st ed., University Publications, 2004.
3. M.D.Koretsky, “Engineering and Chemical Thermodynamics”, 1st ed., John Wiley and sons, 2004.

III Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

BT 306 BIOPROCESS ENGINEERING

Course Description & Objectives:

This course helps to familiarize various aspects of bioreactors, to understand the media requirements and working conditions for profitable run of bioprocess industries.

Course Outcomes

1. The student understands about biological and kinetic concepts underlying bioprocesses engineering.
2. The student able to learn procedures for the design and control of industrial scale fermentation and biological waste treatment processes
3. The student will be able to apply different biotechnological methods used in the recombinant protein production, in fermentation processes and in protein purification.
4. The student will be able to analyze the research results and to present them both in written and oral form.
5. The student will be able to prepare a research plan for practical laboratory training research project in bioprocess field.

UNIT - I : Introduction to Bioprocesses & Media Design :

An overview of traditional and modern applications of biotechnology industry, outline of an integrated bioprocess and the various (upstream and down stream) unit operations involved in bioprocesses, generalized process flow sheets. Medium requirements for fermentation processes, carbon, nitrogen, minerals, vitamins and other complex nutrients, oxygen requirements, medium formulation for optimal growth and product formation, examples of simple and complex media, design and usage of various commercial media for industrial fermentations.

UNIT - II : Metabolic Stoichiometry & Energetics :

Stoichiometry of Cell growth and product formation, elemental balances, degrees of reduction of substrate and biomass, available electron balances, yield coefficients of biomass and product formation, maintenance coefficients. Energetic analysis of microbial growth and product formation, oxygen consumption and heat evolution in aerobic cultures, thermodynamic efficiency of growth.

UNIT - III : Kinetics of Microbial Growth & Product Formation :

Phases of cell growth in batch cultures, Simple unstructured kinetic models for microbial growth, Monod model, Growth of filamentous organisms. Growth associated (primary) and non - growth associated (secondary)

UNIT - IV :Transport process in bioreactors :

Mixing equipments, flow patters in agitated tanks, radial and axial flow impellers, mechansim of mixing, power requirement for ungassed and gassed mixing, scale-up of mixing system, improvement of mixing in fermenters and effect of shear in bioreactors. Oxygen transfer in fermenters, measuring dissolved oxygen concentratins, parameters affecting dissolved oxygen concentrations, measurement of K_La and scale up of oxygen transfer in larger bioreactors.

UNIT - V : Sterilization Kinetics :

Thermal death kinetics of microorganisms, batch and continuous heat sterilization of liquid media, filter sterilization of liquid media, air sterilization and design of depth filters, design of sterilization equipment - batch and continuous.

TEXT BOOKS :

1. M.L.Shuler and F. Kargi “Bioprocess Engineering”, 2nd ed., Prentice Hall of India, 2008.
2. P.M. Doran, “Biochemical Process Principles,1st ed., Elsivier Publications, 2009

REFERENCE BOOKS:

1. Harvey W. Blanch, Douglas S. Clark “Biochemical Engineering”, 1st ed., Marcel Dekker Publications, 2007.
2. Bailey Ollis, David F. Ollis, “Biochemical Engineering Fundamentals”, 2nd ed., McGraw-Hill Publications, 1986.

III Year B.Tech. Biotechnology II - Semester

L	T	P	To	C
4	-	-	4	4

BT 308 ENZYME TECHNOLOGY

Course Description & Objectives:

To acquaint the student with classification of enzymes, mechanism of action, isolation methods, kinetics and applications. Also about immobilization techniques and bioreactor designing.

Course Outcomes:

After completing this course, the student should be able to:

1. Describe various classes of enzymes, concept of active site and energetics of enzyme substrate complex.
2. Gain the knowledge on key structural and energetic factors which give rise to increased enzyme stability important for industrial application.
3. Summarize current processes involved in industrial enzyme production and purification from plants, animals and microorganisms.
4. Understand the selection and optimization of industrial enzymes using genetic and biochemical techniques,
5. Understand the different immobilization methods and analyze the bioconversions in immobilized reactors.

UNIT I: Introduction to Enzymes :

Classification of enzymes, Applications of Enzymes, Principles of catalysis – collision theory, transition state theory, role of entropy in catalysis, Comparison of chemical and enzyme catalysis. Stability, deactivation & catalytic activities. Mechanisms of enzyme action, Concept of active site and energetics of enzyme substrate complex formation, Specificity of enzyme reaction.

UNIT II: Isolation of Enzymes :

Extraction and Purification of Crude Enzyme extracts from plant, animal and microbial sources. Methods of characterization of enzymes and different characteristics, Development of enzymatic assays.

UNIT III: Kinetics of Enzyme Action :

Kinetics of single substrate reactions; Estimation of Michaelis – Menten parameters, Importance of K_M, Multisubstrate reaction mechanisms and kinetics, Turnover number. Types of Inhibition- kinetic models, Substrate and Product Inhibition, Allosteric regulation of enzymes, Deactivation kinetics.

UNIT IV : Enzyme Immobilization

Physical and Chemical techniques for enzyme Immobilization - adsorption. matrix entrapment, encapsulation, cross-linking, covalent binding – examples, Advantages and disadvantages of different Immobilization techniques, Overview of applications of immobilized enzyme systems.

UNIT V : Immobilized Enzyme Reactors

Design of Immobilized Enzyme Reactors-Packedbed, Fluidizedbed Membrane reactors, Bioconversion calculations in free-enzyme CSTRs and immobilized enzyme reactors. Stability, Deactivation & Catalytic activities.

TEXT BOOKS:

1. Trevor palmer - Enzymes, First edition, East west Press, 2004.
2. James E Bailey, David F., Ollis - Biochemical Engineering Fundamentals, 2nd edition. Mc Graw Hill Intl., 1986.

REFERENCE BOOKS:

1. James Lee - Biochemical Engineering , First edition, PHI, 1992.
2. Harvey W. Blanch, Douglas S. Clark - Biochemical Engineering, First Indian edition, Marcel Dekker, Inc. 2007.
3. Shuler, M.L. and Kargi,F. “ *Bioprocess Engineering - Basic concepts* Second Edition Prentice Hall of India Pvt. Ltd., 2005

III Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

BT 310 BIOETHICS, SAFETY AND IPR

Course Description and Objectives:

This course helps to adhere to the ethical practices appropriate to the discipline at all times and to adopt safeworking practices relevant to the bioindustries & field of research :

Course outcomes:

1. Students will gain awareness about Intellectual Property Rights (IPRs) to take measure for the protecting their ideas
2. They will able to devise business strategies by taking account of IPRs
3. They will be able to assists in technology upgradation and enhancing competitiveness.
4. They will acquire adequate knowledge in the use of genetically modified organisms and its effect on human health
5. They will gain more insights into the regulatory affairs.

UNIT I: Engineering Ethics & Bioethics :

Senses of "Engineering Ethics"' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Introduction to Bioethics. Social and ethical issues in Biotechnology Definition of Biosafety. Biosafety for human health and environment. Social and ethical issues. Use of genetically modified organisms and their release in to the environment. Special procedures for r-DNA based products, Transgenic plants and Animals.

UNIT II : Regulatory Affairs :

Regulation, national and international guidelines of Biosafety, r-DNA guidelines, Regulatory requirements for drugs and Biologics GLP and GMP.

UNIT III : Intellectual Property Rights :

Intellectual property rights and protection, patents and methods of application of patents, Trade Secrets copyrights, Trade Marks, legal implications, farmer's rights, plant breeder's rights. International and National conventions on biotechnology and related areas, WTO guidelines.

UNIT IV : Safety, Responsibilities and Rights:

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights.

UNIT V : Global Issues :

Multinational corporations - Environmental ethics - computer ethics - weapons development and bioterrorisms - engineers as managers-consulting engineers - engineers as expert witnesses and advisors - moral leadership-sample code of Ethics.

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS:

1. Sasson A, Biotechnologies and Development, UNESCO Publications, 1988.
2. Sasson A. Biotechnologies in developing countries present and future, UNESCO publishers, 1993. 7. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001. 9. Singh K. "Intellectual Property Rights on Biotechnology", BCIL, New Delhi.

III Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

BT 312 STEM CELL BIOLOGY(ELECTIVE - II)

Course Description & Objectives:

This course is an examination of the goals, practices, and accomplishments of contemporary stem cell biology. It impart in students an understanding about embryonic and adult stem cell culture; their role in drug discovery.

Course Outcomes:

At the end the students will demonstrate the ability

1. Establishment of embryonic & adult stem cells culture.
2. Assess the role of stem cells in drug discovery.
3. Develop awareness in interlinking of genetic engineering in the field of stem cell biology

UNIT I : STEM CELL BASICS :

Unique properties of stem cells – embryonic stem cells - adult stem cells – umbilical cord stem cells – similarities and differences between embryonic and adult stem cells. Properties of stem cells – pluripotency – totipotency.

UNIT II : EMBRYONIC STEMCELLS :

In vitro fertilization –culturing of embryos-isolation of human embryonic stem cells – blastocyst – inner cell mass – growing ES cells in lab – laboratory tests to identify ES cells – stimulation ES cells for differentiation – properties of ES cells.

UNIT III : ADULT STEM CELLS :

Somatic stem cells – test for identification of adult stem cells – adult stem cell differentiation – trans differentiation – plasticity – different types of adult stem cells.

UNIT IV : STEM CELL IN DRUG DISCOVERY AND TISSUE ENGIEERING :

Target identification – Manipulating differentiation pathways – stem cell therapy Vs cell protection - stem cell in cellular assays for screening – stem cell based drug discovery, drug screening and toxicology.

UNIT V: GENETIC ENGINEERING AND THERAPEUTIC APPLICATION OF STEM CELLS :

Gene therapy – genetically engineered stem cells – stem cells and Animal cloning – transgenic animals and stem cells – Therapeutic applications – Parkinson disease - Neurological disorder – limb amputation – heart disease - spinal cord injuries – diabetes –burns - HLA typing- Alzheimer's disease –tissue engineering application – production of complete organ - kidney – eyes - heart – brain.

TEXT BOOKS :

1. Embryonic Stem cells by Kursad and Turksen. 2002.Humana Press.
2. Stem cell and future of regenerative medicine . By committee on the Biological and Biomedical applications of Stem cell Research.2002.National Academic press

REFERENCE BOOKS:

1. Cell Growth and Division: A Practical Approach. Ed. R. Basega, IRL Press.
2. Cell Culture Lab Fax. Eds. M Butler & M. Dawson, Bios Scientific Publications Ltd..Oxford.
3. Animal Cell Culture Techniques. Ed. Martin Clynes, Springer.
4. Methods in Cell Biology, Vol. 57, Animal Cell Culture Methods. Ed. Jenni P Mather and David Barnes. Academic Press.

III Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

BT 330 ANIMAL CELL SCIENCE & TECHNOLOGY (ELECTIVE - II)

Course Description & Objectives:

This course intends to impart in students an understanding of the primary cell culture and methods that convert them to long term established cultures. They will also be exposed to all the factors which could impact cell culture and equipment requirements for propagation. Awareness is generated about recent advances in the area of stem cell technology, organ culture, tissue engineering etc.,

Course Outcomes:

1. Students will demonstrate the ability to develop primary established cell culture.
2. They could assess the effect of factors and their role in cell functions.
3. They will develop awareness in interlinking of different fields for the development of biological organs.
4. They will have indepth knowlege on engineering of Animal Cells and their applications

UNIT-I BASICS OF ANIMAL CELL AND ITS CULTURING :

Structure and organization of an animal cell, Types of animal cell culture - cell culture, organ/tissue culture, organotypic culture and histotypic culture, Equipments and materials needed for animal cell culture technology.

UNIT-II ANIMAL CELL CULTURE MEDIUM AND ITS COMPONENTS AND THEIR SIGNIFICANCE:

Introduction to the balanced salt solutions and growth medium, Brief discussion on the chemical, physical and metabolic functions of different constituents of culture medium, Role of carbon-di-oxide and role of serum and its supplements in maintaining cells in culture medium, Serum and protein free defined media and their application.

UNIT-III BASIC TECHNIQUES OF MAMMALIAN CELL CULTURE *IN VITRO:*

Primary and established cell lines, Biology and characterization of the cultured cells, measuring parameters of growth. Maintenance of cell culture, Cell separation, Cell transformation, Cell synchronization, Measurement of viability and cytotoxicity, Apoptosis - characteristic features and molecular mechanisms, Measurement of cell death.

UNIT-IV ENGINEERING ANIMAL CELLS:

Somatic cell genetics, Cell culture based vaccines, Genetic engineering of mammalian cells in culture, Scaling up of animal cell culture, Stem cell cultures - embryonic and adult stem cells and their applications.

UNIT-V APPLICATIONS OF ANIMAL CELL CULTURE:

Three dimensional culture and tissue engineering, Applications of animal cell culture technology (heterologous, Primary culture/CEF culturing, Protein Expression).

TEXT BOOKS:

1. Culture of Animal Cells, Fl. Ian Froshney. Wiley-Liss.

2. Animal Cell Culture - Practical Approach, Ed. John R.W. Masters, OXFORD,

REFERENCE BOOKS:

1. Cell Growth and Division: A Practical Approach. Ed. R. Basega, IRL Press.

2. Animal Cell Culture Techniques. Ed. Martin Clynes, Springer. Methods in Cell Biology, Vol. 57, Animal Cell Culture Methods. Ed. Jenni P Mather and David Barnes. Academic Press

III Year B.Tech. Biotechnology I - Semester	L	T	P	To	C
	-	-	1	1	1

SR005 SEMINAR

III Year B.Tech. Biotechnology II - Semester	L	T	P	To	C
	-	-	3	3	2

BT 332 MOLECULAR BIOLOGY AND GENETIC ENGINEERING LABORATORY

Course Description & Objectives:

To familiarize students with Molecular Biology and Genetic Engineering Techniques like isolation of DNA agarose gel electrophoresis; PAGE, silver staining, blotting techniques, restriction enzyme digestion, ligation, restriction mapping, cloning of DNA & Transformation.

Course Outcomes:

The course is oriented at providing insights into

1. Isolation of genomic DNA from tissues
2. Amplifying DNA by PCR
3. Quantification of Nucleic acids by PCR
4. In-depth knowledge of various experiments to execute projects independently

List of Experiments:

1. Isolation of Plant, Bacterial Genomic DNA and Plasmid DNA.
2. Agarose Gel Electrophoresis.
3. Molecular Weight Determination DNA
4. Restriction digestion.
5. Restriction mapping and ligation.
6. Blotting Techniques – Northern/Western blots
7. Cloning of DNA into plasmid vector.
8. Expression of Beta – galactosidase assay.

TEXT BOOKS:

1. Ausubel etal, Current Protocols in Molecular Biology, Green Publishing associates, 1988.
2. Arati Nigam & Archana Ayyagari, Lab Manual in Biochemistry, Immunology and Biotechnology, 1 st ed., 2007.

III Year B.Tech. Biotechnology II - Semester

L	T	P	To	C
-	-	3	3	2

BT 334 BIOPROCESS ENGINEERING LABORATORY

Course Description & Objectives:

To learn - microbial process fundamentals, enzyme catalysis. Bioreactor design and analysis.

Course Outcomes :

1. The student understands about biological and kinetic concepts underlying bioprocesses engineering.
2. The student able to learn procedures for the design and control of industrial scale fermentation and biological waste treatment processes

LIST OF EXPERIMENTS:

1. Kinetics of growth in batch cultivation- estimation of Monod kinetic parameters
2. Temperature effect on growth-estimation of energy of activation and Arrhenius Constant for microorganisms.
3. Development of enzyme assays and quantification of enzyme activity and specific activity
4. Enzyme kinetics
5. Effect of pH and temperature on enzyme activity
6. Techniques of enzyme immobilization - matrix entrapment, ionic and cross linking.

TEXT BOOKS:

1. K.R. Aneja, “Experiments in Microbiology, Plant Pathology & Biotechnology” , 4th ed., New Age International Publishers. 2007.
2. P. Gunasekharan, “Laboratory Manual in Microbiology”, 1st ed., Newage International Publishers. 2005.

REFERENCE BOOKS:

1. J.Jayaraman , “Laboratory Manaual in Biochemistry”,1 st ed., New Age International Publications, 2007.
2. Eisenthal, R. & Danson N.J. (Eds) Enzyme Assays: “A Practical Approach”, 2nd ed., IRI Press, Oxford, UK, 1992.

VFSTR UNIVERSITY

IV Year - B.Tech

SYLLABUS

I SEM & II SEM

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 401 BIOINFORMATICS

Course Description & Objectives:

To equip students with computational skills and to help them use computational methods to study, organise, analyse and interpret biological information at molecular, genetic and genomics levels.

Course Outcomes :

This course contributes to the development of the following program learning outcomes

1. Will demonstrate an advanced understanding of biological sciences by articulating the methods of science, explaining why current biological knowledge is both contestable and testable through further inquiry, and explaining the role and relevance of biotechnology in society.
2. Will have an understanding of recent developments in a specialized area of biotechnology
3. Advanced skills to critically analyze and solve problems in biotechnology.
4. Will demonstrate cognitive skills in mastery of advanced theoretical knowledge in biotechnology and apply this knowledge to solve complex problems in existing and new areas.
5. Will be able to query biological data, interpret and model biological information and apply this to the solution of biological problems in any arena involving molecular data.

UNIT I: Introduction to Bioinformatics :

Basics of Bioinformatics, Elementary commands and protocols, ftp, telnet, http,html. Scope of Bioinformatics.

UNIT II: Sequencing Alignment & Dynamic Programming

Heuristic Alignment algorithms. Global sequence alignments - Neddleman - Wunsch Algorithm, Smith - Waterman Algorithm - Local sequence alignments (Amino acid substitution Matrices (PAM, BLOSUM).

UNIT III: Biological Databases & Their Use

Introduction to Biological databases, Organization and management of databases. Searching and retrieval of information from the World Wide Web. Structure databases - PDB (Protein Data Bank), Molecular Modeling Databases (MMDB). Primary Databases NCBI,EMBL, DDBJ,Introduction to Secondary Databases Organization and management of databases Swissprot, PIR,KEGG,Introduction to BioChemical databases-organization and Management of databases. KEGG, EXPASY,BRENDA, WIT.

UNIT IV: Evolutionary Trees & Phylogeny

Ultrasonic trees – parsimony – Ultrametric problem – Perfect phylogeny – Phylogenetic alignment – connection between multiple alignment and tree construction.

UNIT V: Applications of Bioinformatics

DNA Mapping and sequencing –Map alignment – Large scale sequencing and alignment – Shotgun – DNA sequencing – Sequence assembly – Gene predictions – Molecular predictions with DNA strings.

TEXT BOOKS:

1. D. Baxivanis and Foulette - Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Wiely Indian Edition, 2001.
2. Mount. D. - Bioinformatics: Sequence and Genome Analysis, Indian Edition, Cold Spring Harbor Lab, 2001.

REFERENCE BOOKS:

1. C S V Murthy - Bioinformatics, 1st Edition , Himalaya Publishing House, 2003.
2. Harshawardhan P. Bal - Bioinformatics – Principles and Applications, First Reprint, Tata McGraw-Hill, 2006.
3. T K Attwood, D J parry-Smith, Introduction to Bioinformatics, Pearson Education, 1st Edition, 11th Reprint 2005.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 403 IMMUNOLOGY

Course Description & Objectives:

The course enables students to acquire knowledge and understanding of theoretical concepts of Immunology.It also helps in acquiring skills and provides competence in specialized immunological techniques in the diagnosis and management of health related disorders. It also imparts knowledge and understanding of research methods employing immunological techniques for application in biomedical and clinical research.

Course Outcomes:

The learning outcomes are the following:

1. The immune system of the vertebrate host will be comprehensively known
2. The blood cells and their defense roles will be familiar
3. The transplantation techniques and principles involved will be known
4. The techniques to asses immune surveillance help students to undertake clinical immunology as a profession.

UNIT I: Immune system and immune responses:

Cells and organs of immune system; innate and acquired immunity, types of immune responses, theory of clonal selection. Development, maturation, activation and differentiation of T-cells and B-cells; antigen presenting cells, major histocompatibility complex, antigen processing and presentation; regulation of T-cell and B-cell responses. TCR and its diversity.

UNIT II: Antigen and antibodies:

Ntigens: Chemical and molecular nature; haptens;adjuvants;Antibodies: structure and functions of antibodies; genetic control of Ab production. Isotype, allotypes, Idiotypes; antigen-antibody reactions and their significance in diagnosis; monoclonal and polyclonal antibody production: principles and applications, Immunotoxic chimeric antibodies and abzymes.

UNIT III: Infection and Immunity:

Injury and inflammation; immune responses to infections: immunity to viruses, bacteria, fungi and parasites, cytokines, complement; immunosuppression, tolerance, allergy and hypersensitivity, AIDS and Immunodeficiencies, resistance and immunization, vaccines.

UNIT IV: Transplantation and Tumor Immunology:

Transplantation: genetics of transplantation; laws of transplantation; Graft rejection evidence and mechanisms of graft rejection,prevention of graft rejection, tumor immunology. Autoimmunity, Autoimmune disorders and diagnosis.

UNIT V: Immuno-Techniques:

Immunoelectrophoresis, SDS-PAGE, HB electrophoresis, ELISA, RIA, non-isotopic methods for detection of ntigens,chemiluminescence assay, immunohistochemistry, purification techniques of antigens and antibodies. Flowcytometer, PCR, RTPCR, application of recombinant DNA technology for the study of the immune system, Immunotherapy with genetically engineered antibodies.

TEXT BOOKS:

1. Kuby Immunology, 5th Edition . Richard A Goldsby, Thomas J Kindt Barbara A Osborne . W H Freeman and Company.

2. Tizard, Immunology., 4th Edition.

REFERENCE BOOKS :

1. Nandini Shetty-Immunology Introductory Text Book.

2. Fundamentals of Immunology-William Paul

3. Cooper E.L General Immunology.

4. Roitt. Essential Immunology, Vaccines conventional, subunit and recombinant, antidiotypic vaccine, Blackwell Scientific publications, Oxford,1991.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 405 DOWNSTREAM PROCESSING

Course Description & Objectives:

To make the student regarding role and importance of downstream processing in biotechnology and its problems associated with product purification. Also about the different separation, purification and new emerging methods and technologies for product recovery.

Course Outcomes:

1. Imparts an understanding of principles of major unit operations used in downstream processing of biopharmaceuticals (e.g., homogenization, centrifugation, chromatography, and ultra filtration).
2. Gives an insight focuses on designing processes for the recovery and subsequent purification of a target therapeutic protein.
3. Able to perform basic scale-up calculations for downstream unit operations
4. Able to describe and explain about process of recombinant proteins purification.

UNIT I: Role Of Downstream Processing In Biotechnology:

Role and importance of downstream processing in biotechnological processes. Problems and requirements of bioproduct purification. Economics of downstream processing in Biotechnology, characteristics of biological mixtures, process design criteria for various classes of bioproducts.

UNIT II: Physical Separation Methods:

Separation of intracellular, extra-cellular, heat and photosensitive materials. Cell disruption: chemical, mechanical and enzymaticm e t h - ods Physicochemical basis of separation; Physical separation processes: solid and liquid system, flocculation, centrifugation,precipitation, filtration, settling.

UNIT III: Product Recovery Methods:

Extraction, liquid-liquid extraction, aqueous two-phase extraction, absorption, adsorption and leaching. Membrane-based separations (micro, ultrafiltration, reverse osmosis,dialysis), theory, design and configuration of membrane separation equipment applications.

UNIT IV: Product Purification:

Chromatographic techniques- Paper, TLC, Adsorption, Ion exchange, Gel filtration, affinity chromatographic separation processes, GC, HPLC, FPLC, Chromato focusing electrophoretic separations. Elecrtrophoresis of proteins and nucleic acids, 1D-2D Gels, Types of Electrophoretic techniques (Capillary and Pulse field).

UNIT V: Product Finishing and Emerging Technologies:

Crystallization and drying. Pervaporation, super liquid extraction foam based separation case study with examples for processing of Two Industrial Products (Citric acid / Penicillin and Low volume high value product like recombinant proteins).

TEXT BOOKS:

1. BIOTOL.' Series - Product Recovery in Bioprocess Technology, 1st edition, Butterworth Publications, 2004.
2. B. Sivasankar - Bioseparations Principles and Techniques, 1st edition, PHI Publications, 2009.

REFERENCE BOOKS:

1. Wankat PC- Rate Controlled Separations, 1st edition, Spinger, 2005.
2. S.N. Mukhopadhyay - Process Biotechnology Fundamentals, 2nd edition,Viva Books Private Limited, 2005.
3. P F Stanbury, A Whitaker - Principles of Fermentation Technology, 2nd edition, Elsevier Publication, 2008.
4. Keith Wilson, John Walker, John M. Walker - Principles and Techniques of Practical Biochemistry, 7th edition, Camebridge Publication, 2010.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 407 BIOPHYSICS (ELECTIVE - III)

Course Description & Objectives:

The course helps in understanding physical principles that governs the resulting structures. It helps in familiarizing with different types of spectroscopy and analyzing various types of structures.It enables to determine higher order structures of proteins, nucleic acids and carbohydrates and provided understanding of transport mechanism of organisms.

Course Outcomes:

Students will be able to

1. Understand basic principles of physics, biology and chemistry that will govern cell structures.
2. Get familiarized with working principle of different spectroscopy.
3. Analyze various types of structures.
4. Determine higher order structures of proteins, nucleic acids and carbohydrates.
5. Understand various transport mechanisms of organisms.
6. Compare different types of transport systems across membranes.

UNIT-I : Basic thermodynamics Ligand binding and co-operativity in biological systems, kinetics, diffusion and sedimentation.

UNIT-II : Principles and biological applications of UV-Vis, fluorescence, vibrational and circular dichroism spectroscopy. Mass spectrometry and basics of one- and two-dimensional NMR spectroscopy with applications to peptide and protein structure determination.

UNIT-III : Crystal morphology and symmetry :

Symmetry elements and symmetry operations, point groups, lattice space groups. Production and properties of X-rays, diffraction of X-rays by crystals, Laue equations, Bragg'sLaw, Fourier transformation and structure factor, reciprocal lattice, experimental techniques, rotating crystals and moving film methods. Basic ideas of structure determination, Patterson and Fourier methods, chemical crystallography, structures of organic, inorganic compounds and minerals, powder diffraction.

UNIT-IV : Basic ideas on structure and conformation of simple molecules structural features of proteins, nucleic acids and carbohydrates, aspects of biomolecular forces .Higher order structural organisation of proteins and nucleic acid.

UNIT-V : Membrane Biology : Lipid structure and their organization, comparison of different membrane models, diffusion and permeability, different types of transport systems across membranes, liposome and its applications

TEXT BOOKS:

1. Tinoco, I, Sauer K, Wang J C. Physical Chemistry, Principles and Applications in Biological Sciences Prentice Hall, New Jersey, USA, 978.

2. Horst Friebolin, Basic One-and Two-Dimensional NMR Spectroscopy (Fourth Edition), Wiley-VCH.

REFERENCE BOOKS:

1. Cantor, C.R., and Schimmel P.R., Biophysical Chemistry, Vols. I-III, W.H. Freeman and Co., San Francisco, USA, 1980.

2. Buerger M.J., Elementary Crystallography Woolfson M.M., An Introduction to X-ray Crystallography.Stout H. and Jenson L.H., X-ray Structure Determination, Macmillion, 1968.

3. A.R. Leach, Molecular Modelling : Principles and Applications, Prentice Hall (2001).

4. Schulz and Schirmer, Principles of Protein Structure, Springer-Verlag (1979).

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 409 BIOSENSORS AND BIOELECTRONICS (ELECTIVE-III)

Course Description & Objectives:

This course helps to understand the use of biomolecues as recogni tion elements for detection of a particular analyte and the use of biological elements such as proteins in place of silicon chips.

Course Outcomes:

Upon undergoing this course students are expected to:

1. Extend principles of engineering to the development of bio-analytical devices and the design of sensors
2. Understand the basic configuration and distinction among biosensor systems
3. Explore and extend the technical limits of biosensor performance.
4. Overview of current developments in biosensors and bioelectronics.

UNIT I: INTRODUCTION:

Biosensors- Advantages and limitations, various components of biosensors Biocatalysis based biosensors, Bioaf finity based biosensors & Microorganisms based biosensors, Biologically active material and analyte. Types of membranes used in biosensor constructions.

UNIT II: TRANSDUCERS IN BIOSENSORS:

Various types of transducers; principles and applications - Calorimet- ric, Optical, Potentiometric / Amperometric, Conductometric / Resistom etric, Piezoelectric, Sem iconductor, Impedim etric, Chemiluminiscenebased Biosensors.

UNIT III: APPLICATION AND USES OF BIOSENSORS:

Biosensors in clinical chemistry, medicine and health care, biosensorsfor veterinary, agriculture and food Low cost - biosensor for industrial processes for online monitoring; biosensors for environmental monitoring. Application of enzymes in analysis; design of enzyme electrodes and their application as biosensors in industry, healthcare, food and environment.

UNIT IV: BIOELECTRONICS :

Potential advantages & Developments towards a biomolecular computer, development of molecular arrays as memory stores; molecular wires and switches; mechanisms of unit assembly.

UNIT V: DESIGN FOR A BIOMOLECULAR PHOTONIC COMPUTER:

Assembly of photonic biomolecular memory store; Information processing; commercial prospects for biomolecular computing systems.

TEXT BOOKS:

1. Brian R Eggins - Biosensors an Introduction , First edition, John Wiley & Sons Publishers, 1996.
2. Loic J Blum, Pierre R Coulet - Biosensors Principles and Applications, First edition, Marcel Dekker,Inc, 1991.

REFERENCE BOOKS:

1. Donald G. Buerk - Biosensors Theory and Applications, First Edition Technomic Publishing. Co, Inc, 1993.
2. Elizabeth A Hall - Biosensors, First Edition, Open University, Milton Keynes, 1990.
3. Graham Ramsay - Commercial Biosensors, First edition, John Wiley & Sons, Inc. 1998.
4. Tran Minh Canh - Sensor Physics & Technology - Biosensors , First Edition, Champan & Hall, 1993.

IV Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
4	-	-	4	4

BT 411 NANO BIOTECHNOLOGY (ELECTIVE-III)

Course Description & Objectives:

This course combines physical laws, chemical procedures and biological principles on the nano-scale and enrich the students with important applications in a range of fields like medical diagnosis, drug delivery, detection of bio-macromolecules in complicated biochemical systems etc.

Course Outcomes:

1. This course will give a general description about Nanomaterials based on their dimensionality.
2. It gives the information about importance of reduction in materials dimensionality, and its relationship with materials properties.
3. This course will give a general description about Nanomaterials based on their dimensionality.
4. Imparts an understanding of approaches for Nanomaterial fabrication & Nanotechnology tools.
5. Imparts an understanding of approaches for Nanomaterial fabrication & Nanotechnology tools.
6. Gives an insight into the use of Nanotechnology in biomedical, microelectronics and optical applications.

Unit I : Introduction:

Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concepts.

Unit II : Nano Particles :

Introduction, Types of Nanoparticles. Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic effects of Nanomaterials, Significance of Nanoparticles Nanofabrications- MEMS/NEMS, Atomic Force Microscopy, Self assembled monolayers/ Dip-pen Nanolithography, Soft Lithography, PDMS Molding, Nano wires and Nanotubes.

Unit III : Applications - I :

Nanobiosensor and Nanofluids. Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems. Nano-Biodevices and Systems. Fabrication of Novel Biomaterials through molecular self assembly- Small scale systems for *in vivo* drug delivery- Future nanomachine.

Unit IV : Applications- II :

Clinical applications of nanodevices. Artificial neurons. Real-time nanosensors- Applications in cancer biology. Nanomedicine. Synthetic retinyl chips based on bacteriorhodopsins. High throughput DNA sequencing with nanocarbon tubules. Nanosurgical devices.

Unit V : Ethical Issues in Nanotechnology :

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With special Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts. Nanotechnology and Future Socio-economic Challenges.

TEXT BOOKS:

1. Christof M. Niemeyer, Chad A. Mirkin - Nanobiotechnology: Concepts, Applications and Perspectives. 1st Ed. Wiley-VCH, 2006.
2. Jian-Qin Liu, Katsunori Shimohara - Biomolecular Computation by Nanobiotechnology, 1st Ed., Artech House, 2007.

REFERENCE BOOKS:

1. Ralph S. Greco - Nanoscale Technology in Biological Systems. 1st Ed. CRC Press. 2005.
2. Hari Singh Nalwa - Handbook of Nanostructural Biomaterials and Their Applications in Nanobiotechnology. 1st Ed.American Scientific Publishers, 2005.

IV Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
4	-	-	4	4

BT 413 ENVIRONMENTAL BIOTECHNOLOGY (Elective-III)

Course Description & Objectives:

The main objective of this course is to impart students an understanding of pollution of environment by air, water and soil responsible for degradation of natural resources and degradation of biodiversity. The course also provides a fundamental knowledge of biological methods used in safeguarding the environment by waste treatment, energy production from waste and biological methods for minimum pollution formation.

Course Outcomes:

Upon completion of the course, the student will:

1. Be able to conceptually differentiate old biotechnology from modern biotechnology.
2. Become aware of the importance of conserving soil microorganisms in order to maintain the ecological balance
3. Acquire thorough understanding about the various waste water treatment systems.
4. Be able to design and develop small scale waste water management systems
5. Be able to utilize the potential of microorganisms for bioremediation and biodegradation.

UNIT I : INTRODUCTION :

Origin and Definition of old and new biotechnology, Biotechnology a multidisciplinary growing tree, scope and importance of Biotechnology in India. Environmental Pollution-soil, water air, oil and heavy metal pollution, Types and causes and its effects on environment. Microbial flora of soils.

UNIT II: BIOGEOCHEMICAL ROLE OF SOIL MICROORGANISMS :

Microbial flora of soil–Interactions among soil microorganisms–Nitrogencycle–Carboncycle ulfurcycle–Phosphorouscycle

UNIT III : BIOMASS :

Types and composition of biomass, waste as renewable source of energy, methods of energy production, energy and fuel using microorganisms, conversion of methane to synthetic gas, cellulose as a source of energy, conservation of energy.

UNIT IV: INDUSTRIAL WASTE WATER MANAGEMENT :

Aerobic and anaerobic waste water treatment, sewage disposal and treatment – physical and biological treatment, effluent treatment – primary and secondary treatment. Biological nitrogen and phosphate removal waste water treatment in diary, distillery, tannery, sugar and industry pulp.

UNIT V : BIOREMEDIATION AND BIODEGRADATION :

Pseudomonas for bioremediation, types and reactions of bioremediation, biodegradation of hydrocarbons and pesticides, microbes in leaching of metals – leaching of copper and uranium, Control of air pollution, control devices for gaseous pollutants, volatile organic pollutants.

TEXT BOOKS :

1. Casida Jr, L.E., *Industrial Microbiology,* New Age International (P) Ltd.2007
2. Bhattacharya, B.C. and Banerjee, R., “Environmental Biotechnology”, OxfordUniversityPress,2007.

REFERENCE BOOKS :

1. Bioremediation Engineering: Design and application – John T, Cookson Jr., McGraw Hill, Inc., (1985).
2. Environmental Biotechnology (2005)by A. H. Scragg (Author), Alan Scragg, Oxford University Press.
3. Foster C.F. John ware D.A. Environmental Biotechnology, Ellis, Honwood Ltd. 1987.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 415 BIOPHARMACEUTICAL TECHNOLOGY (ELECTIVE-IV)

Course Description & Objectives:

To give awareness to the student about history, sources of drugs, pharmocodynamics, pharmacokinetics and drug manufacturing. It also deals with production and applications of biopharmaceuticals and drug delivery systems.

***Course* Outcomes:**

Student gains knowledge on

1. History and sources of drugs, different dosage forms and routes of drug administration.
2. Pharmacodynamic and pharmacokinetic mechanisms
3. GMP, Manufacturing facilities, sources, production procedures, analysis and formulation of drugs and Biopharmaceuticals
4. Production and medical applications of therapeutic proteins like interferons, interleukins, insulin, erythropoietin, hGH etc.,
5. Biomaterials and different drug delivery systems.

UNIT I : Introduction to Pharmaceuticals:

History & Definition of Drugs. Sources of Drugs - Plant, Animals, Microbes and Minerals, Different dosage forms, Routes of drug administration.

UNIT II : Pharmacodynamics and Pharmacokinetics:

Physico-Chemical Principles, Pharmacodynamics- Mechanism of drug action, Drug receptors, and Physiological receptors: structural and functional families. Pharmacokinetics - Drug absorption, Factors that affect the absorption of drugs, Distribution of drugs, Biotransformation of drugs, Bioavailability of drugs.

UNIT III : Drug manufacturing processes:

Good manufacturing practices, Manufacturing facilities, Sources of Biopharmaceuticals, Production & analysis of Biopharmaceuticals. Recent advances in the manufacture of drugs using r-DNA technology.

UNIT IV : Production and Applications of Biopharmaceuticals:

Production of Therapeutic Proteins, Hormones, Cytokines - Interferon's, Interleukins I & II, Tumor Necrosis Factor (TNF); Nucleic acids. Role of Biopharmaceuticals in treatment of various health disorders

UNIT V : Drug Delivery Systems, Biomaterials & their Applications:

Controlled and sustained delivery of drugs. Biomaterial for the sustained drug delivery. Liposome mediated drug delivery. Drug delivery methods for therapeutic proteins.

TEXT BOOKS:

1. Leon Lachman, H.A. Lieberman & J.L.Kanig, Theory & Practice of Industrial Pharmacy, 3rd ed. Varghese Publishg House, Bombay, 1987.

2. Gary Walsh - Biopharmaceuticals: Biochemistry & Biotechnology, 2nd Ed. John Wiley & Sons Ltd., England. 1998.

REFERENCE BOOKS:

1. Milo Gibaldi - Biopharmaceutics and Clinical Pharmocokinetics, First edition, Pharma Book Syndicate, 2006.

2. Remington's Pharmaceutical Sciences, Mark Publications & Co.

3. Tripathi K.D. - Essentials of Medical Pharmacology, 6th edition, Jaypee Publication, 2006.

4. Brahmankar, D.M., Sunil, B.Jaiswals - Biopharmaceutics & Pharmacokinetics a Treatise , 2nd edition, M.K.Jain Publication, Delhi, 2009.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 417 CANCER BIOLOGY
(ELECTIVE-IV)

Course Description & Objectives:

To acquaint students with the biological principles of cancer as well as the human dimensions of the disease and its therapies. To introduce the students to important and current concepts in Cancer Biology and Cancer Genetics and the lectures are organized into broad thematic groups dealing with Cell - Autonomous Mechanisms, Non Cell-Autonomous Mechanisms Organ Systems and Therapeutic Approaches.

Course Outcomes

Student acquires knowledge on

1. Causes of cancer at molecular level like cell cycle regulation and mutations
2. Different forms of cancer, diet and cancer
3. Physical and chemical carcinogenesis
4. Molecular cell biology of cancer like signal targets of cancer, oncogenes, tumor suppressor genes, growth factors and receptors etc.,
5. Invasion and metastasis of cancer

UNIT- I : Fundamentals of Cancer Biology :

Regulation of cell cycle, mutations that cause changes in signal molecules, effects on receptor, signal switches, tumour suppressor genes, modulation of cell cycle in cancer,different forms of cancers, diet and cancer.

UNIT- II : Principles of Carcinogenesis :

Natural History of carcinogensis, Theory of carcinogenesis, Chemical carcinogenesis, targets of chemical carcinogenesis.metabolism of carcinogenesis.principles of physical carcinogenesis, x-ray radiation-mechanisms of radiation carcinogenesis.

UNIT- III : Principles of Molecular Cell Biology of Cancer :

Signal targets and cancer, activation of kinases; Oncogenes, identification of oncogenes, retroviruses and oncogenes, detection of oncogenes. Oncogenes / proto oncogene activity. Growth Factor and Growth Factor receptors that are Oncogenes.Growth factors related to transformation.

UNIT-IV : Principles of Cancer Metastasis :

Clinical significances of invasion, heterogeneity of metastatic phenotype, metastatic cascade,Basement membrane disruption three - step theory of invasion, proteinases and tumour cell invasion

UNIT-V : Detection & Cancer Therapy :

Cancer screening, early and advanced detection, Detection using biochemical assays, tumor markers, molecular tools for early diagnosis of cancer.Different forms of therapy, chemotherapy, radiation therapy, Use of signal targets towards therapy of cancer; Gene therapy. Immuno therapy: advantages and limitations.

TEXT BOOKS:

1. Maly B.W.J -“Virology A Practical Approach”, IRLl Press, Oxford, 1987.
2. Dunmock N.J And Primrose S.B. - “Introduction to Modern Virology”, Blackwell Scientific Publications, Oxford, 1988.

REFERENCE BOOKS:

1. Margaret A Knowlies, Peter J Selby - Introduction to the Cellular & Molecular Bioilogy of Cancer, Oxford, 4th Edition, 2005.
2. Raymond W. Ruddon - Cancer Biology, Wiley Publications, 4th Edition, 2007.
3. Robert T.A. Weinburg - The Biology of Cancer, Garland Science, First Edition, 2007.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT 419 FERMENTATION TECHNOLOGY (ELECTIVE-IV)

Course Description & Objectives :

This course helps to familiarize important aspects of fermentation technology like media, process optimization, inoculum levels, solid state fermentation and bioprocess considerations for animal and plant cell cultivation

Course Outcomes:

1. After completing this course, students will be able to verbally describe the most common equipment, materials and methods rel ated to biotechnological processes, microbial growth and cultivation and sterilization.
2. Understand the difference in bioprocess of various reactors and develops the processes for bioproducts.
3. Student can design the medium requirements for bioprocess of plant cells, animal cells and microorganisms.
4. Be Able to apply different mathematical formulas for biocatalysis and for the bioreactor performance and use those to plan and analyze bioprocesses.
5. The student will also be able to produce, analyze and interpret data from bioprocesses.

UNIT - I : Fermentation Process:

General requirements of fermentation processes, Basic design and construction of fermentor and ancillaries, Main parameters to be monitored and controlled in fermentation processes; An overview of aerobic and anaerobic fermentation processes and their application in the biotechnology industry, solid-substrate, slurry fermentation and its applications, whole cell immobilization, behaviour of microbes in different reactors (air lift, fluidized, batch, continuous and fed batch condition).

Unit - II: Fermentation inputs:

Nutrient requirement for fermentation process, carbon, nitrogen source, macro and micronutrients, renewable energy sources (carbon and nitrogen), C/N ratio, development of inocula for microbial, plant and animal cell cultivations, supply of air/nitrogen for aerobic and anaerobic process

UNIT - III : Bioproces optimization :

Conventional optimization process (one variable at a time approach), need for statistical experimental desing, screening techniques-Plackett Burman design, response surface methodology-Box-Benken desing, central composite desing and self directing optimization

UNIT - IV : Solid state fermentation :

Introduction to solid state fermentation (SSF), comparison of SSF with submerged fermentation, applications in industry, growth kinetics in SSF, Heat and Mass transfer problems in SSF, SSF bioreactors, Scale up of SSF.

UNIT - V: Plant and animal cell cultivation :

Plant and animal cells compared to microbial cultivation, Bioreactor considerations for plant cell-suspension culture, immobilazation culture and organized tissues. Methods used for cultivation of animal cells, Bioreactor conideration for animal cell culture-suspension culture, anchorage dependent cultivation. Imporant industrial products from plant and animal cell cultivation.

TEXT BOOKS:

1. Stanbury P.F, Stephen J. Hall and Whitaker A - Principles of Fermentation Technology, 2nd edition, Butter Worth - Heinemann, An imprint of Elsevier, India pvt. Ltd., 2005.
2. Shuler, M.L. and Kargi - F. " *Bioprocess Engineering - Basic concepts* Second Edition, Prentice Hall of India Pvt. Ltd., 2005.

REFERENCE BOOKS:

1. Bailey and Ollis - " Biochemical Engineering Fundamentals", 2nd Edition, McGraw Hill , 1986.
2. Pauline M. Doran - Bioprocess Engineering Calculations, First edition, BlackwellScientific Publications, 2005.

IV Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
-	-	3	3	2

BT 421 IMMUNOLOGY LABORATORY

Course Description & Objectives :

This laboratory course is designed to help students become familiar with and proficient in the performance of principles and protocols in cellular immunology immunochemistry and clinical serology.

Course Outcomes:

1. The cellular components of immune system would make students to think of adoptive immunity which constitutes the basic principle of vaccination.
2. The student will be aware of chemical diagnostics and its significance
3. The student will be able to acquire the functioning of ELISA

List of Experiments :

1. Isolation of lymphocytes from the mouse spleen and thymus
2. Examination of mouse lymph nodes.
3. Identification and enumeration of mouse and human leukocytes
4. Complement fixation test
5. Hemagglutination test
6. Ouchterlony double immunodiffusion
7. Immunoelectrophoresis
8. ELISA
9. Preparation of antigen and adjuvant emulsion
10. Immunization of mouse
11. Harvesting of polyclonal antibodies

Text Book :

1. Immunology: A laboratory manual Editor: Richard L Myers, Publisher: Brown (William C)

IV Year B.Tech. Biotechnology I - Semester

L	T	P	To	C
-	-	3	3	2

BT423 DOWNSTREAM PROCESSING LABORATORY

Course Description & Objectives:

To aquaint the student to learn about various cell disruption techniques and product recovery methods.

Course Outcomes:

1. Students will acquire adequate knowledge in physical separation techniques
2. They will be able to purify protein using precipitation methods
3. They will understand the basic practical principles of various chromatographical techniques.
4. The will be able to perform various unit operations in downstream processing.

List of Experiments:

1. Solid separation methods-filtration, sedimentation, centrifugation,
2. Protein precipitation methods
3. Dialysis
4. Ion-exchange chromatography
5. Gel filtration chromatography
6. Aqueous Two-phase extraction,
7. HPLC
8. Product preservative methods
9. Adsorption process in batch and continuous mode

TEXT BOOKS:

1. Scopes AK - " Protein Purification ", IRL Press, 1993.
2. J.Jayaraman - Laboratory Manaual in Biochemistry , First Edition, New Age International, 1993.

REFERENCE BOOK:

1. Eisenthal, R. & Danson N.J. (Eds) - Enzyme Assays - A Practical Approach, First Edition, IRI Press, Oxford, UK, 1992.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		-	-	3	3	2

BT 425 BIOINFORMATICS LABORATORY

Course Description & Objectives:

To gain practical knowledge in retrieving biological information and analysing them & to use bioinformatics tools to solve biological problems.

Course Outcomes:

1. Students will be able to explore biological database.
2. The software tools adopted in the practical exercies make students to analye the biological data.
3. They will be be able toutilize various tolls embedded in public databases
4. They will be able to perform annotation of unknown query sequences
5. They will acquire adequate skills to perform proetin-ligand interactions and molecular simulation.

List of Experiments:

1. To retrieve Nucleotide and protein sequences from Biological Databases like NCBI, SwissProt
2. To retrieve structure data for query protein from PDB
3. To retrieve Pathways from Pathway Databases (KEGG, BRENDA, METACYC, ECOCYC
4. To retrieve Biological Information from Pub Med of NCBI
5. To retrieve Open reading frame of given query nucleotide sequence by Gene prediction methods .
6. Analysis of protein sequence using Expasy.
7. Sequence similarity searching of nucleotide sequences
8. Sequence similarity searching of protein sequences
9. Docking Studies.

TEXT BOOKS:

1. Andreas D. Baxevanis, B.F. Francis Ouellette, Bioinformatics A Practical Guide to the analysis of Genes and Proteins, 3 rd edition, Wiley-Intersicence Publications, 2005.

IV Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

MS 402 PRINCIPLES AND PRACTICE OF MANAGEMENT

Course Description & Objectives:

The main object of the course is to explain about concepts, principles and practice of management.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand what is management and evolution of management thought
2. Importance of planning and decision making in organizations
3. Process of organizing and delegation of authority
4. Theories of motivation and leadership styles
5. Coordination and control process in the organizations

UNIT - I : Management :

Overview: Definition, nature, purpose and scope of management - Functions and Roles of a manager - an overview of planning, organizing and controlling - Is managing a science or art? Ethics in managing and social responsibility of managers - Evolution of management thought. Contributions made by Taylor, Fayol, Weber, Elton Mayo, Maslow, Herzberg, and McGergor. Various approaches to Management - Decision Theory approach. Systems Approach: Key concepts in systems - Closed system versus open system. Subsystems, System Boundary. McKinsey's 7-S Approach needs - Leadership:

UNIT – II : Planning & Decision Making:

Types of plans, steps in planning, and process of planning.Nature of objectives, setting objectives. Concept and process of Managing by Objectives.Nature and purpose of strategies and policies. Strategic planning process. SWOT analysis,Portfolio matrix, premising and forecasting. Decision Making: Meaning, Importance and steps in Decision Making - Traditional approaches to decision-making - Decision making under certainty, programmed decisions – Introduction to decision-making under uncertainty,non-programmed decisions, decision tree- group-aided decisions; Brain storming – Creativity, creative problem solving.

UNIT – III Organizing :

Concept of organization, process of organizing, bases of Departmentation,Authority & power - concept & distinction. Various types of organization structures -Delegation - concept of delegation; elements of delegation - authority, responsibility, accountability. Reasons for failure of delegation & how to make delegation effective.Decentralization - concept, reasons for decentralization and types (or methods) of decentralization. Span ofManagement - concept, early ideas on span of management.

UNIT – IV Directing :

Motivation and Motivators: Concept, Theories of Motivation: Hierarchy of Needs, Motivation-Hygiene Expectancy, Equity, Reinforcement, McClelland's needs - Leadership: Meaning, Definition, Ingredients of Leadership – Trait Approaches of Leadership – Leadership Behavior and Styles – Contingency Approaches to Leadership – Communication: Meaning, Process, and Importance in Functions of Organization – Barriers in Communication – Effective Communication

UNIT – V Coordination and Control :

Concept and importance of coordination; factors which make coordination difficult; techniques or methods to ensure effective coordination. Control: Concept, planning-control relationship, process of control - setting objectives, establishing standards, measuring performance, correcting deviations. Human response to control. Dimensions or Types of Control: Feed forward control, Concurrent Control (Real TimeInformation & Control), Feedback Control - Techniques of Control: Brief review of Traditional and Modern Techniques of Control.

TEXT BOOKS:

1. Stoner, Freeman and Gilbert, Jr. Management, 6/e, Pearson Education, New Delhi, 2006.
2. Heinz Weihrich, Harold Koontz: Management A Global Perspective, 10/e, Tata McGraw Hill, 2007.

REFERENCE BOOKS:

1. Daft, The New Era of Management, Thomson, 7/e New Delhi, 2007.
2. Schermerhorn : Management 8ed, Wiley India 2006.

IV Year B.Tech. Biotechnology II - Semester

L	T	P	To	C
4	-	-	4	4

BT 402 REGULATORY AFFAIRS & CLINICAL TRAILS (ELECTIVE-V)

Course Description & Objectives :

To make the student learn about rules, regulations and guidelines for clinical trails and how they are applicable in different countries. Also to acquaint with medical ethics, IVF, audit types, audit processing, and preparation, packaging, labeling and approval of investigational products and quality management.

Course Out Comes :

Student will be familiar with

1. Rules, regulations and guidelines for clinical trails and their applicability in different countries.
2. Medical ethics, IVF, audit types and audit processing,
3. Preparation, packaging, labeling and approval of investigational products
4. Quality management

UNIT I : Regulations of Clinical Research:

ICH-GCP guidelines, Licensing authorities -roles and responsibilities of FDA, EU Clinical Trial Directive, Data Protection Act , Declaration of Helsinki 2000 amendment and codes of practice, Regulations relating to electronic signatures, drug preparation and packaging, EMEA, European directives and MRECs,Ethics committees – history and structure.

UNIT II : Medical Ethics and Auditing:

Ethics in all aspects of health care, Historical cases, Negligence, informed consent, mental competence Up – to – date cases: cloning, human embryos and IVF, Shared responsibilities for decisions and the understanding of risk: INDIAN / USA / EU Ethics approval system – Overview and Recent developments: Regulations in clinical research, The purpose of audits, Types of audits, Preparing for audits, In company, On site, The audit process, Typical audit finding.

UNIT III : Clinical Research and Clinical Trails:

History and purpose of GCP development, Roles and responsibilities in clinical research according to ICH GCP-Sponser Monitor Investigator Audit, IRB/IEC Investigational brochure Essential documentation. The INDIAN / USA / EU Directives on GCP in Clinical Trials - Purpose, How will the introduction affect clinical research, Extracts from the guidance documents; Possible sanctions for non- compliance - Legal and regulatory, Commercial and Professional.

UNIT IV: Regulatory Affairs and Product Approval:

History of regulatory affairs, Main concepts QSE, Sources of information, Regulatory affairs for studies in human subjects and required data. Current and future European ,US perspectives,requirements and procedures. Regulatory submissions for new products, Requirements for gaining approval, US perspective, Regulating control over marketing and sales of medical products, Regulations, Codes of practice, Promotional materials. Inputs of Indian guidelines & Indian perspectives.

UNIT V : Latest Developments and issues in Clinical Research:

Latest developments in ICH, Confidentiality issues, Medicines for human use (clinical trials) regulations 2003 and other relevant issues.

Related Web resources:

1. Code of Federal Regulation by USFDA - Download
2. ICH-GCP Guidelines – http//www.ich.org
3. Drugs and Cosmetics Act, 1940 or Download
4. WHO – http//www.who.in
5. http//www.oecd.org
6. http//www.unep.org
7. http//www.unido.org
8. http//www.fao.org
9. http//www.isaaa.org

TEXT BOOKS:

1. Good Clinical Practices, Central Drugs Standard Control Organisation, Govt. of India
2. Dominique P.Brunier and Gerhardt Nahler - International Clinical Trial, Volume 1 & 2 Interpharm Press, Denver, Colorado.

REFERENCE BOOK:

1. Biosafety issues related to genetically modified organism , Biotech Consortium India Limited, New Delhi.

IV Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

BT 404 PROTEOMICS AND GENOMICS (ELECTIVE - V)

Course Description & Objectives :

To acquaint the student with genome organization, gene identification, expression and applications of genomics analysis. Also about proteomics, analysis and its applications.

Course Outcomes:

1. Be able to explore various genomes sequenced
2. Be able to gain adequate knowledge on various tools available annotation of genomes
3. Be able to utilize the principle of two- dimensional gel electrophoresis for analysis of various proteins
4. Be able to utilize the principle of mass spectrometry and micro array for analysis of proteins.

UNIT I: Introduction to Genomics and Proteomics:

Introduction – Organization and structure of genomes, Genome size, Sequence complexity, Introns and Exons, Genome structure in viruses and prokaryotes, Isolation of Chromosomes, chromosome micro dissection, Retrofitting. Introduction to Proteomics – The Proteome, Mining proteomes, Bridging Genomics and Proteomics. Proteomics and the new biology.

UNIT II: Gene Identification and Expression:

Genome annotation, traditional routes of gene identification, detecting open-reading Frames, software programs for finding genes, Identifying the function of a new gene, gene ontology, overview of comparative and genomics, Protein structural genomics, determining gene function by sequence comparison and through conserved protein structure Global expression profiling – Introduction, traditional approaches to expression profiling, Analysis of RNA expression, applications of genome analysis and genomics.

UNIT III: Analysis of Proteomes I:

Analysis of proteomes - Two-dimensional polyacrylamide gel electrophoresis, Sample Preparation, Solubilization, Reduction, Resolution, Reproducibility of 2-DE- Detecting proteins in polyacrylamide gels, Image analysis of 2-DE gels.

UNIT IV: Analysis of Proteomes II:

Mass spectrometry based methods for protein identification- De novo sequencing using mass spectrometric data- Correlative mass spectrometric based identification strategies, 2-DE gel electrophoresis coupled with mass spectrometry, Micro array techniques- Types of micorarrays, Designing a microarray experiment, Microarray Technology in Treating Disease.

UNIT V: Applications of Genomics and Proteomics Analysis:

Analysis of Genomes – Human, Mouse, *Plasmodium falsiparum,Saccharomyces cerevisiae, Mycobacterium tuberculosis*. Application of proteome analysis- drug development and toxicology, Pharmaceutical Applications, Proteomics in drug Discovery in human, phage antibodies as tools, Glycobiology and Proteomics in plant genetics and breeding.

TEXT BOOKS:

1. S. B. Primrose and R.M. Twyman - Principles of Genome Analysis and Genomics, 7th Edition, Blackwell Publishing, 2006.
2. S. Sahai - Genomics and Proteomics, Functional and Computational Aspects, Plenum Publication, 1999.

REFERENCE BOOKS:

1. Andrezej K Konopka and James C. Crabbe, Compact Hand Book Computational Biology, Marcel Dekker, USA, 2004.
2. Pennington & Dunn - Proteomics from Protein Sequence to Function, 1 st edition, Academic Press, San Diego, 1996.

IV Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		4	-	-	4	4

BT 406 INDUSTRIAL PROCESS CONTROL (ELECTIVE - V)

Course Description & Objectives :

The course is aimed at Choosing the control strategy for a process, distinguishing between feed forward and feedback control strategies. It also enables to choose the appropriate control action (P,PI,PD,PID) for a particular process.It helps in developing the Block diagram from process identification, analyzing the stability of a dynamic system. It provides insights in knowing the main types of Instruments and their working principles along with understanding of the working principle of different types of control loops.

Course Outcomes:

Students will be able to

1. Understand process dynamics and control.
2. Develop the block diagram for process identification.
3. Analyze the stability of dynamic system.
4. Know main types of instruments and their working principle.
5. Understand working principle of different types of control loops.
6. Choose appropriate control for a particular process.
7. Understand various types of multiloop control systems.

UNIT I: Process dynamics : Introduction to process dynamics and control. Response of First Or- der Systems. Physical examples of first order systems. Response of first order systems in series, Higher order systems

UNIT II: Process controllers :

Block digram of chemical reactor control, Servo & Regulator opera- tions. flow, level, temperature and pressure control, Basic control actions- characteristics of two position, two position control of single capacitance process, single speed floating control. P, P+D, P+I and P+I+D control modes.

UNIT III: Controller settings:

Optimum Controller Settings- Ziegler - Nichols tuning technique, Cohen-Coon settings, determination of optimum settings for mathematically described process using time response and frequency response. Evaluation criteria, 1/4th decay ratio, IAE. ISE, ITAE.

UNIT IV: Multiloop Control System :

Feed forward control - Feed back control, Ratio control - Cascade control - Split range control -Multivariable control and examples from distillation column and Boiler system.

UNIT V: Bioprocess Instrumentation:

Introduction to process instrumentation, pH probes, DO probes, introduction to biosensors, online glucose sensors and biomass sensors. umps, pneumatic, hydraulic and electronic controllers. Pneum atic, electric nd hydraulic actuators. control v alv es- characteristics of control valves-alve body-Globe, butterfly, diaphragm valves.

TEXT BOOKS:

1. D.R. Coughanowr - Process Systems Analysis and Control , 2nd Ed. Mc Graw - Hill, 1991.
2. Harriott P. - Process control, Tata Mc Graw- Publishing Co., New Delhi, 1972.

REFERENCE BOOKS:

1. G. Stephanopolous - Chemical Process Control, PHI,1998.
2. Eckman D.P. - Automatic Process Control , Wiley Eastern Ltd.
3. Heinemann & Pollard A. - Process Control, Educational Books, Lon- don, 1971.

IV Year B.Tech. Biotechnology   II - Semester

L	T	P	To	C
4	-	-	4	4

BT 408 COMPUTATIONAL MOLECULAR BIOLOGY (ELECTIVE-VI)

Course Description & Objectives :

It helps the student to be familiar with the various Bioinformatics tools. Helps in Predicting the 3 Dimensional structure of proteins (without wet lab) giving information about function of protein and hence It gives knowledge about finding the function of gene and identifying disease causing genes by comparative genomics.

Course Outcomes:

1. Be able to perform nucleic acid sequence analysis
2. Be able to identify motifs in biological sequences
3. Gain adequate knowledge about various secondary structures of RNA and also about discrete models of lattice proteins
4. Be able to predict structure of proteins by alignment based methods
5. Be able to use various available tools to annotate eukaryotic and prokaryotic genomes.

UNIT I : Introduction to Computational Biology :

Introduction, Biomolecular sequence analysis – Nucleic acid sequences, Motifs – localization and extraction, Protein sequence analysis and prediction of secondary structural features.

UNIT II : Discrete Models of Biopolymers:

Discretized structure models – Lattice proteins, contact graphs. Combinatorial considerations – secondary structure graphs. Random graph models of sequence structure maps, RNA secondary structures.

UNIT III : Protein Structure Folding & Prediction and DNA- Protein Interaction:

Overview of protein structure, Protein folding invitro and invivo, Theoretical models of folding, Insilico folding, Protein structure prediction - Alignment based methods. DNAProtein Interaction – Target prediction, sequence based methods, Structure based method, Ab inito method.

UNIT IV : Computational Genomics:

Sequences and contigs, Sequence data description, Advanced Sequence data description,Genome annotation- Eukaryotic and Prokaryotic genome annotation tools. Computer simulated functions.

UNIT V : Computation in Comparative Genomics:

Introduction, Evolutionary basis, Tools for comparative genomics – data selection, Alignment, Visualization .

TEXT BOOKS:

1. Andrezej K Konopka and James C. Crabbe, Compact Handbook - Computational Biology, Marcel Dekker, USA, 2004.
2. Peter Clote, Rolf Backofen - Computational Molecular Biology An Introduction, John Wiley & Sons ltd.1997.

REFERENCE BOOKS:

1. David W. Mount - Sequence and Genome Analysis, Published by CSHL Press Science, 2004.
2. S. Salzberg, D. Searls,and S. Kasif - Computational Methods in Molecular Biology, Elsevier Science, 1998.
3. Joao Setubal and Joao Meidanis - Introduction to Computational Molecular Biology Publisher: PWS Publishing Company, Boston, 1997.
4. SC Rastogi,N.Mendiratta.P.Rastogi - Bioinformatics Methods and Applications:Genomics,Proteomics and Drug Discovery, Prentice Hall India Publications, 2005.

IV Year B.Tech. Biotechnology II - Semester

L	T	P	To	C
4	-	-	4	4

BT 410 BIOSTATISTICS (ELECTIVE-VI)

Course Description & Objectives:

The course enables the students to make themselves aware of various concepts of sampling. The course provides adequate knowledge about multivariate as well as non parametric statistical methods. It helps in acquiring basic concepts regarding markov chain models

Course Outcomes:

Upon completion of the course, the student will:

1. Be able to design an experiment statistically
2. Be able to perform various multivariate statistical methods for the interpretation of multi dimensional data
3. Be familiar with the cases for which non-parametric test can be applied
4. Dtilize the concept of markov chain models in biological sequence analysis

UNIT - I: SAMPLING THEORY AND TESTS OF SIGNIFICANCE

Sampling Concepts: Methods of sampling – simple random sampling, stratified and systematic sampling (description only) - Concept of sampling distributions and standard error – tests of hypothesis critical region, two types of errors – level of significance - Student's t test for single mean, two sample mean, paired t test - z test for single mean, two sample mean, single proportion and two sample proportion.

UNIT - II: CHI SQUARE TEST AND DESIGN OF EXPERIMENT

Chi square test of goodness of fit and independence of attributes, Completely randomized Design, Randomized Block Design, Latin Square Design and their analysis of Variance.

UNIT - III: MULTIVARIATE ANALYSIS

Multiple regression analysis, Principal Component analysis, Canonical Correlation analysis, Factor Analysis,Descriminant Analysis, Cluster nalysis (No derivations, theory only).

UNIT-IV: NON PARAMETRIC TESTS

Sign test, Wilcoxon signed rank test, One sample Run Test, Median test, Kruskal Wallis H test, Kolmogorov Smirnov test, Mann Whitney U test.

UNIT-V: MARKOV CHAIN MODELS

Definition, Classification, Markov Chain,Transition Probability Matrix, chapman Kolmogrov theorem, Classification of states and chains, Poisson Process, Postulates, Properties. Hidden Markov Models Basic Algorithms, Viterbi Algorithm, Estimation, Forward and Backward Algorithm, Applications - Multiple Sequence Alignment, Pfam and Gene finding.

TEXT BOOKS:

1. Veerarajan T, Probability, “Statistics and Random Process”, 4th Edition, Tata Mcgraw Hill, 2008.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, “Probability & Statistics for Engineers & Scientists”, 8th Edition, Prentice Hall, 2006.

REFERENCE BOOKS:

1. Stephen Bernstein, “Schaum’s Outline of Elements of Statistics I: Descriptive Statistics and Probability”, McGraw-Hill, 1998.
2. Jerrold H zar, “Biostatistical Analysis”, 5th Edition, Prentice Hall, 2010.
3. Irivin Miller, John E Freund, “Probability and Statistics for Engineers”, Prentice Hall, 1977.

IV Year B.Tech. Biotechnology II - Semester

L	T	P	To	C
4	-	-	4	4

BT 412 PLANT DESIGN AND ECONOMICS (ELECTIVE- VI)

Course Description & Objectives:

Perform economic evaluation of chemical processes and chemical projects, Become familiar with professional and forma for representing engineering results.

Course Outcomes:

1. Understand concepts of process design and project management
2. Synthesize feasible and optimum flow-sheet
3. Estimation of capital investment, total product costs, and profitability. 4. Optimum design of equipments based on economics and process considerations.
5. Estimation of alternative investments and optimum profitability analysis.

UNIT I : Process Design and Cash Flow:

Introduction – Process design development, design, Cost and asset accounting, Cash flow for industrial operations, Factors effecting investment, Production cost.

UNIT II : Capital Estimation and Interest:

Estimation of capital investments, Cost indices, Cost factors, Interest and investment cost, types of interest nominal and effective interest rates.

UNIT III : Annuities and Taxes:

Continuous interest, Present worth and discount annuities, Interest on investment, source of capital taxes and types of taxes, Insurance – Types of insurances, Self insurance.

UNIT IV : Depreciations:

Depreciation. Types of depreciation, Services life, Salvage value,Present Value, Methods for determining depreciation, group depreciation.

UNIT V : Profitability Analysis:

Profitability, Alternative investments and replacements, Profitability standards, discounted cash flow, Capitalized cost payout period, Alternative investments, Optimum design, Design strategy, Optimum condition, Optimum production rates, fluid dynamics.

TEXT BOOK:

1. M.S. Peters and K.D.Timmerhaus - Plant Design and Economics, 4th Edition, McGraw - Hill, 1991.

REFERENCE BOOKS:

1. Coulson and Richardson. - Chemical Engineering Plant Design and Economics. Vol 6, 4th Edition, McGraw-Hill.

IV Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		-	-	10	10	10

BT 414 PROJECT WORK

IV Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		-	-	36	36	18

BT 416 INTERNSHIP

I

YEAR

CHEMICAL ENGINEERING

B.Tech.

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engineering
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16ME103 - Workshop Practice
- 16CH101 - Basics of Chemical Engineering

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	30	10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L- 9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L- 9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.

11. Solving first order O.D.E.

12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.

2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.

3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.

2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fiber which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*

✓ *Study the wavelengths of light sources and lasers.*

✓ *Estimate the efficiency of a given solar cell.*

✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*

✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non- linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to:

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

- ✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*
- ✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*
- ✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*
- ✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*
- ✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**
  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory Practice : Introduction to phonetics
  (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role - Plays
  (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs

Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions (from Energy Unit)
Summarizing, Text on "Flight from conversation" (New York Times)

- Laboratory Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**

  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory

  Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 “*Mindscapes* - English for Technologists and Engineers”, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, “A Textbook of English Phonetics for Indian Students”, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. “Spoken English: A Self-Learning Guide to Conversation Practice”, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine Your English”, 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, “Effective Technical Communication”, Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to:

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.

6. Demonstrate the following experiments using Office automation tools.
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, “Introduction to Computers”, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

✓ *Identify suitable data types for an application.*

✓ *Apply control statements for decision making problems.*

✓ *Use multidimension array for matrix application.*

✓ *Design a program to calculate average of a class.*

✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L- 10, T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L-8, T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.

7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

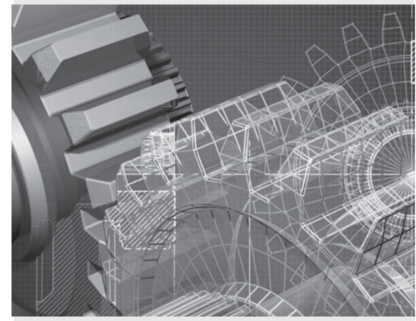
TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1^{st} edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2^{nd} edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4^{th} edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4^{th} edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a Lighting scheme for specific working environment.*

✓ *Design a composition of Heating element for a particular application.*

✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

✓ *Provide an earthing for Domestic Outlet.*

✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks,

Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of

cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps

4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, “Concrete Technology”, 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, “Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, “Electrical engineering - Electrical machines and Appliances Theory”, 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, “How Stuff Works”, 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, “Basic Mechanical Engineering”, 1 st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to:

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*

✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*

✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

Listening – Following long conversations / Interviews

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

PRACTICE: Objective PET Units 25 – 30

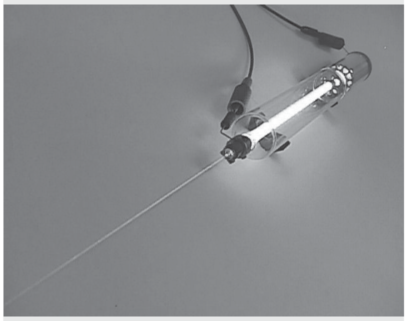
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, “Objective PET”, Student’s Book with Answers, 2^{nd} edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, “Introduction to PET”, Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

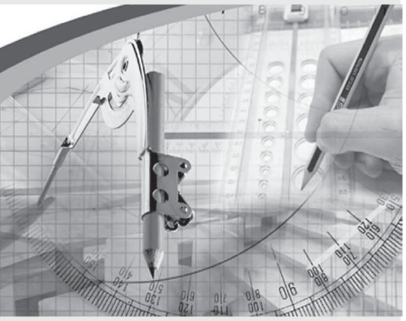
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments, field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- carry out the basic operations of matrix algebra.
- use row operations to reduce a matrix to echelon form, normal form.
- determine consistency of a system linear equations.
- compute eigen values and eigen vectors.
- evaluate double integrals and triple integrals.
- evaluate double integrals in polar coordinates.
- utilize Cartesian and polar coordinates to find area.
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals.

SKILLS:

✓ *Appreciate various methods to find the rank of a matrix.*

✓ *Solve given system of linear equations.*

✓ *Compute Eigen values and Eigen vectors of a matrix.*

✓ *Compute the power of a matrix by suitable method.*

✓ *Evaluate Multiple integrals.*

✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9, T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L-9, T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L-9, T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L-9, T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L-9, T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

- ✓ *Analyse the total hardness of water sample.*
- ✓ *Understand the basic principles involved in various batteries.*
- ✓ *Understand the mechanisms of corrosion and various controlling methods.*
- ✓ *Synthesize various polymers.*
- ✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to:

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*

✓ *Draw geometrical objects like polygons, solids of different types.*

✓ *Visualize the objects in real time situations.*

✓ *Develop 3D views (isometric views).*

UNIT - 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT - 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT - 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT - 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT - 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

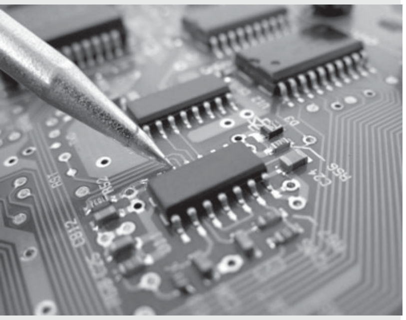
1. N.D.Bhatt, “Engineering Drawing”, 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal , C.M.Agrawal “Engineering Drawing” , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, “Engineering Drawing”, 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, “Engineering drawing”, 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC, AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, "Basic Electrical and Electronics Engineering", 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, "Integrated Electronics", McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, "Electrical Technology", Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, "Basic Electrical Engineering", 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to:

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
30	-	-	10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to:

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*

✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*

✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*

✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*

✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES: Environmental studies - Definition scope and its importance, Need for public awareness; Natural resources - Forest resources, Deforestation, Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources, Land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY: Ecosystem - Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems; Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forest community, Bio-villages; Green technology for sustainable development; Life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental protection act; Environmental Impact Assssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation - Food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions; Role of youth in the development, Promoting activities, Youth as initiators, Field work/environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment, Common plants, Insects, Birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik and CP Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016
2. Benny Joseph, “Environmental studies”, 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008.
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004.
7. Kurian Joseph and R.Nagendram, “Essentials of environmental studies”, Pearson Education Pt Ltd, Delhi, 2007.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management- 3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	20	-	-

Course Description and Objectives :

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes :

The student will be able to:

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs etc.*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*
- ✓ *CNC machines and various machining operations and processes.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin smithy and Black smithy.
4. House wiring.
5. Foundry and welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS:

1. S.K. Hazra Choudhury, “Elements of workshop Technology”, 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., “A first course on workshop practice: Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S, “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai, 1999.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

16CH101 BASICS OF CHEMICAL ENGINEERING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
7	45	3	10	-	-

Course Description and Objectives:

This course deals with the fundamentals of chemical engineering and methods to solve practical problems. The objective of the course is to make the students learn about various unit operations in chemical process industries.

Course Outcomes:

The student will be able to:

- have an insight into the fundamentals of Momentum transfer, Heat transfer, Mass transfer etc.
- familiarize with the typical chemical engineering terminology that they will come across in their future courses.

SKILLS:

✓ *Choose a type of extraction for given chemical process.*

✓ *Differentiate various heat exchangers.*

UNIT - I **L-9**

INTRODUCTION : Introduction, Unit operations, Unit processes, Basic laws, Useful mathematical methods, Units and dimensions, Conversion factors, Dimensional analysis.

UNIT - II **L-9**

PHYSICO-CHEMICAL CALCULATIONS : Energy, Equivalent mass (weight), Electrochemical processes, Hardness of water, Humidity and saturation.

MATERIAL AND ENERGY BALANCES : Material balance, Energy balance.

UNIT - III **L-9**

FLOW OF FLUIDS : Introduction, Nature of a fluid, Viscosity, Flow field, Flow of a fluid past a solid surface, Conservation of mass, Conservation of energy, Friction losses in laminar flow through a circular tube, Friction losses in turbulent flow, Pressure drop in flow through porous media, Fluidization, Cavitation, Water hammer, Pumping of fluids.

UNIT - IV **L-9**

HEAT TRANSFER : Conduction, Convection, Radiation, Flow arrangements in heat exchangers, Variation of fluid temperatures in heat exchangers, Heat transfer equipment, Evaporation.

CHEMICAL KINETICS : Introduction, Thermodynamics review, Determination of rate equation, Effect of temperature on reaction rate, Catalysis, Reactors.

UNIT - V **L-9**

MASS TRANSFER : Diffusion, Interphase mass transfer, Absorption, Vapor-liquid equilibrium, Relative volatility, Distillation, Reflux, Calculation of number of theoretical stages by McCabe-Thiele method. Liquid liquid extraction, Single stage equilibrium extraction, Multistage extraction process, Drying, Adsorption.

TEXT BOOK:

1. Salil K Ghosal, Shyamal K Sanyal and Siddhartha Datta, “Introduction to Chemical Engineering”, Tata McGraw- Hill, 2001.

REFERENCE BOOK:

1. Mc. Cabe W. L, Smith. J. C and Harriot. P, “Unit Operations in Chemical Engineering”, 7Th edition, McGraw-Hill, 2005.

ACTIVITIES:

- *Identification of various mass transfer equipment.*
- *Identification of various heat transfer equipment.*

II

YEAR

CHEMICAL ENGINEERING

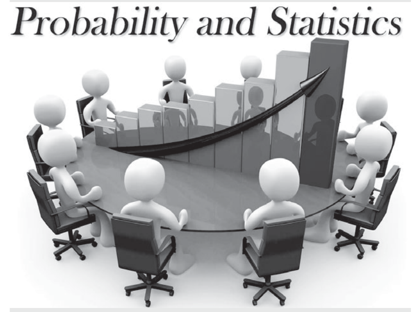
B.Tech.

I SEMESTER	16HS202	-	Probability and Statistics
	16EL102	-	Soft Skills Laboratory
	16CS202	-	DATA Structures
	16CH102	-	Materials Science and Technology
	16CH201	-	Chemical Process Calculations
	16CH202	-	Momentum Transfer
	16CH203	-	Process Instrumentation
		-	Employability and Life Skills
II SEMESTER	16EL103	-	Professional Communications Laboratory
	16CH204	-	Chemical Engineering Thermodynamics-I
	16CH205	-	Mechanical Unit Operations
	16CH206	-	Organic Chemistry
	16CH207	-	Process Heat Transfer
		-	Department Elective
		-	Department / Open Elective
		-	Employability and Life Skills

COURSE CONTENTS

I SEM & II SEM

16HS202 PROBABILITY AND STATISTICS



Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	35	-	10	2	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation and regression and their applications, probability, theoritical distributions and testing of hypothesis.

The objective of this course is to enable the student to understand and apply statitical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L-9**

STATISTICS : Basic definitions, Frequencies, Graphical representation, Histogram, Ogive curves, Measures of central tendency, Arithmetic mean, Median, Mode, Mean deviation, Standard deviation, Symmetry and skewness, Karl Pearson's coefficient of skewness.

UNIT - 2 **L-9**

CURVE FITTING, CORRELATION & REGRESSION : Least squares method, Curve fitting (straight line and parabola only). Covariance, Correlation, Types, Pearson's coefficient of correlation, Rank correlation, Spearman's rank correlation. Regression, Regression lines.

UNIT - 3 **L-8**

PROBABILITY : Introduction, Definition (classical and axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L-8**

DISTRIBUTIONS: Random variables, Discrete and continuous variables, Introduction to distributions.

BINOMIAL DISTRIBUTION : Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION : Definition, Mean and standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION : Definition, Normal curve, Mean and standard deviation, Median, Mode, Normal distribution applications.

UNIT - 5 **L-12**

SAMPLING METHODS : Population and sampling, Parameters and statistics, Types of sampling. Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion, T-distribution for small sample, difference between means of small sample, Chi square test for goodness of fit, Chi square test for test of independence.

TEXTBOOKS:

1. Miller and Freund, "Probability and Statistics for Engineers", 8th edition, Pearson Publishers, 2013.
2. H. K. Dass & Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd revised edition, S. Chand and Company, 2014.

REFERENCE BOOK:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Company, New Delhi, 2005.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	30	-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, Preparing Resume, Group Discussion, and Interview Skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to:

- equip with requisite professional and inter-personal skills.
- possess the ability to think critically on issues for informed decision making and know how to communicate effectively, through choice of appropriate language and speech, while dealing with others at the workplace.
- identify and introspect on individual strengths and weaknesses, will emerge with improved levels of self-awareness and self-worth, for greater efficacy at workplace.

SKILLS:

✓ *Communicate and understand the difference between soft skills and hard skills.*

✓ *Learn professionalism and Employability skills.*

✓ *Plan Career by drawing their SWOT, Setting the Goal, learn the importance of Time and Stress Management.*

✓ *Learn Vocabulary, Situational English, Group Discussion, Reading Comprehension and Listening Comprehension which are essential for all competitive examinations.*

✓ *Prepare Resume and learn how to face interview.*

✓ *Learn Gender sensitive language, Good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 1 **P-8**

A) COMMUNICATION : Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY : Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH : Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION : Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY : Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING : Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY : Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS : Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION : Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY : Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION : Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY : Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

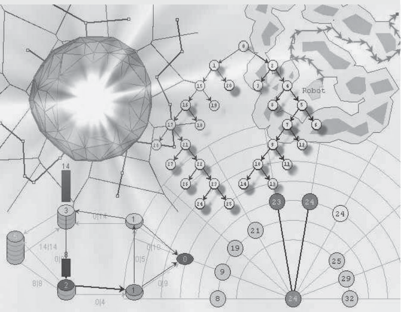
UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY : Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY : Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw-Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw-Hill, 2005.
5. Krishna Mohan and NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa and Co, 2004.



16CS202 DATA STRUCTURES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	-

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explaining how to implement them. It begins with the basic concepts of data and data structures and introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

Course Outcomes:

The student will be able to:

- apply advanced C programming techniques such as pointers, dynamic memory allocation, structures to develop solutions for particular problems.
- analyze characteristics of various data structures.
- differentiate between Graphs and Trees.
- understand the importance of sorting and applying it wherever useful.
- understand the usefulness of data structures in solving problems.

SKILLS:

✓ *Identify the required data structures for various applications.*

✓ *Identify the sorting algorithm suitable for a given scenario.*

✓ *Implement array or linked list for a given problem.*

✓ *Analyse Pros & Cons of each of the data structure.*

✓ *Usage of trees and graphs.*

UNIT - 1 **L-9**

SORTING AND SEARCHING: Introduction - Data, Data type, Data structure, Primitive and Non-primitive - Data type, Data structure; Storage structures - Sequential and linked storage representations; Applications of structures, Hashing.

SORTING: Selection sort, Bubble sort, Insertion sort, Quick sort, Merge sort.

SEARCHING: Binary search and linear search.

UNIT - 2 **L-9**

LINKED LISTS: Introduction, Types of linked list - Singly linked list, Doubly linked list, Circular linked List; Operations - Insertion, Deletion, Traverse forward/reverse order; Multi lists, Applications of linked lists.

UNIT - 3 **L- 9**

STACKS AND QUEUES: Stacks - Introduction, Array and linked representations, Implementation and their applications; Queues - Introduction, Array and linked representations, Implementation and their applications, Types - Linear, Circular and doubly ended queues; Applications.

UNIT - 4 **L-9**

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and linked representations; Tree traversals and their Implementation, Expression trees, BST definition and implementation; AVL Trees - Definition and implementation.

UNIT - 5 **L-9**

GRAPHS: Introduction, Properties, Modeling problems as graphs representations - Adjacency matrix, Adjacency list; Traversals - Breath first search and depth first search; Application of graphs.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- understand the importance of structure, abstract data type and their basic usability in different applications through different programminglanguages.
- understand the linked implementation and its uses both in linear and non-linear data structure.
- understand various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
- decide a suitable data structure to solve a real world problem.

LIST OF EXPERIMENTS Total hours-30

1. Selection, Bubble, Insertion, Quick and Merge sorting algorithms.
2. Linear and Binary search algorithms.
3. Single linked list, doubly linked list, and circular linked list.
4. Stack using an array and linked list.
5. Queue using an array and linked list.

ACTIVITIES:

- *Design and Implement a School Management System.*
- *Design and Implement a Social Networking Site.*
- *Implement a project to find out the most common words in the articles.*
- *Design and Implement a Library Book Management System.*
- *Design and Implement a CricBuzz Application.*

6. Tree using an array and linked list.
7. Check if given expression is fully parenthesis or not using stack.
8. Tree traversing techniques.
9. BST using an array and linked list.
10. Graph traversal techniques.

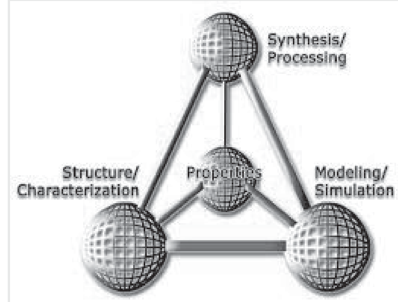
TEXT BOOK:

1. ReemaThareja, “Data Structures Using C”, 2nd edition, Oxford University Press, 2014.

REFERENCE BOOKS :

1. Richard F. Gilberg and Bhrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd edition, Cengage Learning, 2004.
2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd edition, Tata Mc-Graw Hill, 2004.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education, 2006.

16CH102 MATERIALS SCIENCE AND TECHNOLOGY



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	8	60	-	10	-	-

Course Description and Objectives:

This course will emphasize the structure-property relationships of engineering materials. The objective of this course is to provide knowledge in basic principles of material science and also to study structure of materials at all length scales.

Course Outcomes:

The student will be able to:

- understand crystal structure of various materials and techniques used for structure determination.
- understand the influence of defects on the properties of materials.
- understand the fundamentals of equilibrium phase diagrams.
- gain knowledge on various fabrication techniques used for manufacturing common engineering materials.

SKILLS:

✓ *Identify the type of material: ceramic, polymer, metal or composite.*

✓ *Select materials with suitable properties for a given application.*

✓ *Predict the type of fracture/failure in a material.*

✓ *Read and draw conclusion from binary phase diagrams.*

✓ *Suggest manufacturing methods for metals, ceramics and polymeric materials.*

✓ *Determine basic mechanical properties of materials using universal testing machine.*

ACTIVITIES:

- *Testing the type of failures.*
- *"Gee Whiz": Wonder presentations.*
- *Analysis of load test results.*
- *Study of micro structures of materials.*
- *Segregation of the given materials.*
- *Identification of phases in the given phase diagram.*

UNIT - I **L-9, T-3**

BONDING IN SOLIDS : Inter atomic forces and potential energy, Types of bonds: Primary and secondary, Variation in bonding character and resulting properties.

CRYSTAL STRUCTURE : Classification of crystal systems–SC, BCC, FCC & HCP crystal structures with examples, Atomic packing factor, Coordination number, Determination of miller indices of planes and directions of cubic and hexagonal crystals, Linear and planar densities, Separation between successive planes, Crystal structure determination: Bragg law, Powder method.

UNIT - 2 **L-10, T-3**

CRYSTAL DEFECTS : Point defects, Dislocations: Edge, Screw and mixed, Burgers vectors, Energy of dislocation, Motion of dislocation, Dislocation density. Grain boundary, Stacking faults and twin boundary.

PHASE DIAGRAMS : Gibb's phase rule and terms involved–Reduced phase rule, Tie line and lever rules, Two component systems–invariant reactions–Eutectic system and Iron-Carbon system.

UNIT - 3 **L-9, T-3**

MATERIALS FABRICATION TECHNIQUES : Fabrication of Metals: Forming operations, Casting, Fabrication of Ceramics: Particulate forming processes, Cementation. Forming techniques of Plastics: Compression, Transfer and injection molding, Extrusion, Blow molding.

MECHANICAL PROPERTIES : Stress-Strain relations of various solids–Elastic, Anelastic, Visco-elastic and plastic deformations in solids, Creep and fatigue, Fracture: Brittle and Ductile, Fracture toughness, Ductile to brittle transitions.

UNIT - 4 **L-8, T-3**

ELECTRICAL & SEMICONDUCTING PROPERTIES : Ohm's Law, Electrical conductivity, Electronic and Ionic conduction, Energy band structures in Solids, Classification of solids based on band models, Electron mobility, Electrical resistivity of metals, Intrinsic semiconduction, Extrinsic Semiconduction, The temperature dependence of carrier concentration, Factors that affect carrier mobility.

UNIT - 5 **L-8, T-3**

DIELECTRIC AND MAGNETIC PROPERTIES : Dielectric behavior, Capacitance, Polarization, Frequency Dependence of dielectric constant, Dielectric strength. Types of magnetism, Ferromagnetism-Domain theory-hystersis behavior, Ferrimagnetism, Soft and hard magnets–application of magnetic materials.

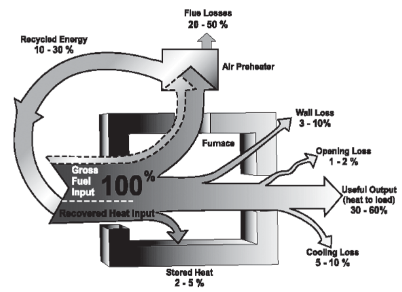
TEXT BOOKS:

1. W. D. Callister, "Materials Science and Engineering: An Introduction," 8th edition, John Wiley & Sons Inc, 2009.
2. V.Raghavan, "Materials Science and Engineering:A First Course", 5th edition, Prentice Hall of India Learing Pvt. Ltd., 2013.

REFERENCE BOOKS:

1. L. H. VanVlack, Elements of Materials Science and Engineering, 6th edition, Addison Wesley, 1989.
2. W.F. Smith and J. Hashemi, "Foundations of Materials Science and Engineering", 4th edition, McGraw-Hill, 2005.
3. N.W. Dowling, "Mechanical Behavior of Materials", 3rd edition, Prentice Hall of India, 2006.
4. J.F. Shackelford, Introduction to Materials Science for Engineers, 6th edition, Prentice Hall of India, 2004.
5. P. Haasen and B. L. Mordike, Physical Metallurgy, 3rd edition, Cambridge University Press, 1996.

16CH201 CHEMICAL PROCESS CALCULATIONS



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	50	-	5	5	5

Course Description and Objectives:

This course deals with fundamentals of material and energy balances involved in chemical processes. The objective of this course is to develop basic understanding pertaining to principles of chemical engineering processes and calculations.

Course Outcomes:

The student will be able to:

- use mole concepts and perform calculations involving concentrations.
- apply gas laws to solve problems related to ideal gas mixtures.
- carry out detailed material and energy balance for any chemical plant having different unit operations and unit processes.

SKILLS:

✓ *Material balance calculations for different chemical processes.*

✓ *Energy balance for any chemical plant.*

ACTIVITIES:

- *Mini project on material and energy balance of a chemical process.*
- *Estimation of physical properties.*

UNIT - 1 **L-10, T-2**

STOICHIOMETRIC RELATIONS : Basis of calculations, Methods of expressing composition of mixtures and solutions, Mole fraction and mole percent, Density and specific gravity, Baume and API gravity scales.

BEHAVIOR OF IDEAL GASES : Kinetic theory of gases, Application of ideal gas law, Gaseous mixtures, Gases in chemical reactions, Gas densities and specific gravities.

UNIT - 2 **L-9, T-2**

VAPOR PRESSURE : Liquefaction and liquid state, Vaporization, Boiling point, Effect of temperature on vapor pressure, Antonie equation, Vapor pressure plots, Vapor pressure of immiscible liquids and ideal solutions, Raoult's law, Non-volatile solutes, Basics of humidification.

UNIT - 3 **L-9, T-3**

MATERIAL BALANCE : Materials balance without reaction, Materials balance with reaction–recycle, purge, bypass.

UNIT - 4 **L-8, T-4**

THERMO PHYSICS : Energy, Energy balances, Heat capacity of gases, Liquid and mixture solutions, Kopp's rule, Latent heats, Heat of fusion and heat of vaporization, Trouton's rule, Kistyakowsky equation for non-polar liquids, Enthalpy and its evaluations.

UNIT - 5 **L-9, T-4**

THERMO CHEMISTRY : Calculation and applications of heat of reaction, Combustion and formation, Kirchoff's equation, Calculation of theoretical and actual flame temperatures, Combustion calculations.

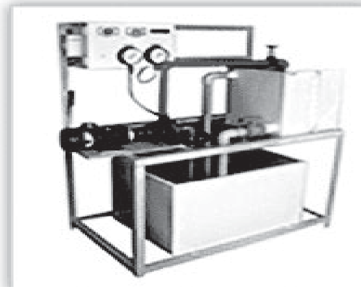
TEXT BOOKS:

1. Hougen O.A., Watson K.M. and Ragatz .R. A., "Chemical Process Principles Part – I: Material and Energy Balance", John Wiley sons, 2nd edition, CBS Publishers & Distributors, 2004.
2. Bhatt B. I., and Vora S. M., "Stoichiometry", 4th edition, Tata McGraw-Hill, New Delhi 2004.

REFERENCE BOOKS:

1. Himmelblau D.H., "Basic Principles and Calculations in Chemical Engineers", 8th edition, Prentice Hall of India, 2011.
2. Richard M.F., and Ronald W.R., "Elementary Principles of Chemical Processes", 3rd edition, John Wiley, 2004.

16CH202 MOMENTUM TRANSFER



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	20	45	-	5	5	5

Course Description and Objectives:

This course deals with fundamentals of fluid flow and its application to chemical process industries including pipe flow, fluid machinery. The objective of this course is to familiarize students with basic concepts of fluid statics, fluid dynamics, compressible and incompressible fluids, fluidization, transportation and metering of fluids.

Course Outcomes:

The student will be able to:

- understand basic principles of fluid mechanics.
- analyze fluid flow problems with the application of the momentum and energy equations.
- analyze pipe flows as well as fluid machinery.

SKILLS:

✓ *Application of fluid mechanics concepts to solve real life problems.*

✓ *Estimate* physical properties of fluids in motion and at rest.

✓ *Measurement of flowing fluids.*

✓ *Selection of pumps for engineering applications.*

ACTIVITIES:

- *Calibration of rotameter.*
- *Separation of immiscible liquids using decanter.*
- *Calibration of manometer.*
- *Design of Venturi meter.*
- *Design of Orifice meter.*

UNIT - 1 **L-10**

DEFINITIONS AND PRINCIPLES : Unit operations, Unit systems, Dimensional analysis, Basic concepts. Fluid Statics: Nature of fluids, Hydrostatic equilibrium, Manometers.

FLUID FLOW PHENOMENA : Laminar flow, Shear stress, Viscosity, Turbulence, Eddy viscosity, Flow in boundary layers.

UNIT - 2 **L-9**

BASIC EQUATIONS OF FLUID FLOW : Mass balance, Mass velocity, Momentum balance, Bernoulli equation, Mechanical energy balance equation, Correction factors, Pump work.

UNIT - 3 **L-9**

FLOW OF INCOMPRESSIBLE FLUIDS : Shear stress distribution in pipes, Relation between skin friction parameters, Laminar flow in pipes, Hagen-poiseuille equation, Laminar flow of non-Newtonian liquids, Velocity distribution for turbulent flow, Friction factor chart.

FLOW OF COMPRESSIBLE FLUIDS : Mach number, Basic equations.

UNIT - 4 **L-8**

FLOW PAST IMMERSED BODIES : Drag, Drag Coefficient, Stagnation point, Friction in flow through beds of solids, Motion of particles through fluids, Terminal velocity, Motion of spherical particles. Fluidization: Conditions for fluidization, Minimum fluidization velocity.

UNIT - 5 **L-9**

TRANSPORTATION AND METERING OF FLUIDS : Pipes, Fittings, Valves, Joints, Pumps, Developed head and Power requirement in pumps, Suction lift and cavitation, Positive displacement pumps, Centrifugal pumps, Measurement of flowing fluids: Classification of measuring devices, Venturi meter, Orifice meter, Rotameter.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total Hours-30

1. Identification of laminar and turbulent flows.
2. Verification of Bernoulli's Equation.
3. Measurement of flowing fluid using Venturi meter.
4. Measurement of flowing fluid using Orifice meter.
5. Determination of friction loss in fluid flow through pipes.
6. Determination of friction loss in fluid flow through fittings.
7. Determination of pressure drop in packed bed.
8. Determination of pressure drop in fluidized bed.
9. Determination of characteristics of centrifugal pump.
10. Determination of characteristics of reciprocating pump.

TEXT BOOKS:

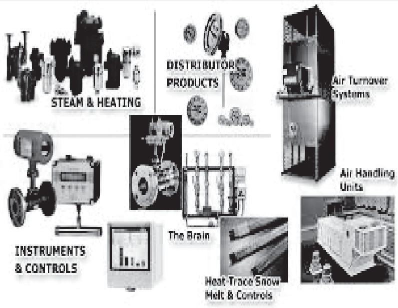
1. W.L. McCabe, J.C. Smith and P. Harriot, "Unit Operations of Chemical Engineering", 7th edition, McGraw-Hill, 2005.

2. Chattopadhyay. P, "Unit Operations of Chemical Engineering Vol-1 ", 1st edition, Khanna Publishers, 2012.

REFERENCE BOOKS:

1. C. J. Geankoplis, "Transport Processes and Unit Operations", 3rd edition, Prentice Hall of India, 1993.

2. A.S. Foust, "Principles of Unit Operations", 2nd edition, John Wiley & Sons, 1981.



16CH203 PROCESS INSTRUMENTATION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	-	-	5	5

Course Description and Objectives:

The course provides insight into instruments that are used to measure physical properties in chemical process industries. The objective of this course is to familiarize student with the working principles of standard measurement devices used in engineering applications.

Course Outcomes:

The Student will be able to:

- discuss principles involved in the measurement and control of industrial processes.
- understand instruments and devices used for designing process control systems.

SKILLS:

✓ *Temperature measurement with electrical systems.*

✓ *Flow measurement with different devices.*

✓ *Select a suitable measurement device for a given application.*

UNIT - 1 **L-9, T-2**

QUALITIES OF MEASUREMENT : Elements of Instruments, Static and dynamic characteristics, Response of first order instruments.

TEMPERATURE MEASUREMENTS : Expansion thermometer- Thermoelectric temperature measurements.

UNIT - 2 **L-10, T-3**

TEMPERATURE MEASUREMENT : Resistance and radiation, Thermal coefficients of resistance, Industrial resistance thermometer bulbs and circuits, Radiation, Photoelectric and optical pyrometers.

COMPOSITION ANALYSIS : Spectroscopic analysis, Chromatography (GC, HPLC, GCMS/LCMS), Color measurement spectrometers.

UNIT - 3 **L-9, T-4**

MEASUREMENT OF PRESSURE AND VACUUM : Liquid column manometers, Gauge pressure and vacuum measurement, Indicating elements for pressure gauges, Measurement of absolute pressure, Corrosive liquids, Static accuracy and response of pressure gauges.

UNIT - 4 **L-8, T-3**

MEASUREMENT OF HEAD AND LEVEL : Head, Density and specific gravity measurement, Direct measurement of liquid level, Pressure measurement in open vessels measurement of interface level, Density measurement.

UNIT- 5 **L-9, T-3**

FLOW METERING : Head Flow and area flow meters, Open channel meters, Viscosity measurements, Quantity meters, Flow of dry materials. Recording, Indicating and signaling Instruments. PI Diagrams, Control center.

TEXT BOOKS :

1. Donald P. Eckman, "Industrial Instrumentation", 1st edition, Wiley Eastern, 2004.
2. Patranabis, "Principles of Industrial Instrumentation", 2nd edition, Tata McGraw-Hill, 2007.

REFERENCE BOOKS :

1. D.M.Considine, "Hand Book of Instrumentation", 2nd edition, McGraw-Hill, 1957.
2. Norman Anderson, "Instrumentation for Process Measurement and Control", 3rd edition, CRC Press, 1997.

ACTIVITIES:

- *Calibration of spectro photometer.*
- *Measurement of flow rate in open channels.*
- *Calibration of head and flow meters.*

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

The student will be able to:

- be equipped to clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- equip them to stand out both in the professional setting as well as for further pursuits in the academic world.
- since this certification looks at LSRW (Listening, Speaking, Reading and Writing) components in great detail, we hope to equip students to confidently and successfully attempt all the 4 critical components.

SKILLS:

- ✓ *Understand and use grammar rules in writing; sentences, paragraphs, paraphrasing.*
- ✓ *Write business emails, memos, letters, reports and proposals.*
- ✓ *Comprehend business articles, and documents.*
- ✓ *Use expressions in Professional context, and acquire presentation skills like one minute talk and pair discussion in professional context.*
- ✓ *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT - 1 **P-6**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage), Elements of technical writing - Sentence structure, Reducing verbosity, Arranging ideas logically, Building coherence, Paragraph level and document level, Topic sentence, Cohesive devices, Transitional words, Paraphrasing and précis-writing; Mechanics of writing - Stylistic elements, The rapporteur, The purpose, The reader's viewpoint (audience), Elementary rules of grammar, Choice of diction, Elementary principles of composition, Matters of form, Punctuation, Conventions of business communication, Language and professional tone, Weak links in business correspondence, Ethical concerns in business writing, Code of conduct (not sending illegal, Offensive, Disparaging personal remarks or comments) in written business communication.

UNIT - 2 **P-6**

BUSINESS CORRESPONDENCE: E-mail - Nature and scope, E-mail etiquette, Clear call for action, Common errors in composing e-mails, Office communication such as meeting agenda and minutes of the meeting, Notice, Circular and memo; Letter-Writing - Formal and informal letters, Structure of formal letters, Expressions of salutations, Different types of letters [Such as sales letter, Complaint letter, Response to the complaint letter (dispute resolution), Letter of permission, Letter of enquiring, claim letter, Letter of apology etc], Introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, Types of reports such as factual reports, Feasibility reports and survey reports, Parts ofa report (Such as title page, Declaration, Acknowledgements, Table of contents, Abstract, Introduction, Findings, Conclusion and recommendations, Citations, References and appendices).

UNIT - 3 **P-6**

SPEAKING: Speaking in business context, Assertiveness, Politeness, Making requests, Queries and questions, Negotiations, Asking for information, Offering suggestions, Conflict resolution, Contacting clients, Initiating, Addressing delegates (in public), Features of a good power point presentation (making the PPT), Delivering the presentation effectively, Telephone etiquettes, Delivering seminar/proposal/report effectively, Team meeting etiquettes (face to face and conference call), Making effective one minute presentations.

UNIT - 4 **P-6**

READING: Reading and comprehending business documents, Learning business register, Regularizing the habit of reading business news, Suitable vocabulary, Skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **P-6**

LISTENING: Specific information in business context, Listening to telephonic conversations/messages and understanding the correct intended meaning, Understanding the questions asked in interviews or in professional settings, Summarizing speaker's opinion or suggestion, Enable active listening.

TEXT BOOKS:

1. Guy Brook Hart, "Cambridge English Business Bench Mark: Upper Intermediate", 2nd edition: CUP, 2014.

2. Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

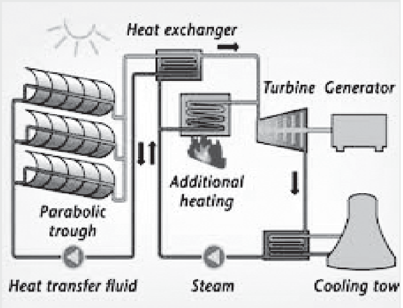
ONLINE REFERENCES:

1. http://www.cambridgeenglish.org/exams/business-certificates/business vantage/preparation/

2. https://www.youtube.com/watch?v=qxFtn9pGaTI.

ACTIVITIES:

- *Basic grammar practice, Framing paragraphs on topics allocated.*
- *Paraphrase an article or a video in your own words Finding topic sentences in newspaper articles.*
- *Find out new words from a professional viewpoint Understanding the meaning and its usage.*
- *Peruse samples of well prepared proposals and reports.*
- *Draft different proposals/reports on topics assigned.*
- *Watch videos/ listening to audios of business presentations.*
- *Classroom activities of team and individual presentations.*
- *Use PPTs, mock exercises for BEC speaking.*
- *Present (speaking) the written components completed in Unit 1.*
- *Hand-outs; matching the statements with texts.*
- *Find the missing appropriate sentence in the text from multiple choice, multiple choices.*
- *Use right vocabulary as per the given context and editing a paragraph.*



16CH204 CHEMICAL ENGINEERING THERMODYNAMICS-I

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
25	50	-	-	5	5

Course Description and Objectives:

This course deals with first, second and third laws of thermodynamics, volumetric properties, refrigeration and liquefaction processes. The objective of this course is to provide understanding in the theory and applications of classical thermodynamics, thermodynamic properties and equations of state.

Course Outcomes:

The student will be able to :

- apply fundamental concepts of thermodynamics to engineering applications.
- estimate thermodynamic properties of substances in gas and liquid states.
- determine thermodynamic efficiency of various energy related processes.

SKILLS:

✓ *Estimation of thermodynamic properties.*

✓ *Determination of heat engine and pump efficiency.*

✓ *Identification of reversible and irreversible processes.*

✓ *Selection of refrigeration process and refrigerant.*

UNIT- 1 **L-9, T-3**

BASIC CONCEPTS : The scope of thermodynamics, Dimensions and units, Measures of amount or size, Force, Temperature, Pressure, Work, Energy, Heat, Zeroth law.

UNIT - 2 **L-9, T-3**

FIRST LAW OF THERMODYNAMICS : Joule's experiment, Internal energy, Statement of first law, Energy balance for closed system, Thermodynamic state and state functions, Equilibrium, Phase rule, Reversible processes, Constant-v and constant-p processes, Enthalpy, Heat capacity.

UNIT - 3 **L-9, T-3**

VOLUMETRIC PROPERTIES OF PURE FLUIDS : PVT behaviour of pure substances, Virial equations of state, Ideal gas, Applications of the virial equations, Cubic equations of state.

UNIT - 4 **L-9, T-3**

THE SECOND LAW OF THERMODYNAMICS : Statements of the second law, Heat engines, Thermodynamic temperature scales, Entropy, Mathematical statement of the second law, Third law of thermodynamics (statement).

UNIT - 5 **L-9, T-3**

REFRIGERATION AND LIQUEFACTION : Carnot refrigerator, Vapor compression cycle, Choice of refrigerant, Absorption refrigeration, Liquefaction processes.

Production of Power from Heat: Steam power plant, Rankine cycle, Otto engine, Diesel engine.

TEXT BOOKS:

1. J.M.Smith, H.C,Vanness and M.M.Abbot, "Introduction to Chemical Engineering Thermodynamics", 6th edition, McGraw-Hill, 2005.

2. Y.V.C.Rao, "Chemical Engineering Thermodynamics", 1st edition, Universities Press, 2004.

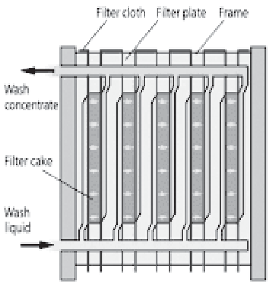
REFERENCE BOOKS:

1. Dodge B.F., "Chemical Engineering Thermodynamics", 1st edition, McGraw-Hill, 1944.

2. Kyle B.G., "Chemical and Process Thermodynamics", 1st edition, Prentice Hall of India,1999.

ACTIVITIES:

- *Calibration of thermometer.*
- *Conversion of work into heat using Joule's experiment.*
- *Expansion of gas using Joule-Thomson effect.*



16CH205 MECHANICAL UNIT OPERATIONS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	-	-	5	5

Course Description and Objectives:

This course provides knowledge in the basics of unit operations employed in chemical process industries. The objective of this course is to familiarize student on the principles and practices involved in transporting, separating and storing of solids and associated unit operations.

Course Outcomes:

The student will be able to :

- understand and apply the basic methods of characterization of particles and bulk solids.
- carry size reduction and separation of solid materials.
- explain applications of unit operations and their operational principles.

SKILLS:

✓ *Perform cumulative and differential particle size analysis.*

✓ *Identify the suitable mixer required for mixing cohesive and non cohesive solids.*

✓ *Recognize the required specifications of the size reduction equipment for a given feed.*

✓ *Identify the filtration equipment required for a specific application.*

✓ *Compare the efficiency of separation equipment.*

UNIT - 1 **L-9**

PROPERTIES AND CHARACTERIZATION OF SOLIDS : Properties of particulate masses, Characterization of solid-particles, Particle Shape, Particle size, Mixed particle sizes and size analysis, Screen analysis, Standard screen series, Properties of particulate masses, Pressures in masses of particles, Storage of solids, Pressures in bins and silos, Flow out of bins.

UNIT - 2 **L-9**

MIXING AND CONVEYING OF SOLIDS : Mixing of solids, Types of mixers, Mixers for cohesive solids, Criteria of mixing effectiveness - mixing index ,Mixers for free flowing solids, Mixing index in blending granular solids, Mixing index at zero time, Rate of mixing, Conveying of solids-Belt conveyor, Screw conveyor, Pneumatic conveyor, Bucket elevator.

UNIT - 3 **L-9**

PRINCIPLES OF COMMINUTION : Criteria for comminution, Characteristics of comminuted products, Energy and power requirements in comminution, Empirical relationships, Size reduction equipment-Crushers, Grinders, Ultrafine Grinders, Cutting machines.

PARTICLE SIZE ANALYSIS : Screening, Screening equipment, Screen effectiveness.

UNIT - 4 **L-9**

FILTRATION : Introduction to filtration, Types of filters–pressure filters, Vacuum filters, Centrifugal filters, Filter media, filter aids, Principles of cake filtration, Pressure drop through filter cake, Continuous filtration, Principles of centrifugal filtration, Clarifying filters, Liquid clarification, Cross flow filtration.

UNIT - 5 **L-9**

PARTICLE SEPARATION TECHNIQUES : Separations based on motion of particles through fluids, Gravity settling processes, Gravity classifiers, Sorting classifiers, Clarifiers and thickeners, Flocculation, Batch sedimentation, Clarifier and thickener design, Centrifugal settling processes, Electrostatic precipitators, Cyclones and hydro clones.

ACTIVITIES:

- *To compare the working of different types of crushers.*
- *To find the optimum time of sieving.*
- *To compare the working of leaf filter and plate and frame filter press.*

LABORATORY EXPERIMENTS

Total hours: 30

LIST OF EXPERIMENTS

1. Determination of particle size using screen analysis.
2. Finding the effectiveness of a screen.
3. Verification of size reduction laws using jaw crusher.
4. Verification of size reduction laws using ball mill.
5. Verification of size reduction laws and finding efficiency using roll crusher.
6. Determination of compressibility coefficient using sedimentation process.
7. Determination of filter medium resistance and cake resistance using plate and frame filter press.
8. Determination of percent recovery of coal from coal-sand mixture using froth flotation cell.
9. Determination of the efficiency of leaf filter.
10. Determination of the efficiency of cyclone separator.

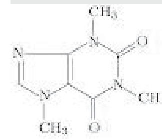
TEXT BOOKS:

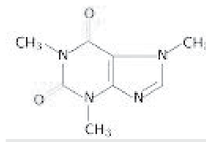
1. Mc Cabe, W. L., Smith J.C. and Peter Harriot, “Unit Operations of Chemical Engineering”, 7th edition, McGraw-Hill, 2005.
2. Foust et.al, “Principles of Unit Operations” 2nd edition, Wiley, New York, 2004.

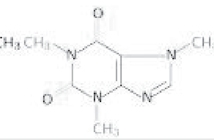
REFERENCE BOOK:

1. Perry R.H, and Green, D.W. “Chemical Engineer’s Hand book”, 8th edition, McGraw-Hill, New York, 2007.

16CH206 ORGANIC CHEMISTRY







Hours Per Week :

L	T	P	C
3	1	2	4

Total Hours :

L	T	P
45	12	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course offers fundamental concepts and preparation of most organic compounds and pharmaceuticals and also reaction mechanism and stereo chemical aspects. The objective of this course is to familarise the student about the reaction mechanisms involved in organic synthesis.

Course Outcomes:

The student will be able to :

- write reaction mechanism.
- understand different named reactions.
- know characteristics and properties of various functional groups.
- understand stereochemical aspects.
- know medicinal aspects of heterocyclic chemistry.
- estimate retrosynthetic stratergy.

SKILLS:

✓ *Identify the purity of solid and liquid compounds.*

✓ *Detection of unknown functional group present in the given organic compound.*

✓ *Identify pharmaceutical intermediates.*

✓ *Preparation of organic compounds.*

ACTIVITIES:

- *Perform preliminary tests.*
- *Identification of extra elements present in organic compounds.*
- *Properties of various functional groups.*
- *Medicinally important reactions.*
- *Concentrate organic liquids obtained from plant extracts.*
- *Fractional distillation / column purification of plants extracts.*

UNIT - 1 **L-9, T-2**

(A) **REACTION INTERMEDIATES** : Bond fissions, Carbanions, carbonium ions, Free radicals, Nitrenes, Carbenes, Benzyne, Nucleophiles and electrophiles.

(B) **POLAR EFFECTS :** Inductive effect, Resonance, Hyper conjugation, Electromeric effect, Mesomeric effect.

UNIT - 2 **L-9, T-3**

(A) **TYPES OF ORGANIC REACTIONS** : Electrophilic reactions: Friedal - Craft's reactions, Fries Rearrrangement, Reimer - Tiemann reaction, Nucleophilic reactions: Aldol condensation, Cannizaro reaction.

(B) **FREE RADICAL REACTIONS :** Halogenation of alkane, Addition of HBr to alkene in presence of peroxide, Anti-Markovnikov's rule.

UNIT - 3 **L-9, T-2**

PREPARATIONS AND REACTIONS : Preparations and reactions of alcohols, Phenols, Carboxylic acids, Aldehydes, Ketones, Amines.

UNIT - 4 **L-9, T-3**

STEREO CHEMISTRY : Stereo isomerism, Optical isomerism, Symmetry, Optical Rotation, Chirality,

Lactic acid, Tartaric acid, Enantiomers, Diastereomers, R and S nomenclature, Racemic mixture and resolution methods. Geometrical Isomerism, E and Z nomenclature.

UNIT - 5 **L-9, T-2**

HETEROCYCLIC COMPOUNDS : Preparation and reactions of 1) Furan 2) Thiophene 3) Pyrrole 4) Pyridine.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

I. **Criteria of purity of solid and liquid compounds**

a. Determination of Melting point

b. Determination of Boiling point

II. ***Detection of extra elements in organic compounds***

c. Nitrogen

d. Sulphur

e. Halogens

III. Identification of an unknown substance from the following organic compounds

f. Acids

g. Alcohols

h. Aldehydes

i. Amides

j. Amines

k. Carbohydrates

l. Esters

m. Ketones

n. Nitro Group

o. Phenols

IV. Preparations

a. Asprin

b. Preparation of DA Adduct

TEXT BOOK :

1. Arun Bahl and B.S. Bahl , "Text Book to Organic Chemistry", 18th edition, S. Chand, 2009.

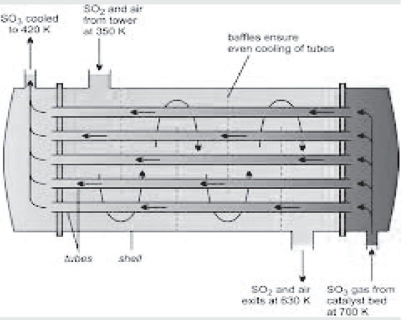
REFERENCE BOOKS :

1. I. L. Finar; "Organic Chemistry, Vol – I, 6th edition, Longman Scientific Publications, 2006.

2. Somendra Nadh Sanyal, "Named Reactions, Rearrangements and Reagents", Bharathi Bhavan Publications, 2003.

3 O.P. Agarwal, "Reactions and Reagents", 46th edition, Goel Publications, 2005.

4 R.T Morrison and R.M. Boyd, "Organic Chemistry", 6th edition, Pearson Publications, 2008.



16CH207 PROCESS HEAT TRANSFER

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
25	50	-	5	5	5

Course Description and Objectives:

This course deals with the phenomena of heat transfer and methodologies applied for solving a wide variety of practical engineering problems. The objective of this course is to provide theoretical and practical knowledge in various modes of heat transfer and its application for designing of process equipments.

Course Outcomes:

The student will be able to :

- understand the basic laws of heat transfer.
- account for the consequence of heat transfer in thermal analyses of engineering systems.
- analyze problems involving steady state heat conduction in simple geometries.
- obtain numerical solutions for conduction and radiation heat transfer problems.
- understand the fundamentals of convective heat transfer process.
- evaluate heat transfer coefficients for natural and forced convection.
- understand the basic mechanism behind boiling and condensation processes.
- analyze heat exchanger performance by using the method of log mean temperature difference.
- calculate radiation heat transfer between black and gray surfaces.

SKILLS:

✓ *Estimate the rate of heat flow through a wall, cylinder or sphere*

✓ *Calculate the insulation thickness for a specified heat loss target.*

✓ *Determine heat transfer coefficient in simple geometries for forced and natural convection.*

✓ *Estimate area of heat exchanger required for specified conditions.*

✓ *Design of heat exchanger.*

✓ *Determine the emissivity of a given body.*

UNIT - 1 **L-9**

HEAT TRANSFER AND ITS APPLICATIONS : Nature of heat flow, Conduction, Convection, Radiation Heat transfer by conduction: Fourier's law of conduction, Thermal conductivity, Steady state conduction, Compound resistances in series, Heat flow through cylinder, Principles of heat flow in fluids: Heat exchange equipment, Counter current & parallel current flows, Energy balances, Rate of heat transfer, LMTD, Individual heat transfer coefficients, Overall heat transfer coefficient.

UNIT - 2 **L-9**

HEAT TRANSFER TO FLUIDS WITHOUT PHASE CHANGE : Regimes of heat transfer, Thermal boundary layer, Heat transfer by forced convection in laminar flow, Heat transfer by forced convection in turbulent flow, Analogy between transfer of momentum and heat, Reynolds analogy, Colburn analogy, Interpretation of dimensionless groups. Natural Convection: Dimensional analysis, Natural convection to vertical shapes and horizontal planes**.**

UNIT - 3 **L-9**

HEAT TRANSFER TO FLUIDS WITH PHASE CHANGE : Drop wise and film type condensation, Coefficients for film type condensation, Practical use of nusselt equations, Condensation of super heated vapors,Pool boiling of saturated liquid, Maximum flux and critical temperature drop.

UNIT - 4 **L-9**

RADIATION HEAT TRANSFER : Fundamental facts concerning radiation, Emission of radiation, Black body radiation, Laws of black body radiation, Absorption of radiation by opaque solids, Radiation between surfaces, Non black surfaces.

UNIT - 5 **L-9**

HEAT EXCHANGE EQUIPMENT : General design of heat exchange equipment, Heat exchangers, Condensers, Boilers. Evaporation: Liquid characteristics, Types of evaporators, Performance of tubular evaporators, Multiple effect evaporators.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Estimation of natural convection heat transfer coefficient.
2. Determination of overall resistance in composite wall.
3. Estimation of emissivity of a test plate.
4. Verification of Stefan-Boltzmann's law of radiation.
5. Determination of heat transfer coefficients of double pipe heat exchanger.
6. Estimation of heat transfer coefficient in forced convection.
7. Determination of thermal conductivity of liquid sample.
8. Determination of thermal conductivity of solid sample.
9. Determination of critical heat flux points of nichrome wire.
10. Determination of overall heat transfer coefficient of a given coil.

ACTIVITIES:

- *Mix the heat.*
- *Feel the heat.*
- *Identification of heat exchangers.*
- *Fabrication of double pipe heat exchanger.*
- *Connecting shell and tube heat exchanger setup.*

TEXT BOOKS :

1. W. L. McCabe, J. C. Smith and P. Harriott, "Unit Operations of Chemical Engineering", 6th edition, McGraw-Hill, Inc., 2005.
2. D. Q. Kern, "Process Heat Transfer", 1st edition, Tata McGraw-Hill, 2002.

REFERENCE BOOKS :

1. J. P. Holman, "Heat Transfer", 8th edition, McGraw-Hill, New York, 1997.
2. Y. V. C. Rao, "Heat Transfer", 1st edition., University Press, 2001.
3. D. Pitts, E. Leighton and Sissom, "Schaum's Outline of Heat Transfer", 2nd edition., McGraw-Hill publications, 1998.
4. J.M. Coulson and J. F. Richardson, "Chemical Engineering,Vol-1", Oxford, Pergamon Press,1968.

VFSTR UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

III Year B.Tech. Chemical Engg. - I -Semester

L	T	P	To	C
4	0	-	4	4

CH 301 PROCESS HEAT TRANSFER

Course Description & Objectives:

Study about heat transfer mechanisms conduction, convection, radiation and various equipments used in chemical industries

To understand the fundamentals of heat transfer mechanisms and their applications in various heat transfer equipment in process industries.

Course Outcomes:

1. *Understand and use empirical equations to solve forced and natural convection heat-transfer problems;*
2. *Analyze the heat transfer processes involved in boiling and condensation;*
3. *Perform basic calculations of common heat exchangers to determine relevant design parameters.*

UNIT I – Heat Transfer and its Applications

Heat Transfer and Its Applications: Nature of heat flow, Conduction, Convection, Radiation, Heat Transfer by Conduction: Fourier's law of conduction, Thermal conductivity, Steady state conduction, Compound resistances in series, Heat flow through cylinder, Unsteady state conduction, Semi-infinite solid. Principles of heat flow in fluids: Heat exchange equipment, Counter current & parallel current flows, Energy balances, Rate of heat transfer, LMTD, Individual heat transfer coefficients, Over all heat transfer coefficient, Fouling factors, Effective coefficients for unsteady state heat transfer.

UNIT II - Heat Transfer to Fluids Without Phase Change

Regimes of heat transfer, Thermal boundary layer, Heat transfer by forced convection in laminar flow, Heat transfer by forced convection in turbulent flow, Analogy between transfer of momentum and heat, Reynolds analogy, Colburn analogy, Heat transfer in transition region, Transfer to liquid metals, Interpretation of dimensionless groups. Natural Convection: Dimensional analysis, Natural convection to vertical shapes and horizontal planes.

UNIT III - Heat Transfer to Fluids With Phase Change

Drop wise and film type condensation, Coefficients for film type condensation, Practical use of nusselt equations, Condensation of super heated vapors, Effect of non condensable gases on rate of condensation, Heat transfer to boiling liquids, Pool boiling of saturated liquid, Maximum Flux and critical temperature drop, Minimum flux and film boiling.

UNIT IV - Radiation Heat Transfer

Fundamental facts concerning radiation, Emission of radiation, Black body radiation, Laws of black body radiation, Absorption of radiation by opaque solids, Radiation between surfaces, Non black surfaces, Radiation to semitransparent materials, Combined heat transfer by conduction-convection and radiation.

UNIT V - Heat Exchange Equipment

General design of heat exchange equipment, Heat exchangers, Condensers, Boilers, Calandrias, Extended surface equipment.

Evaporation: Liquid characteristics, Types of evaporators, Performance of tubular evaporators, Enthalpy balances for single effect evaporator, Multiple effect evaporators.

TEXT BOOKS

1. W.L.McCabe, J.C.Smith & P.Harriott,"Unit Operations of Chemical Engineering", 6th ed., McGraw-Hill, Inc., 2001.
2. D.Q.Kern, "Process Heat Transfer", 1st ed., Tata McGraw Hill, 2002.

REFERENCE BOOKS

1. J.P.Holman, "Heat Transfer", 8th ed., McGraw Hill, New York, 1997.
2. Y.V.C.Rao, "Heat Transfer", 1st ed., University Press, 2001.
3. Donald Pitts, Leighton E, Sissom, "Schaum's Outline of Heat Transfer", 2nd ed., McGraw Hill publications, 1998.
4. J.M. Coulson. J.F.Richardson, "Chemical Engineering", Vol-1, Oxford, Pergamon Press, 1968.

III Year B.Tech. Chemical Engg. - I -Semester	L	T	P	To	C
	4	0	-	4	4

CH 303 MASS TRANSFER OPERATIONS-I

Course Description & Objectives:

The course deals about various mass transfer operations like Absorption, Stripping, Humidification, etc.

It includes the design of various equipments like Absorber, Humidifier, etc.

Course Outcomes:

The student will be able to recognize the various modes of mass transfer like Determination of mass transfer rates using

1. *Fick's Law*
2. *Estimation of diffusion coefficients*
3. *Solving of unsteady state diffusion problems*

UNIT I - Diffusion and Mass Transfer

Mass transfer operations, molecular diffusion in fluids, Binary solutions, Fick's Law, equation of continuity, Steady state equimolar counter current diffusion; Stefan's diffusion estimation of diffusivity n gases and liquids, application of molecular diffusion, theories of mass ransfer, diffusion in fluids, Reynolds analogy, heat and mass transfer coefficients in laminar and turbulent flow, diffusion through solids.

UNIT II - Interphase Mass Transfer

Concept of equilibrium, diffusion between phases, material balances in steady state, co – current and counter current stage processes, Sparged vessels mechanically agitated vessels for liquid gas (single phase), Venturi scrubbers, Sieve tray design for absorption tray tower vs. packed tower, Stage efficiencies and point efficiencies.

UNIT III - Absorption and Stripping

Introduction, Counter and co – current isothermal absorption and stripping of single component, operating lines, minimum flow rate, Determination of number of transfer units and height of continuous absorber, determination of no. of plates, absorption factor, Kremser - Brown equations.

UNIT IV - Humidification

Introduction, Vapor – pressure curve, definitions, psychometric charts, Enthalpy of vapor – gas mixtures, humidification and de humidification, operating lines and design of packed humidifiers, cooling towers, spray chambers.

UNIT V - Drying

Introduction, Definitions of various moisture contents, drying conditions, Rate of Batch drying under constant drying conditions, mechanism of batch drying, Drying time, through circulation drying, batch and continuous drying, equipment design of continuous counter current dryer.

TEXT BOOKS

1. R.E.Treybal "Mass Transfer Operations" 3rd ed., Mc-Graw Hill, 1981.
2. Binay. K.Dutta, "Principles of Mass Transfer and Separation Processes",Prentice Hall of India, New Delhi, 2007.

REFERENCE BOOKS

1. C. Judson King, "Separation Processes", 2nd ed., McGraw Hill, 1982.
2. Seader. J. D, E. J. Henley & D.Keith Roper, "Separation ProcessesPrinciples", John Wiley & sons, New York, 2010.
3. Alapati Suryanarayana "Mass Transfer Operations", 1st ed., New - Age, International, 2006.

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH305 CHEMICAL REACTION ENGINEERING - I

Course Description & Objectives:

Chemical Reaction Engineering is the heart of a Chemical Process Industry, especially the kinetics i.e. the rate at which chemical reactions occur. This subject enables the students to learn about the different types of reactions underlying a chemical process and thereby design chemical reactors.

Course Outcomes:

1. *On having completed the course, the student will be in a position to design reactor, with some additional inputs.*

2. *The homogeneous reactions & hence the reactors are fairly easy to design. But, with increasing complexity like in multiple rxns & heterogeneous rxno.*
3. *The student has to exercise some caution in designing the reactors.*
4. *The reactor history coupled with personal experience and sound judgment are necessary.*

UNIT I - Reaction Kinetics

Rate equation, Elementary, Non Elementary Reactions and their mechanisms, Theories of reaction rate and temperature dependency, Searching for mechanism.

UNIT II - Interpretation of Batch Reactor Data

Constant volume batch reactor, varying volume batch reactor, analysis of batch reactor, temperature and reaction rate the search for a rate equation.

UNIT III - Ideal Reactors

Ideal batch reactors, steady state mixed flow reactors, steady state plug flow reactors. Size comparison of single reactors, Case studies & problems.

UNIT IV - Multiple Reactions

Parallel reactions, Series reactions, Series – parallel reactions, Maximizing the productivity of desired reactant. An alternative approach to using fractional conversion; Net reaction rates and stoichiometry.

UNIT V - Temperature and Pressure Effects

Single reactions, Heat of reactions from thermodynamics, Heat of reaction and temperature, equilibrium constant from thermodynamics, Conversion, Graphical Design procedure.

TEXT BOOK

1. Octave Levenspiel, "Chemical Reaction Engineering", 3rd ed., WEE, 1999.

REFERENCE BOOKS

1. H.S.Fogler, "Elements of Chemical Reaction Engineering", 3rd ed., PHS, 1992.
2. J.M.Smith, "Chemical Engineering Kinetics", 3rd ed., MGH, 1981.

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH325 PROCESS DYNAMICS & CONTROL

Course Description & Objectives:

Study of dynamic behavior of chemical processes and techniques of conventional process control, Mathematical modeling and analysis of open loop and closed loop process, frequency domain analysis and stability Provide a conceptual and methodological framework for describing a process and its control system.

Course Outcomes:

. 1. Develop mathematical models of chemical processes by writing unsteady-state mass and energy balances.

2. Ability to design controllers.

UNIT I - First Order System

Introduction to process dynamics and control, Response of first order systems, Physical examples of first order systems, Response of first order systems in series, Higher order systems, Second order systems and transportation lag.

UNIT II - Control System

Controllers and final control elements, Block diagram of a chemical reactor, Control Systems, Closed loop transfer functions, Transient response of simple control systems.

UNIT III - Stability Criteria

Stability, Routh array Root locus, Application of Root locus to control systems.

UNIT IV - Frequency Response Analysis

Introduction to frequency response, control systems design by frequency response, Bode diagrams.

UNIT V - Advanced Control Strategies

Advanced control strategies, Cascade control, Feed Forward control ratio control, Smith predictor, Dead time compensation, Internal mode control. Controller tuning, Process Identification, Different types of control valves like linear, on – off etc.

TEXT BOOKS

1. Donald R Coughanowr, “Process System Analysis and Control” 2nd ed., Mc Graw Hill, 1993.
2. G.Stephanepolous, “Chemical Process Control”, 1st ed., Prentice Hall, 1998.

REFERENCE BOOK

1. Peter Harriott, “Process Control”, Tata McGraw Hill, 2008.
2. R.W.Gaikwad,S.A.Misal “Process Dynamics and Control”,1st ed.,Central Techno publications,2004.

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH327 ENERGY ENGINEERING (ELECTIVE - I)

Course Description & Objectives:

The course programme focuses on understanding the sources of energy and their contributions to the energy and power needs of the nation and the world.

Course Outcomes:

The student will be able to

1. Understand the present and future enery demands of the energy resources,

2. Know about various energy auditing and energy conservation methods.

3. Obtain in detail knowledge about the stem distribution and utilization.

4. Know about various renewable energy resources.

UNIT I - Sources of Energy and Types of Fuels

Energy resources present and future, Energy demands with reference to India. Coal: - Origin, occurrence reserves, petrography, rank, classification, analysis, testing, storage, carbonization liquefaction, gasification.

UNIT II - Liquid Fuels: Petroleum

Origin, occurrence, Reserves, Composition, classification, fractionation, reforming cracking, petroleum products, specification for petroleum natural gas, coke oven gas, producer gas, water gas, LPG.

UNIT III - Energy Auditing

Short term, medium term, long term schemes, energy conversion energy index, energy cost, representation of energy consumption, Energy auditing.

UNIT IV - Steam Plant

Run time cycle, boiler plant, steam cost, steam distribution and utilization, combined heat and power cycles. Energy from biomass, gas purification solar energy, wind energy, energy storage, waste heat recovery.

UNIT V- Energy Conservation:

Energy conservation methods in process industries, practical applications and theoretical analysis.

TEXT BOOKS

1. O.P.Gupta, "Elements of Fuels, Furnaces & Refractories", 3rd ed., Khanna Publications, 1996
2. Sami Sarkar, "Combustion", 2nd ed., Orient Longman, 1998.

REFERENCE BOOKS

1. Conventional Energy Technology, Fuel and Chemical Energy, Tata Mc Graw Hill, 1987.
2. G.D.Rai, "Non – Convectional Energy Sources", 4th ed., Khanna Publications, 1997.

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH329 INDUSTRIAL SAFETY & HAZARD MANAGEMENT (ELECTIVE - I)

Course Description & Objectives:

To provide comprehensive knowledge of safety and hazards aspects in industries and the management of hazards. To build in safety competency of the participants in the Quantifying risk, Design for Safety, Investigating accident.

Course Outcomes:

1. *This course will enable the student to identify and understand safety hazards in a business or industrial setting.*
2. *The principles learned in this course will allow the student to use current safety theory and guidelines in making the workplace safer for workers.*
3. *The intention is for the student to be able to: Identify basic safety hazards.*
4. *Demonstrate the ability to document and record incidents and accidents in the workplace, Identify basic methods of hazard control.*

UNIT I - Safety

Safety programs, engineering ethics, accident and loss statistics, acceptable risk, public perception.

UNIT II - Toxicology

How Toxicants enter biological organisms & are eliminated from biological organisms, government regulations, Industrial Hygiene: identification, evaluation, control.

UNIT III - Fires and Explosions

The fire triangle, distinction between fires and explosions, Definitions, flammability characteristics of liquids and vapors, ignition energy, auto ignition, auto oxidation, adiabatic compression, explosions.

UNIT IV - Introduction to Relief's

Relief concepts, definitions, location of relief's, relief types, relief systems, conventional spring operated reliefs in liquid service and vapor or gas service, rupture disc relief's in liquid service and vapor or gas service.

UNIT V - Hazard's Identification

Process hazards checklists, hazards and operability studies, safety reviews.

TEXT BOOKS

1. DA.Crowl & J.F.Louvar, "Chemical Process Safety", Vol. 2, Prentice Hall, 1980.
2. H.H.Fawcett and W.S.Wood, "Safety & Accident Prevention in Chemical Operations", 2nd ed., John Wiley and Sons, New York, 1982.

REFERENCE BOOKS

1. R.K.Sinnoot, "Coulson and Richardson's - Chemical Engineering", Vol 6, Butterworth - Heinmann Limited, 1996.
2. Roye Sanders, "Chemical Process Safety", 1st ed., Elsevier, 2007.

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH331 DESIGN OF ANALYSIS & EXPERIMENTS (ELECTIVE - I)

Course Description & Objectives:

Understand the important role of experimentation in new product design, manufacturing process development, process improvement and analyze the results from such investigations to obtain conclusions

Course Outcomes:

1. *Describe how to design experiments, carry them out, and analyze the data they yield.*

2. *Understand the process of designing an experiment including factorial and fractional factorial designs.*

3. *Examine how a factorial design allows cost reduction, increases efficiency of experimentation, and reveals the essential nature of a process.*

UNIT I - Introduction

Modeling and study of systems in Chemical Engineering leading to systems of algebraic, ordinary differential and partial equations (both linear and non-linear systems). Methods of solution of systems of linear algebraic equations, linear homogeneous ordinary differential equations and linear non-homogeneous ordinary differential equations observed in systems of interest to chemical engineers.

UNIT II - Differential Equations

Methods of solution of linear and non-linear finite difference equations, solution of differential – difference equations, numerical solution to partial differential equations by relaxation method, finite – difference method, introduction to finite element method and application to problems of interest in chemical engineering.

UNIT III - Basic Statistical Concepts

Probability distributions, sampling and sampling distributions; Inferences about the differences in Means.

Randomized Designs**:** Hypothesis Testing – t-test, use of P-values; Confidence intervals, Inferences about the difference in means, paired comparison designs, inferences about the variances of normal distributions F-test.

UNIT IV - Analysis of Variance

One-way and two way Analysis. Analysis of fixed effects model – Decomposition of the total sum of squares, statistical analysis.

Factorial Experiments: Definitions, Interpretation of main effects and interactions, design with factors at two levels – Calculation of effects and Analysis of variance – Model adequacy testing, Estimating model parameters Analysis of 2K factional design in detail.

UNIT V - Regression Models

Linear Regression Models, Estimation of parameters, Multiple regression, Hypothesis Testing in multiple regression, confidence intervals in multiple regression.

Response Surface Methodology: Introduction, Method of Steepest Ascent, Analysis of a second order response. Experimental designs for fitting response surfaces Composite Designs. Introduction to other experimental design: Mixture experiments, Evolutionary Operation, Robust Design (Taguchi Methods).

TEXT BOOKS

1. S. Pushpavanam, "Mathematical Methods in Chemical Engineering", 1st ed., Prentice Hall of India, New Delhi, 2005.
2. Douglas C. Montgomery, "Design and Analysis of Experiments", 5th ed., John Wiley and Sons INC, 2007.

REFERENCE BOOKS

1. W.L. Hines and D.C. Montgomery, "Probability and Statistics in Engineering and Management", John Wiley and Sons, 1980.
2. Ed. Oven L. Davies Longman Group, "Design and Analysis of Industrial Experiments", 2nd ed., 1978.
3. Jenson and Jeffereys, "Mathematical Methods in Chemical Engineering", Academic Press, 1963.
4. C.F. Jeff Wu & Michael Hamada 2009, Experiments-Panning, Analysis, and Parameter Design Optimization, 2nd edn, John Wiley & Sons. Inc.

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
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CH333 PROCESS HEAT TRANSFER LAB

Course Description & Objectives:

To understand the fundamentals of heat transfer mechanisms and their applications in various heat transfer equipment in process industries.

Course Outcomes:

The course will provide a sound practical knowledge of the three main heat transfer phenomena namely conduction, convection and radiation.

List of Experiments

1. Determination of heat transfer coefficient by Natural Convection.
2. Determination of overall resistance in Composite Wall.
3. Determination of heat transfer coefficient through Pin Fin.
4. Emissivity Measurement.
5. Determination of heat transfer coefficient of Shell and Tube Heat Exchanger.
6. Determination of Thermal Conductivity of Metal Rod.
7. Determination of heat transfer coefficient of Vertical Condenser.
8. Determination of heat transfer coefficients of Agitated Vessel.
9. Determination of heat transfer coefficients of Double Pipe Heat Exchanger.
10. Determination of Thermal Conductivity of Liquids.
11. Determination of performance of Single Effect Evaporator.
12. Determination of heat transfer coefficient of Horizontal tube lossing heat by Forced Convection.
13. Determination of Stefan Boltzmann Constant.
14. Determination of Critical Heat Flux points of Nichrome Wire.

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
-	-	3	3	2

CH335 CHEMICAL TECHNOLOGY LAB

Course Description & Objectives:

To study process technologies of various organic and inorganic process industries.

This course covers manufacture of various chemicals, cement, rubber, soaps, detergent, paper and ceramics.

Course Outcomes:

1. Ability to understand the manufacturing of various inorganic and organic chemicals
2. Ability to estimate melting / boiling points, preparation, analysis of different chemical compounds.

List of Experiments

1. Estimation of Glucose
2. Estimation of Sucrose
3. Iodine value of oil
4. Saponification value of oil
5. Acid value of oil
6. Preparation of Acetanilide
7. Preparation of Aspirin (Acetyl Salicylic acid)
8. Preparation of Azodye (Phenyl Azo – 2 – Naphthol)
9. Preparation of Nitrobenzene from benzene
10. Preparation of M – Dinitro Benzene from Nitro Benzene
11. Preparation of Urea formaldehyde resin
12. Preparation of Phenol formaldehyde resin
13. Determination of Alkalinity of water
14. Determination of Percentage purity of lime stone

III Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
-	-	3	3	2

CH337 PROCESS DYNAMICS & CONTROL LAB

Course Description & Objectives:

Study of dynamic behavior of chemical processes, various controllers and techniques of conventional process control.

Course Outcomes:

To provides a sound practical knowledge of different control systems, controllers, and control valves that are used in industries.

List of Experiments:

1. Dynamics of 1st Order Systems [Thermometer].
2. Dynamics of Interacting System for Step Input.
3. Dynamics of Non Interacting System for Step Input
4. Response of Interacting System for Pulse Input.
5. Response of Non-Interacting System for Pulse Input.
6. Response of Single Tank for Step Input
7. Response of Single Tank for Pulse Input
8. Response of Manometer (2nd Order System)
9. Response of Control Values
10. Response of 1st Order System using Mat Lab
11. Response of 2nd Order System using Mat Lab
12. Temperature Control Trainer
13. Cascade Control Trainer
14. Response of “P” Controller using Mat Lab.

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
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MS310 MANAGERIAL ECONOMICS

Course Description & Objectives:

This course provides students with the knowledge, tools and techniques to make effective economic decisions under conditions of risk and uncertainly.

Course Outcomes:

Students will be able to:

1. *Apply the economic way of thinking to individual decisions and business decisions*
2. *Understand how prices get determined in markets, how market participants benefit in the form of consumer surplus and producer surplus, and what are the consequences of government intervention*
3. *Understand the roles of managers in firms*
4. *Understand the internal and external decisions to be made by managers*
5. *Design competition strategies, including pricing, product differentiation, research & development, and marketing, according to the natures of products and the structures of the markets*
6. *Analyse real-world business problems with a systematic theoretical framework.*

UNIT I - Nature & Scope of Managerial Economics

Basic tools and techniques of Business Economics, Macro Economic Environment and Managerial decisions.

UNIT II – Demand Analysis

Demand Analysis: Types of Demand, Demand determination Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT III – Theory of Production

Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors,Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT IV – Cost Analysis

Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis.

UNIT V - Features and types of different competitive situations

Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

Text Books:

1. Gupta: Managerial Economics, 1/e TMH, 2005
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010

Reference Books:

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
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CH302 MASS TRANSFER OPERATIONS-II

Course Description & Objectives:

The Course deals about various separation techniques and mass transfer operations like Distillation, Extraction, adsorption, etc.

It includes the design of various equipments like Distillation, adsorber, extractor etc.

Course Outcomes:

The student will be able to recognize the various Principles like design of operating line equation, design of Distillation units, Tower sizing, design of single and multi stage cross current, co-current, counter current extractors, design of adsorption and leaching equipments.

UNIT I - Distillation

Introduction, Fields of application, VLE for miscible liquids, immiscible liquids, steam distillation, VLE phase diagrams, tie lines, mixture rules, Flash vaporization and differential distillation for binary and multicomponent mixtures, Batch distillation with reflux.

UNIT II - Mc – Cabe and Ponchon - Savarit Methods

Continuous fractionation of binary mixtures, Mc – Cabe Thiele method, Ponchon – Savarit method determination of no of ideal plates for binary mixtures, optimum reflux ratio, plate efficiencies, condenser and reboiler duties, principles of
azeotropic and extractive distillation, open steam system.

UNIT III – Liquid-Liquid Extraction

Fields of application of ternary liquid systems, triangular and solvent free coordinate systems, Choice of solvent and selectivity, extraction with insoluble and partially soluble systems,Single and multi stage cross and counter current extraction with reflux, continuous contact extraction (packed beds) equipment for liquid – liquid extraction.

UNIT IV - Leaching

Introduction, Fields of application, Preparation of solid for leaching, types of leaching, Leaching equilibria, Constant under flow conditions, Single and multistage leaching calculations, equipment for leaching operation.

UNIT V - Adsorption and Ion – Exchange

Principles and applications, types of adsorption, use of adsorbents, Adsorption equilibria, adsorption isotherms for vapor and dilute solutions, Design of steady state moving bed adsorber for one component, Un steady state adsorption, Break through curve, fixed bed adsorber and ion exchange.

TEXT BOOKS

1. R.E.Treybal, "Mass Transfer Operations", 3rd ed., Mc-Graw Hill, 1981.
2. Binay. K.Dutta, "Principles of Mass Transfer and Separation Processes",Prentice Hall of India, New Delhi, 2007.

REFERENCE BOOKS

1. C. Judson King, "Separation Processes", 2nd ed., McGraw Hill, 1982.
2. Alapati Suryanarayana, "Mass Transfer Operations", 1st ed., New - Age, International, 2006.

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH304 CHEMICAL REACTIONS ENGINEERING – II

Course Description & Objectives:

This covers the degree of nonideality contribution in reactors, which affects the conversion levels. Also, here hetroganeous systems to an extent are taken into account coupled with catalysis.

Course Outcomes:

1. *On having completed the course, the student will be in a position to design reactor, with some additional inputs.*
2. *The homogeneous reactions & hence the reactors are fairly easy to design. But, with increasing complexity like in multiple rxns, & heterogeneous rxno.*
3. *The student has to exercise some caution in designing the reactors.*
4. *The reactor history coupled with personal experience and sound judgment are necessary.*

UNIT I - Non Ideal Flow

E curve, the age distribution of fluid, the RTD studies, conversion in non ideal flow reactors, dispersion model Axial dispersion, correlations of axial dispersion, problems.

UNIT II - Tanks in Series Model

Pulse response experiments and the RTD, Chemical conversion, Convertion model in laminar flow reactors, Earliness of mixing, Segregation and RTD: Self mixing of a single fluid.

UNIT III - Fluid - Particle Reactions: Kinetics - The Rate Equation

Fluid particle reactions: Kinetics - selection of a model, shrinking core model for spherical particles of unchanging size, rate of reaction for shrinking spherical particles, determination of rate controlling step.

UNIT IV - Heterogeneous Reactions

Introduction**:** Solid catalyzed reactions - pore diffusion resistance combined with surface kinetics, porous catalyst particles, performance equations for reactors containing porous catalyst particles.

UNIT V - Deactivating Catalysts

Mechanism of catalyst deactivation, the rate and performance equations.

TEXT BOOKS:

1. Octave Levenspiel,"Chemical Reaction Engineering", 3rd ed., WEE, 1999.
2. H.S.Fogler, "Elementary Chemical Reaction Engineering", 3rd ed., PHS, 1981.

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH306 CHEMICAL ENGINEERING THERMODYNAMICS – II

Course Description & Objectives:

To understand the theory and applications of classical thermodynamics, thermodynamic properties, equations of state, methods used to describe and predict phase equilibria, vapor-Liquid equilibria, Chemical reaction equilibria.

Course Outcomes:

1. *State the thermodynamic equations and explain them for solving actual thermodynamic problems.*

2. *Apply the thermodynamic principles for the chemical process design as well as industrial application.*

3. *Analyse and calculate thermodynamic properties for a given system or process at specified conditions using appropriate thermodynamic approaches.*

4. *Use the Vapor Liquid Equilibrium relations to solve the process separation problems.*

5. *Evaluate the chemical reaction equilibria for the equilibrium conversion/composition calculations.*

UNIT I - Heat Effects

Sensible heat effects, Latent heats of pure substances, standard heat of Reaction, standard heat of formation, standard heat of combustion, Temperature dependence of ÄH^0.

UNIT II - Solution Thermodynamics -Theory

Fundamental property relation, The chemical potential and phase equilibria, Partial properties, Ideal gas mixtures, fugacity and fugacity coefficient: pure species, fugacity and fugacity coefficient: species in solution .

UNIT III - Vapor / Liquid Equilibrium

The nature of equilibrium, Phase rule, Duhem's theorem, VLE: Qualitative behaviour, Simple models for VLE, VLE by modified raoult's law.

UNIT IV - Phase Equilibria

Equilibrium and stability, Liquid – Liquid equilibrium, Vapor liquid liquid equilibrium, solid – liquid equilibrium, Solid Vapor equilibrium, equilibrium adsorption of gases on solids.

UNIT V - Chemical Reaction Equilibria

The reaction coordinate, Application of equilibrium criteria to chemical reactions, the Standard Gibbs- energy change and the equilibrium constant, effect of temperature on equilibrium constant, Evaluation of equilibrium constants, Relation of equilibrium constants to composition.

TEXT BOOKS

1. J.M.Smith, H.C.Vanness, “Introduction to Chemical Engineering Thermodynamics”, 6th ed., TMH, 2003.
2. Kyle.B.G. “Chemical and Process Thermodynamics”, 2nd ed., PHI, 1990.

REFERENCE BOOKS

1. Dodge B.F “Chemical Engineering Thermodynamics”, 1st ed., MGH, 1960.
2. Sandler, S.I “Chemical and Engineering Thermodynamics”, 2nd ed., Wiley, 1989.

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH308 MEMBRANE TECHNOLOGY (ELECTIVE – II)

Course Description & Objectives:

The course will describe in details membrane separation technology and wide range of applications including water treatment and desalination.

The objective of the course is to give the students the technical background on membrane technology and to provide wide level of understanding that will allow them to design, using appropriate combinations of unit processes and water treatment plant. The practical component will provide the students with a range of laboratory skills together with an understanding of the need for rigorous experimental design of membrane modules for water treatment plant.

Course Outcomes:

Students will be able to

1. *Apply various transport models for the calculation of membrane fluxes and the extent of separation for various membrane systems.*
2. *Identify the types of experimental data needed for the calculation of membrane parameters.*

3. *Select a membrane process and design components to carry out a specific separation.*
4. *Be familiar with the relevant literature.*
5. *Have an introduction to advancement of membrane techniques to solve environmental problems.*

UNIT I – Introduction to Membrane Processes

Separation process, Introduction to membrane processes, definition of a membrane, classification of membrane processes.

Preparation of Synthetic Membranes: Types of Membrane materials, preparation of Synthetic membranes, phase inversion membranes, preparation technique for immersion precipitation, preparation technique for composite membranes.

UNIT II - Characterization of Membranes

Introduction, membrane characterization, characterization of porous membranes, characterization of non-porous membranes.

Transport in Membranes: introduction, driving forces, non equilibrium thermodynamics, transport through porous, non-porous, and ion exchange membranes.

UNIT III - Membrane Processes

Pressure driven membrane processes: Introduction, microfiltration, membranes for microfiltration, industrial applications, ultrafiltration, membranes for ultrafiltration, industrial applications, reverse Osmosis and nanofiltration: membranes for reverse osmosis and nanofiltration, industrial applications, Electrically Driven Processes: Introduction, electrodialysis, Process parameters, membranes for electrodialysis, applications, Membrane electrolysis, Bioploar membranes, Fuel Cells.

UNIT IV- Concentration Driven Membrane Processes

Gas separation, gas separation in porous and non porous membranes, membranes for gas separation, applications, pervaporation, membranes for pervaporation, applications, dialysis: membranes for dialysis, applications, liquid membranes: aspects, liquid membrane development, choice of the organic solvent and carrier, applications, introduction to membrane reactors.

UNIT V - Polarization Phenomenon and Fouling

Introduction to concentration polarization, turbulence promoters, pressure drop, gel layer model, osmotic pressure model, boundary layer resistance model, concentration

polarization in diffusive membrane separations and electro dialysis, membrane fouling, methods to reduce fouling, compaction.

Module and Process Design: Introduction, plate and frame module, spiral wound module, tubular module, capillary module, hollow fiber module, comparison of module configurations.

TEXT BOOKS

1. M.H.V.Mulder, “Membrane Separations”, Springer Publications, 2007.
2. R.Philip C.Wanket, “Rate-Controlled Separations”, 1st ed., Springer, 2005.

REFERENCE BOOKS

1. S.P.Nunes, K.V.Peinemann, “Membrane Technology in the Chemical Industry”, Wiley-VCH, 2nd ed., 2006.
2. Rautanbach and R. Albrecht, “Membrane Process”, John Wiley & Sons, 1st ed., 1986.
3. J.G.Crespo, K.W.Bodekes, “Membrane Processes in Separation and Purification”, Kluwer Academic Publications, 1st ed., 1994.
4. C .J. Geankoplis, “Transport Processes and Unit Operations”, 3rd ed., PHI, 2003.

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH310 MATHEMATICAL METHODS FOR CHEMICAL ENGINEERING (ELECTIVE – II)

Course Description & Objectives:

The course deals about various mathematical differential equations. It discuss about the vector analysis and heat transfer with various bodies.

Course Outcomes:

Mathematical tools are indispensable to process modeling, analysis, engineering design and research. The theme of the course is to introduce a spectrum of widely used mathematical methods in chemical engineering useful to solve problems commonly encountered.

UNIT I - Introduction

Mathematical formulations of the physical problem, formulation of differential equations, application of the law of conservation of mass and energy, flow systems, rate equations.

UNIT II - Partial Differential Equations

Formulation of partial differential equations, differentiation formulae change from Cartesian to cylindrical and spherical , differentiation of implicit functions, directional derivatives, maxima and minima, one dimensional heat conduction problems.

UNIT III - Vector Analysis

Vectors, scalars, vector field, vector differential operators, line integral, mass transfer in binary gas mixture, equation of motion.

UNIT IV - Heat Transfer in Finite and Infinite Slab Thicknesses

Solutions of PDEs heat transfer in a flowing fluid, heat conduction in a slab, temperature distribution in rectangular parallel pipe, heat conduction in a slab of infinite thickness.

UNIT V - Steady State and Unsteady State Heat Transfer

Solutions of PDEs by Laplace transforms, one dimensional un steady state heat conduction, Un steady state operations of packed bed.

TEXT BOOKS

1. T.S.Sherwood & C. Reed, "Applied Mathematics in Chemical Engineering", 2nd ed., Tata McGraw Hill Publishers, 1998.
2. V.G.Jenson & G.V.Jeffreys, "Mathematical Methods in Chemical Engineering", 2nd ed., Academic Press, London, 2000.

REFERENCE BOOKS

1. Steve Chopra, " Numerical Methods for Chemical Engineering" 5th ed., Tata McGraw Hill Publishers, 2009.
2. Pushpavanam ,Kondaswamy, "Numerical Methods for Chemical Engineering" 1st ed., PHI Publishers, 2005.

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH312 BIOCHEMICAL ENGINEERING (ELECTIVE – II)

Course Description & Objectives:

This course focuses on the interaction of Chemical engineering, biochemistry, microbiology.

To enhance skills in the areas of biochemical processes, to provide the fundamental background of biological systems.

Course Outcomes:

1. *The course will help the students to understand and apply the principles of biochemical engineering in the analysis and design of industrial biochemical processes.*
2. *Understanding of biological basics and bio processing.*
3. *Understanding the difference between bioprocesses and chemical processes.*

4. *Students will be able to understand the kinetics of growth, depth& metabolism.*

UNIT I - Introduction to Microbiology

Introduction to Microbiology: Bio physics, and cell doctrine, the structure of cell, Important Cell Types RNA, DNA building blocks.

UNIT II - Kinetics of Enzyme Catalyzed Reactions

Kinetics of enzyme catalyzed reactions, The enzyme substrate complex, Enzyme action, Kinetics with one and two substrates, Michaelis – Menten equation, Estimation of MM parameters. Line weavers burk plot.

UNIT III - Enzyme Immobilization

Enzyme inhibitions, immobilized enzyme technology, Utilization of co – factors, biosynthesis, transport across cell membrane, Introduction to metabolic path way and end products of metabolism.

UNIT IV- Microbial Growth Kinetics

Microbial growth, Monod growth kinetics, Substrate and product inhibition, yield coefficients for bio mass and products, continuous culture for stirred tank fermenter design and analysis of biological reactors.

UNIT V- Fermentation Technology

Production of antibiotics, pencilin, citric acid, bakers yeast, ethanol, Anaerobic fermentation production of biogas, aeration and agitation in bio reactors.

TEXT BOOK

1. J.E.Bailey & David F. Ollis, "Bio Chemical Engineering Fundamentals", 2nd ed., McGraw Hill Publishers, 1986.

2. Michael L. Shuler & Fikret Kargi, "Bioprocess Engineering", 1st ed., Pearson Education International Series, 2002.

REFERENCE BOOKS

1. James – Lee , "BioChemical Engineering", 1st ed., Prentice Hall Publishers, 1992.
2. Pauline M. Doran, "Bioprocess engineering principles" Elsevier Publishers, 1995.

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
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CH314 CHEMICAL REACTION ENGINEERING LAB

Course Description & Objectives:

Here, a bimoelcular, second order homogeneous reaction is considered for which rate constant k is found through various systems. Also, the degree of Non-Ideality is studied by finding the R.T.D's.

Course Outcomes:

Provides a practical knowledge to students of the different chemical reactors used in chemical engineering industries.

List of Experiments:

1. Kinetic Studies in C.S.T.R
2. Kinetic Studies in P.F.R
3. Kinetic Studies in Combined Reactor
4. Kinetic Studies in MFR's in Series
5. Kinetic Studies in Batch Reactor Equimolar Feed
6. Kinetic Studies in Batch Reactor Non - Equimolar Feed
7. Isothermal Batch Reactor
8. Adiabatic Batch Reactor
9. R.T.D Studies in C.S.T.R
10. R T D Studies in C.S.T.R's in Series
11. R.T.D Studies in Plug Flow Reactor
12. R.T.D Studies in Combined Reactor
13. R.T.D Studies in Fluidized Bed Reactor
14. R.T.D Studies in Packed Bed Reactor

III Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
-	-	3	3	2

CH334 MASS TRANSFER OPERATIONS LAB

Course Description & Objectives:

The Course discuss about the various experiments like Distillation, Extraction, Diffusion, etc

It includes the estimation of various parameters like Temperature, Pressure and concentration.

Course Outcomes:

1. *Provides to students the knowledge of various mass transfer operations used in industries.*
2. *Provides to students able to design equipments.*

List of experiments:

1. Verification of Rayleigh's equation using batch distillation
2. Determination of steam distillation temperature and vaporisation efficiency
3. Gas Diffusivity
4. Liquid-Liquid Diffusivity
5. Tray Drier
6. Surface Evaporation
7. Determination of solubility characteristics of given ternary system
8. Estimation of Liquid - Liquid extraction and determination of plait point
9. Estimation of solid liquid extraction and leaching efficiency
10. Determination of VLE data for a binary mixture
11. Adsorption Stuidies of ternary mixture
12. HETP (Hight Equivalent to Theoretical Plate)

VFSTR UNIVERSITY

IV Year - B.Tech

SYLLABUS

I SEM & II SEM

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH 401 CHEMICAL ENGINEERING PLANT DESIGN AND ECONOMICS

Course Description & Objectives:

This course introduces the student to the basic concepts of process design development ,general design considerations, Estimation of capital investments , Interest and investment cost, Taxes, Insurance & Depreciation, Profitability & Optimum Design.

Course Outcomes:

The student will be able to

1. Compare projects using the methods of net present value, discounted cash flow and equivalent minimum investment period

2. Develop a plant capital cost estimate based on published data,

3. Determine the impact of taxation, depreciation and investment incentives on the economic viability of a project.

4.know the procedures involved in optimum designing

UNIT I- Introduction to Process Design

Introduction – Process design development, design considerations, Cost and asset accounting.

UNIT II- Estimation of Capital Investment

Cash flow for industrial operations, Factors effecting Investment, Total product cost, Estimation of capital investments, Cost indices, Cost factors.

UNIT III- Interest and Investment Costs

Interest and investment cost, types of interest, nominal and effective interest rates, Continuous interest, Present worth and discount annuities, Interest on investment.

UNIT IV - Taxes, Insurance & Depreciation

Source of capital taxes and types of taxes ,Insurance – Types of insurances, Self insurance, Depreciation-Types of depreciation, Service life, Salvage value, Present Value, Methods for determining depreciation, group depreciation.

UNIT V - Profitability & Optimum Design

Profitability, Alternative investments and replacements, Profitability standards, discounted cash flow, Capitalized cost payout period, Alternative investments, Optimum design, Design strategy, Optimum conditions, Optimum production rates.

TEXT BOOK:

1. K.D. Timmerhaus & M.S. Peters, "Plant Design and Economics for " Chemical Engg.", 3rd ed., McGraw Hill, 1981.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH403 CHEMICAL PROCESS EQUIPMENT DESIGN

Course Description & Objectives:

This course teaches the student about selection and design of chemical process equipments. To learn about the design procedures of process equipment used in chemical process plants.

Course Outcomes:

1. *Able to design heat transfer equipment and mass transfer equipmet.*
2. *Able to design cooling and heating systems of chemical reactors.*
3. *Able to use software tools for the analysis of process equipment.*

UNIT I - Design of Shell and Tube Heat Exchangers

1-2 heat exchanger, arrangements for increased heat recovery, and calculations for process conditions. Design calculations of a double-pipe heat exchanger: Double pipe exchangers in series-parallel arrangement.

UNIT II - Pressure Vessels

Introduction, vessels subjected to internal pressure &combined loading, stresses induced in vessels, optimum proportions of a vessel, optimum vessel size. problems.

UNIT III - Design Of Dryers

Design of Dryers: Design of rotary dryer, tray dryer and spray dryer.

Design of Packed Towers for Absorption: Flow of liquid over packing's, limiting gas velocities, Pressure-drop calculations, design of packed towers using absorption coefficients, design of packed tower using transfer-unit method.

UNIT IV - Design Of Sieve Tray Tower For Distillation

Introduction, sieve tray, tower diameter, plate spacing, entrainment, flooding, weepage, tray layout, hydraulic parameters.

UNIT V – Cooling Towers

Cooling Tower Practice: Mechanism, types, rating duty and physical size of cooling towers, Cooling tower components, construction material, practical aspects of tower selection

Cooling Tower Design Calculations: Heat transfer calculations, selection of tower size for a given duty, corrections for altitude, use of charts for calculation of cooling tower duties.

TEXT BOOKS

1. D.Q. Kern, "Process Heat Transfer", 1st ed., Tata McGraw Hill, 2001.
2. S. D. Dawande, "Process Equipment Design", Vol 1 & 2, 4th ed., Central Techno Publishers, 2005.

REFERENCE BOOKS

1. Robert E. Treybal, "Mass Transfer Operations", McGraw Hill, 1982.
2. Morris and Jackson, "Absorption Towers",Butter Worth's Scientific Publications, 1985.
3. Pring and Osborn Butter Worth,"Cooling Tower Principles and Practice", Heinemann - Hill, 1986.
4. Coulson & Richardson Series, "Chemical Engineering", Volume 6, Pergaman Press, 1983.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH405 PROCESS MODELING AND SIMULATION

Course Description & objectives:
To make the students understand physical systems in chemical engineering and to develop their mathematical models and solutions for these models. The students will also learn to use the commercial process simulators.

Course Outcomes:
1. *Understand the important physical phenomena from the problem statement.*
2. *Develop model equations for the given system.*
3. *Demonstrate the model solving ability for various processes/unit operations.*
4. *Demonstrate the ability to use a process simulation.*

UNIT I - Fundamentals
Mathematical models for chemical engineering systems, fundamentals, introduction to fundamental laws, examples of mathematical models of chemical engineering systems, constant volume CSTRS, two heated tanks.

UNIT II - Examples
Gas phase pressurized CSTR, non-isothermal CSTR, single component vaporizer, batch reactor, reactor with mass transfer, ideal binary distillation column, batch distillation with holdup.

UNIT III - Iterative Methods
Bisection, false position, Newton –Raphson, successive approximation method, comparison of iterative methods.
Solution of Linear Simultaneous Algebraic Equations: Computation of Eigen values and Eigen vectors, Gauss elimination method, Gauss-Jordan and Gauss-Seidel's method.

UNIT IV - Numerical Integration

Trapezoidal and Simpson's rules. Numerical Solution of Differential Equations**:** Euler method, Runge-Kutta fourth order method, Milne predictor corrector method.

Interpolation**:** Lagrange interpolation, forward difference, backward difference and central difference interpolation methods, least square approximation of functions.

UNIT V - Computer Simulation Examples

Gravity flow tank, three CSTRs in series, binary distillation column, batch reactor, Non-isothermal CSTR, VLE dew point, bubble point calculations, countercurrent heat exchanger.

TEXT BOOKS

1. William L. Luyben, "Process Modeling, Simulation and Control for Chemical Engineers", 2nd ed., McGraw - Hill International, 1990.
2. Santosh.K. Gupta, "Numerical Methods in Engineering", 2nd ed., New Age International (P) Ltd., 2003.

REFERENCE BOOK

1. K.Balu and K.Padmanabhan, "Modeling and Analysis of Chemical Engineering Processes", IK International Private Limited, 2007.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH407 INDUSTRIAL POLLUTION CONTROL ENGINEERING

Course Description & Objectives:

This course is designed to learn a variety of chemical, physical, biological treatment processes related to industrial pollution control. This course is to make pollution profiles of the industries, categorization, control methodologies and technologies, system design, ethic concepts and solving of the engineering problems on industrial systems.

***Course Outcomes**:*

1. *Understanding of air/water pollution regulations and their scientific basis.*
2. *Apply knowledge for the protection and improvement of the environment.*
3. *Ability to monitor and design the air and water pollution control systems.*
4. *Ability to select and use suitable waste treatment technique.*

UNIT I

Types of emissions from chemical industries and effects of environment, environment legislation, Type of pollution, sources of wastewater, Effluent guidelines and standards,

UNIT II

Characterization of effluent streams, oxygen demands and their determination (BOD, COD, and TOC), Oxygen sag curve, BOD curve mathematical, controlling of BOD curve, self purification of running streams, sources and characteristics of pollutants in fertilizer, paper and pulp industry.

UNIT III

General methods of control and removal of sulfur dioxide, oxides of nitrogen and organic vapors from gaseous effluent, treatment of liquid and gaseous effluent in fertilizer industry.

UNIT IV

Air pollution sampling and measurement: Types of pollutant and sampling and measurement, ambient air sampling: collection of gaseous air pollutants, collection of particulate air pollutants. Stack sampling: sampling system, particulate sampling, and gaseous sampling. Analysis of air pollutants: Sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and Ozone, hydrocarbons, particulate matter.

UNIT V

Air pollution control methods and equipments: Source collection methods: raw material changes, process changes, and equipment modification. Cleaning of gaseous equipments particulate emission control: collection efficiency, control equipment like gravitational settling chambers, Cyclone separators, fabric filters, scrubbers, packed beds and plate columns, venturi scrubbers, their design aspects. Control of gaseous emissions: absorption by liquids, absorption equipments, adsorption by solids.

TEXT BOOKS

1. Environmental pollution and control engineering, Rao C. S. - Wiley Eastern Limited, India, 1993.
2. Pollution control in process industries by S.P. Mahajan TMH.,1985.

REFERENCE BOOKS

1. Waste water treatment by M.Narayana Rao and A.K.Datta,Oxford and IHB publ. New Delhi.
2. Air pollution control by P.Prathap mouli and N.Venkata subbayya. Divya Jyothi Prakashan, Jodhpur.
3. “Industrial Pollution Control and Engineering.” Swamy AVN, Galgotia publications, 2005, Hyderabad

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH409 TRANSPORT PHENOMENA

Course Description & Objectives:

The course deals about various transport processes like Momentum Transfer, Heat Transfer and Mass Transfer. It includes the dynamics of fluid behavior and their turbulence nature.

Course Outcomes:

Students have an understanding and appreciation for the implications of the science of transport phenomena on society as a whole, and recognize connections between transport phenomena and other areas of study.

UNIT I - Transport Properties

Introduction: Transport Properties, Estimation of transport properties, pressure, Temperature, Concentration dependence, Newton’s Law of viscosity.

UNIT II - Momentum Balance

Boundary conditions, Flow problems flat plate, Circular pipe, Annulus, Creeping flow.

UNIT III - Energy Balance

Boundary conditions, Fourier's law of conduction, Composite wall, Extended Fin surface, Viscous heat source, Chemical heat source, Electric heat source.

UNIT IV - Mass Balance

Boundary conditions, diffusion through a stagnant gas film, homogeneous, heterogeneous reactions, falling liquid film, chemical reaction inside a porous catalyst.

UNIT V - Flow Problems

Equation of change for isothermal, Non isothermal systems, use of equation of change to solve flow problems, introduction to turbulent flow.

TEXT BOOK:

1. R.B.Bird, W.E. Stewart, "Transport Phenomena", 1st ed., Mc Graw Hill, 2003.

REFERENCE BOOKS :

1. James. R. Welty, Robert. E. E. Wilson, "Fundamentals of Momentum, Heat and Mass Transfer", 2nd ed., John Wiley & sons, 2002.
2. L. Theodore, "Transport Phenomena", 2nd ed., John Wiley & Sons, 2002.
3. J. Geankoplis, "Transport Processes & Unit Operations", 3rd ed., Prentice Hall of India, 2003.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH411 PETRO CHEMICAL ENGINEERING (ELECTIVE-III)

Course Description & Objectives:

Studying this subject the students will learn about the extraction and production of oil and gas to meet energy needs, as well as refining of crude oil for a wide spectrum of useful products, such as petrochemicals, Chemicals, Plastics.

Course Outcomes:

1. *Introduction with the petroleum refinery worldwide.*
2. *Develop knowledge of different refining processes.*
3. *To find the suitable refining technology for maximizing the gasoline yield.*
4. *Students will be well-veresed with some aspects of Petrochemical Technology in detail.*

UNIT I - Sources of Petroleum

Origin and formation of petroleum, Reserves and deposits of world, Indian Petroleum industry.

UNIT II - Fractionation of Petroleum

Dehydration and desalting of crudes, heating of crude pipe still heaters, Distillation of petroleum, blending of gasoline.

UNIT III - Thermal and Catalytic Processes

Cracking, Catalytic cracking, catalytic reforming, Naphtha cracking, Coking, Hydrogenation processes, Alkylation processes, Isomerisation processes.

UNIT IV - Petrochemical Technology

Chemicals from ethane, Ethylene and acetylene: ethanol, acetaldehyde and acetic acid, Vinyl acetate, butyraldehyde, 2 - Ethyl hexanol and ethylene oxide, Ethylene Glycols, Acrilonitrile, Polyesters, Ethanolamines, ethylene dichloride.

UNIT V - Chemicals Form Butanes, Butenes, Pentanes And Pentenes

Butadiene, butane epoxides and butanolamines, butanol, butyl acetate, methyl ethyl ketone, isoprene, amyl alcohol.

TEXT BOOKS

1. B.K.Bhaskara Rao, "Modern petroleum refining processes" 4th edition, Oxford and IBH Publication, 2002.
2. B.K.Bhaskara Rao, " A Text book on Petrochemicals**"** 2nd edition, Kanna publishers

REFERENCE BOOKS

1. O.P.Gupta, "Fuels, furnaces & Refractories" Kanna publishers.
2. Lahari, Biswas, "Petrochemical Industries".

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH413 PROCESS INTENSIFICATION (ELECTIVE-III)

Course Description & Objectives:

The course discuss about process intensification, Flow patterns and Reactor types and operation It covers the areas like sono chemistry, crystallization and extraction process.

Course Outcomes:

This Is The course to Provide A Practical Working Guide To Understanding And Developing Successful PI Solutions That Deliver Savings And Efficiencies. It Will Appeal To Engineers Working With Leading-Edge Process Technologies And Those Involved Research

UNIT – I Introduction

Definition of process intensification; Benefits and drawbacks; Techniques for PI application – passive and active techniques.

UNIT – II Flow Patterns

Mixing, flow patterns, heat transfer: Scales of mixing; Flow patterns in reactors, Mixing in stirred tanks, Scale up of mixing; Mixing in intensified equipment;

UNIT – III Mixers & Reactors

Heat transfer. High intensity inline reactors: Static mixers; Ejectors; Tee mixers; Impinging jets; Rotor stator mixers; Principles of operation; Applications; Performance envelopes.

UNIT – IV Reactor Types and Operation

Combined chemical reactor heat exchangers and reactor separators. Spinning disc reactors; Rotating packed bed; Oscillatory flow reactor;

UNIT – V Sono Chemistry and Crystallization

Compact heat exchangers Enhanced fields: Sono-chemistry; Microwaves; Electrostatic fields. Intensified separation: Higee; Compact separation; Crystallization and extraction.

TEXT BOOKS

1. Stankiewicz, A. and Moulin, (Eds.), “Engineering: the Chemical Process Plants.
2. Process Intensification”, Marcel Dekker.

REFERENCE BOOKS

1. Process intensification by David Reay, Colin Ramshaw, Adam Harvey.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
3	1	-	4	4

CH415 OPTIMIZATION OF CHEMICAL PROCESSES (ELECTIVE-IV)

Course Description & Objectives:

To study optimization algorithms, provide modeling skills to describe and formulate optimization problems, solve several types of optimization problems arising in process systems engineering.

This course covers organization of problems, basic concepts, single and multivariable optimization, linear programming and optimization of chemical processes.

Course Outcomes:

1. *Identify different types of optimization problems.*
2. *Understanding of different optimization technique.*
3. *Ability to solve various single and multivariable optimization problems.*
4. *Ability to solve problems by using least square analysis.*

UNIT I - Nature and Organization of Optimization Problems

What optimization is all about, Why optimize, scope and hierarchy of optimization, examples of applications of optimization, the essential features of optimization problems, general procedure for solving optimization problems.

Fitting Models to Data**:** Classification of models, how to build a model, fitting functions to empirical data, the method of least squares, factorial experimental designs, fitting a model to data subject to constraints.

UNIT II - Basic Concepts of Optimization

Continuity of functions, unimodal versus multimodel functions. Convex and Concave functions, Convex region, Necessary and sufficient conditions for an extremum of an unconstrained function.

Optimization of Unconstrained Functions One-Dimensional Search: Numerical methods for optimizing a function of one variable, scanning and bracketing procedures, Newton's, Quasi-Newton's and Secant methods of uni-dimensional search, Region elimination methods, polynomial approximation methods.

UNIT III - Unconstrained Multivariable Optimization

Direct methods: Random search, grid search, uni-variate search, simplex method, conjugate search, Powell's methods. Indirect methods- first order: Gradient method, conjugate method. Indirect methods - second order: Newton's method, movement in the search direction, termination, summary of Newton's method, relation between conjugate gradient methods and Quasi-Newton method.

UNIT IV - Linear Programming and Applications

Basic concepts in linear programming, Degenerate LP's – graphical solution, natural occurrence of linear constraints, the simplex method of solving linear programming problems, standard LP form, obtaining a first feasible solution, the revised simplex method, sensitivity analysis, duality in linear programming, the Karmarkar algorithm, LP applications.

UNIT V - Optimization of Unit Operations

Recovery of waste heat, shell & tube heat exchangers, evaporator design, liquid liquid extraction process, optimal design of staged distillation column, Optimal pipe diameter, optimal residence time for maximum yield in an ideal isothermal batch reactor, chemostat, optimization of thermal cracker using liner programming.

TEXT BOOK

1. T.F.Edgar and Himmelblau DM, "Optimization of Chemical Processes", McGraw Hill, 2001.

REFERENCE BOOK

1. Kalyan Moy Deb, "Optimization for Engineering Design", PHI, 2000.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH417 POLYMER TECHNOLOGY (ELECTIVE-IV)

Course Description & Objectives:

Expose the students to the various methods of fabricating commercially useful polymer products of plastics, rubbers (elastomers), fibres such as extrusion, compression molding, injection and blow molding. To provide fundamental knowledge of the polymers and their chemical, physical and mechanical behavior. Emphasis on the processing techniques, along with the production of polymers.

Course Outcome:

The course aims to offer a sound base in the knowledge of various polymers and plastics used in industries, their properties etc.

UNIT I - Introduction and Fundamentals

Definitions and concepts of plastics and polymers, Comer, Co – monomer, Mesomer, Co – polymer, functionality, Visco – elasticity classification of polymers Methods determining molecular weights of polymers: Based on colligative properties, Sedimentation equilibrium method. Gel chromatography. Natural polymers: rubber, shellac, rosin, cellulose, and lignin's, Proteins.

UNIT II - Chemistry of Polymerization

Concepts of addition polymerization condensation polymerization and Co – polymerization, glass transitation temperature of polymers, Degradation of polymers of following types: Mechanical, Hydrolytic thermal, back bone effects.

UNIT III - Methods of Polymerization

Mass, solution, emulsion, suspension Role of following additives for polymers: Initiators, catalyst inhibitors, solvents, fillers, reinforcing agents, stabilizers plasticizers, lubricants, blowing agents, coupling agents, flame retardants photo – degradents.

UNIT IV - Methods of Manufacture, Properties, Uses of Following Addition Compounds

Polyethylene (LDPE & HDPE), Polypropylene, PVC and its copolymers, acetals, PTFE, Condensation compounds: polyester – PMMA, PET, Alkyd, Epoxy resins, Polyurethanes, Silicons, PF, UF, MF resins.

UNIT V - Description of Following Processing Methods

With principles involved and equipment used mixing and compounding, extrusion, calendring, laminating, moulding – compression, transfer, injection and blow moulding.

TEXT BOOKS:

1. Bill Meyer, "Text Book of Polymer Science", 3rd ed., John Wiley and Sons, 1984.
2. J.A Bryson Newness – Butterwarths, "Plastic Materials", London, 1989.

REFERENCE BOOKS :

1. J.H.Briston and C.C.Gosselin, "Introduction to Plastics", Newnes, London, 1968.
2. C.C Winding and G.D.Haitt, "Polymeric Materials", Mc Graw Hill Book,1961.
3. M.S.Bhatnagar, "A Text Book of Polymers", 1st ed., S. Chand and Company, New Delhi, 2007.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

CH419 COLLOIDAL & INTERFACIAL SCIENCE (ELECTIVE-IV)

Course Description & Objectives:

Fundamental principles of colloid and interface science involved in disperse systems, surfactants and their solution properties.

To understand the science and technology of colloids and interfacial phenomena and processes often appeared in high value added products and modern technologies.

Course Outcomes:

Mathematical tools are indispensable to process modeling, analysis, engineering design and research. The objective of the course is to introduce a spectrum of widely used mathematical methods in chemical engineering useful to solve problems commonly encountered.

UNIT I - Basic Concepts of Colloids and Interfaces

Introduction, Examples of Interfacial Phenomena, Solid-Fluid Interfaces, Colloids.

Properties of Colloid Dispersions: Introduction, Sedimentation under Gravity, Sedimentation in a Centrifugal Field, Brownian Motion, Osmotic pressure, Optical properties, Electrical Properties, Rheological Properties of Colloid Dispersions.

UNIT II - Surfactants and their Properties

Introduction, Surfactants and their Properties, Emulsions and Microemulsions, foams.

Surface and Interfacial Tension: Introduction, Surface tension, Interfacial Tension, Contact Angle and Wetting, Shape of the Surfaces and interfaces.

UNIT III - Surface and Interfacial Tension

Measurement of Surface and Interfacial Tension, Measurement of Contact Angle; Intermolecular and Surface Forces: Introduction, Vanderwalls Forces.

Intermolecular and Surface Forces: Electrostatic double layer force, The DLVO theory, Non-DLVO forces.

UNIT IV - Adsorption at Interfaces

Introduction, The Gibbs Dividing surface, Gibbs Adsorption Equation, Langmuir and Frumkin Adsorption Isotherms, Surface Equation of state(EOS), Effect of Salt on Adsorption of Surfactants.

UNIT V - Adsorption at Interfaces

Adsorption Isotherms incorporating the Electrostatic Effects, Calculation of Free energy of Adsorption, Adsorption of inorganic salts at interfaces, Dynamics of Adsorption of Surfactants at the interfaces, Adsorption at Solid-Fluid interfaces.

TEXT BOOKS

1. Pallab Ghosh, “Colloid and Interface Science”, PHI, New Delhi, 2009.
2. R. J. Hunter, “Foundations of Colloid Science”, 2nd ed., Oxford University Press, USA, 2001.

REFERENCE BOOKS

1. Paul C. Hiemenz and Raj Rajagopalan, “Principles of Colloid and Surface Chemistry”, 3rd ed., Revised and Expanded, 1997.
2. A. Adamson, “Physical Chemistry of Sciences”, 6th ed.,1997.
3. G.Barnes, I.Gentle, “Interfacial Science: An Introduction”, Oxford University Press, USA, 2006.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
-	-	3	3	2

CH421 CHEMICAL PROCESS EQUIPMENT DESIGN LAB

Course Description & Objectives:

This course teaches the student about selection and design of chemical process equipments. To learn about the design procedures of process equipment used in chemical process plants.

Course Outcomes:

The course will offer students a broad based understanding of the chemical process equipment design & drawing which is the starting point to establish a new chemical industry.

List of Experiments

1. Drawing of Flow Sheets Symbols
2. Drawing of Instrumentation Symbols
3. Drawing of Instrumentation Diagrams
4. Mechanical Aspects of Chemical equipment design and drawing of double pipe heat exchanger.
5. Mechanical Aspects of Chemical equipment design and drawing of 1-2 shell and tube heat exchanger.
6. Mechanical Aspects of Chemical equipment design and drawing of 2-4 shell and tube heat exchanger.
7. Mechanical Aspects of Chemical equipment design and drawing of Feed forward evaporator.
8. Drawing of distillation column by using Mc - Cabe Thiele method
9. Drawing of distillation column by using Ponchon - Savarit method
10. Design of Adsorption Column
11. Design of Absorption Tower
12. Design of Batch Reactor
13. Design of CSTR.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
-	-	3	3	2

CH423 CHEMICAL PROCESS SIMULATION LAB

Course Description & Objectives:

The course will offer students a broad based understanding of the chemical process equipment design & drawing which is the starting point to establish a new chemical industry.

Course Outcomes:

1. The course provides a sound practical knowledge about chemical process modeling, Simulation.

2. Students will be able to design of various chemical engineering equipments.

3. Students will be able to gaining experience in simulation packages.

List of Experiments

1. Simulation of gravity flow tank system
2. Simulation of three constant holdup CSTRs in series
3. Simulation of three variable holdup CSTRs in series
4. Bubble point calculations
5. Dew point calculations
6. Simulation of double pipe heat exchanger
7. Simulation of interacting two tank liquid level systems
8. Simulation of non – interacting two tank liquid level system
9. Simulation of non isothermal CSTR
10. Simulation of binary distillation column
11. Simulation of isothermal batch reactor
12. Simulation of cone shaped tank

TEXT BOOKS

1. William L. Luyben, “Process Modeling, Simulation and Control for Chemical Engineers”, 2nd ed., McGraw - Hill International, 1990.

IV Year B.Tech. Chemical Engg. I - Semester

L	T	P	To	C
-	-	3	3	2

CH449 INDUSTRIAL POLLUTION CONTROL ENGINEERING LAB

Course Description & Objectives:

To determine the oxygen levels, Biological oxygen demand, chemical oxygen demand in municipal ground sewage and industrial effluent waters.

To determine the dissolved suspended solids fixed and volatile solids in the give sample of water.

To determine the optimum amount of coagulant and alums required for municipal sewage and industrial affluent water.

Course Outcomes:

The course will enable students to interpret the process of Industrial pollution control through consideration of appropriate experiments, to gain enough knowledge to handle equipments besides kindling their interest towards carrying out R & D activities.

List of Experiments

1. Water Analysis
2. Neutralization of acids by titration
3. Neutralization of bases by titration
4. Absorption of color
5. Adsorption of phenol
6. Adsorption of gaseous pollutants
7. Toxic metal analysis
8. Filtration of suspended solids
9. Flocculation
10. Settling, particulate matter collection

IV Year B.Tech. Chemical Engg. II- Semester

L	T	P	To	C
4	0	-	4	4

CH402 TECHNOLOGY OF PHARMACEUTICALS AND FINE CHEMICALS (ELECTIVE-V)

Course Description & Objectives:

This course focuses on preparation, properties, manufacturing and testing of various Pharmaceuticals and fine chemicals

Course Outcomes:

The student will be able to

1. *Explore the design, development, manufacture, and evaluation of traditional and novel drug delivery systems*
2. *Emphasize practical solutions and applications to theoretical and research-based problems.*
3. *Know the manufacturing and testing procedures of various pharmaceuticals and fine chemicals.*
4. *Acquire knowledge in tablet making, coating and sterilization.*

UNIT I - Introduction to Pharmaceuticals

A brief outline of grades of chemicals, sources of impurities in chemicals, principles (without going into details of individual chemicals) of limit test for arsenic, lead, iron, chloride and sulfate in Pharmaceuticals. Outlines of Preparation, properties, uses and testing of the following Pharmaceuticals - sulfacetamide, paracetamol, riboflavin, nicotinamide.

UNIT II - Preparation & Properties

Outlines of Preparation, properties, uses and testing of the following fine chemicals - Methyl orange, fluorescence, procaine hydrochloride, paramino salicylic acid, isonicatinic acid hydrazide. Manufacture with flowsheets, properties uses and testing of the following Pharmaceuticals – aspirin, penicillin, calcium gluconate,

UNIT III - Manufacturing & Testing

Manufacturing procedures with flowsheets, properties, uses and testing of the following - ferric ammonium citrate, pthallic anhydride and phenol flourobenzene process and benzene sulfate process, other processes in outline only.

UNIT IV-Tablet Making and Coating

Tablet making and coating, granulation equipments, Preparation of capsules, extraction of crude drugs.

UNIT V - Sterilization

Sterilization: introduction, risk factor, methods of sterilization, heat (dry and moist), heating with bactericide, filtration, gaseous sterilization and radiation sterilization, suitable example to be discussed.

TEXT BOOKS:

1. Remington's, "Pharmaceutical Science", 13th ed., Mac Publishing Company,1965.
2. Blently and Driver, "Text Book of Pharmaceutical Chemistry" 8th ed., Oxford University Press, London, 1960.

REFERENCE BOOKS :

1. H A Rawlins, B Tindell and Box Blently's,"Text Book of Pharmaceutical Chemistry", 8th ed., OU Press, London, 1977.
2. Faith, Kayes and Clark, "Industrial Chemicals", John Wiley & Sons, 3rd ed., 1965.

IV Year B.Tech. Chemical Engg. II- Semester

L	T	P	To	C
4	0	-	4	4

CH404 MINERAL PROCESS ENGINEERING (ELECTIVE-V)

Course Description & Objectives:

To provide a possibility to understand mineral processes for ores, industrial minerals, recycling products and mineral fuels (coal and peat).

Course Outcomes:

1. *Analyze and interpret raw field data in order to design structures in fractured rock masses using various methods (mapping surface and underground exposures; drilling, i.e. manual core logging and geophysical logging, etc.).*
2. *Design basic surface and underground structures in rock for mining and heavy civil applications (i.e. slope, underground openings, tunnels, stopes, shafts, etc).*
3. *Assess the life cycle of a mineral project from exploration to decommissioning and final closure.*
4. *Apply basic understanding of soil mechanics in order to discern whether a design problem requires more comprehensive understanding.*
5. *Determine the economic feasibility of a rock engineering design.*
6. *Determine environmental factors that impact on a rock engineering design.*
7. *Assess social, cultural, political and legal impact of a rock engineering design.*

UNIT I - Characterization & Properties of the important minerals

Names, compositions and properties of the important minerals of common metals like iron, copper, lead, zinc, tin, chromium, aluminum, manganese, gold, silver, uranium, thorium, titanium, zirconium etc.

UNIT II - Cut off, average and concentrate grades of each ore

Similar information about industrial minerals like calcite, silimanite, phosphate, granite, dolomite, magnesite, Ilmenite, rutile, zircon, garnet, monazite, pyrite, quartz, feldspar etc.

UNIT III -Beneficiation circuits for hematite and magnetite iron ores

Dry and wet processes – their scopes and limitations. Pulp densities at different stages of wet operations. Estimation of water requirements and pumping loads.

UNIT IV - Beneficiation circuits for lead, zinc and copper ores

Optimization of the grinding process for liberation of the minerals and minimization of slime loss. Scope and limitations of regrinding circuits.

UNIT V - Concentration, concentrate up gradation and separation processes for beach sand minerals

Effects of repeated cleaner operations on grades and recoveries. Overview of the beneficiation circuits of ores of gold, tin, manganese and other metals Overview of the beneficiation of lime stone, graphite and other industrial minerals

TEXT BOOKS

1. A.F.Taggart " Elements of Mineral Dressing" John Wiley and Sons, 1956.
2. Barty A. Wills and Tim Napier Munn "Mineral Processing Technology" Elsevier Publishers, 2006.

REFERENCE BOOKS

1. A.F.Taggart "Handbook of Mineral Dressing " John Wiley and Sons, New York. 1956.
2. A.Gupta and D.S.Yan," Mineral Processing Design and Operation" Elsevier 2006.
3. T.Simon "Ore Dressing Principles and Practice" McGraw Hill Co., 1924.
4. S.J.Truscott , "Ore Dressing" ,London Macmillan. 1923.
6. Handbook of Ore Dressing by A.W.Allen – McGraw Hill Co., 1920.
7. Complete Technology Book on Mineral Processing by NPSC Board – Asia Pacific Business Press 2008.

IV Year B.Tech. Chemical Engg. II- Semester

L	T	P	To	C
4	0	-	4	4

CH 406 FOOD PROCESSING TECHNOLOGY (ELECTIVE-V)

Course Description & Objectives:

To impart knowledge to the students about food processing and various unit operations involved in it, packaging, storing and preservation, food poisoning, food related hazards and safety, and transportation.

Course Outcomes:

1. *Outline the process of red and white meat slaughter, explain meat structure and inspect meat quality parameters*
2. *Process manufactured meat products to produce variety of animal food products.*
3. *Identify the areas of concern in the processing of meat products, in relation to process control, undesirable microbes and export*
4. *Explain the requirements for meat export and chemical and physiological structure of meat.*
5. *Demonstrate processing techniques used to produce a variety of milk products.*

UNIT I - Fundamentals of Food Process Engineering

Application of Quantitative methods of Material & Energy Balances in Food Engineering Practices. Constituents of Food, Quality and Nutritive aspects, Food Adulterations, Deteriorative factors and Control

UNIT II - Fluid Flow, Thermal Process Calculations

Refrigeration, Evaporation and Dehydration operations in Food Processing

UNIT III - Fundamentals of Food Canning Technology

Heat Sterilization of Canned food , Containers – metal, Glass and Flexible packaging . Canning Procedures for Fruits, Vegetables, Meat, Poultry, marine Products.

UNIT IV - Food Preservation

Preservation by Heat and Cold, Dehydration, Concentration, Drying, Irradiation, Microwave heating, Sterilization and Pasteurization, Fermentation and Pickling, Packaging Methods.

UNIT V- Food Products

Cereal Grains, Pulses, Vegetables, Fruits, Spices, Fats and Oils, Bakery, Confectionary and Chocolate Products, Soft and Alcoholic Beverages, Dairy Products , Meat , Poultry and Fish Products.

TEXT BOOKS

1. Norman N.Potler Joseph .H. Hotchk'ss, " Food Science" 5th Edition, CBS Publishers & Distributors India, 1987.
2. Owen .R.Fennema, "Principles of Food Science Part I & II", Marcel Dekker Inc New York, 1976.

REFERENCE BOOKS

1. Heid, J.L., Joslyn M.A, Fundamentals of Food Processing Operation, 3rd Edition, The AVI Publishing Co., Westport,1967.
2. Heldman, D.R., Food Process Engineering, 2nd Edition, The AVI Publishing Co.,1965

IV Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH 408 NANO TECHNOLOGY (ELECTIVE-VI)

Course Description & Objectives:

The course deals about various types of nano materials and their importance. It includes the study of Nanotechnology,nano science, nano products,etc.

Course Outcomes:

1. *Understand and apply basic concepts of nanotechnology and nanoscience.*

2. *Understand the different nano-materials along with their characterization.*
3. *Understand the applications of nanomaterials in Chemical Engineering*

UNIT I - Supramolecular Chemistry

Definition and examples of the main intermolecular forces used in supramolecular chemistry. Self-assembly processes in organic systems. Main supramolecular structures.

UNIT II - Physical Chemistry of Nanomaterials.

Students will be exposed to the very basics of nanomaterials; A series of nanomaterials that exhibit unique properties will be introduced.

UNIT III - Methods of Synthesis of Nanometerials.

Equipment and processes needed to fabricate nanodevices and structures such as bio-chips, power devices, and opto-electronic structures. Bottom-up (building from molecular level) and top-down (breakdown of microcrystalline materials) approaches.

UNIT IV - Biologically-Inspired Nanotechnology

Basic biological concepts and principles that may lead to the development of technologies for nanoengineering systems. molecular nanoscale engineered devices, nanoscale biotechnologies, nano products.

UNIT V - Instrumentation for Nanoscale Characterization

Instrumentation SEM, TEM, XRD, FTIR for characterization of properties .Llimits of each technique.

TEXT BOOKS

1. Jean-Marie Lehn. Supramolecular Chemistry, 1st Edition, Wiley Publications, 1995.
2. Novailhat, Alain, Introduction to Nano technology, 2nd Edition, Wiley Publications, 2007.

REFERENCE BOOKS

1. Hovnyax G., Moore J., Tibbals J., Fundamental of Nanotechnology, 1st Edition, CRC Press.

IV Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH410 COMPUTER APPLICATIONS IN CHEMICAL ENGINEERING (ELECTIVE – VI)

Course Outcomes:

1. *Understanding of fundamental mathematics and to solve problems of algebraic and differential equations, simultaneous equation, partial differential equations*
2. *Ability to convert problem solving strategies to procedural algorithms and to write program structures*
3. *Ability to solve engineering problems using computational techniques*
4. *Ability to assess reasonableness of solutions, and elect appropriate levels of solution sophistication*

UNIT I - Introduction

Review on programming languages, basic, FORTRAN, Review on operation system Commands, Numerical solution of first order differential equations with initial conditions, Euler's Method, Runge kutta method.

UNIT II - Spread Sheets

Application in density, molecular weight, mole and percentage compositions, empirical and molecular formula calculations, heat of mixing, gas laws, vapor pressure, chemical kinetics calculations.

UNIT III - Spread Sheets (Data Analysis)

Application in data processing, statistical analysis of data, regression analysis of variance, interpolations, graphical representations, design and development of single data bases on chemical and physical properties of substances.

UNIT IV - Numerical Methods

Roots of algebraic and transcendental equations, iterations methods, regulafalsi method, Newton – raphson method, roots of simultaneous and solution set of transcendental and algebraic equations, development of equations for heat transfer, fluid mechanics and reaction Engineering problems.

UNIT V - Mathematical Programming

Linear programming, transportation, assignment, dynamic programming in chemical engineering, formulation and solution through PC based programmes.

TEXT BOOKS:

1. Leon Lapidas, "Digital Computation for Chemical Engineering", 2nd ed., MGH, 1962.
2. Jerry, O. Breneman GL., "Spread Sheet Chemistry", PH, Englewood Cliffs,1991.

REFERENCE BOOKS:

1. Hanna OT Scandell O.C, "Computational Methods in Chemical Engineering", PH, 1995.
2. Taxali R. K. T. K, " D Base IV Made Simple", 1st ed.,TMH, 1991.

IV Year B.Tech. Chemical Engg. II - Semester

L	T	P	To	C
4	0	-	4	4

CH 412 FLUIDIZATION ENGINEERING (ELECTIVE – VI)

***Course Description & Objectives**:*

Studying this subject the students will learn about the extraction and production of oil and gas to meet energy needs, as well as refining of crude oil for a wide spectrum of useful products, such as petrochemicals, Chemicals, Plastics.

Course Outcomes:

1. *Ability to estimate pressure drop, bubble size, TDH, voidage, heat and mass transfer rates for the fluidized beds*
2. *Ability to write model equations for fluidized beds*
3. *Ability to design gas-solid fluidized bed reactors*

UNIT I - Phenomenon of fluidization

Fluidization regimes; Types of fluidization operations; Typical industrial applications of fluidized beds. Gross behaviour of fluidized beds.

UNIT II - Minimum fluidization velocity

Distributor and bubble formation; Bed voidage; Transport disengaging height (TDH); Bulk viscosity, fluidity and power consumption. Bubble behaviour and models of bubbling beds.

UNIT III - Flow Pattern

Gas and solid in fluidized bed and freeboard region. Heat and mass transfer in fluidized bed. Entrainment and elutriation from fluidizeded.

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UNIT IV - Residence time distribution and size distribution of solids in fluidized bed. Circulating fluidized bed; Pneumatic transport of solids.

UNIT V - Design

Fluidized bed for physical operations, catalytic reactions and non-catalytic reactions.

TEXT BOOKS

1. Kunii, D. and Levenspiel, O., “Fluidization Engineering”, John Wiley & Sons, Inc.
2. Leva, M., “Fluidization”, McGraw-Hill Book Co.
3. Davidson, J.F. and Harrison, D., “Fluidized Particle”, Cambridge University Press.

TEXT BOOKS

1. William L. Luyben, “Process Modeling, Simulation and Control for Chemical Engineers”, 2nd ed., McGraw - Hill International, 1990.

I
YEAR

CIVIL ENGINEERING

B.Tech.

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16CS202 - Data Structures
- 16ME103 - Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L- 9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L- 9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.
11. Solving first order O.D.E.
12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fiber which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

- ✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*
- ✓ *Study the wavelengths of light sources and lasers.*
- ✓ *Estimate the efficiency of a given solar cell.*
- ✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*
- ✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non-linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to:

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**
  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory Practice : Introduction to phonetics
  (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role - Plays
  (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs
- Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions (from Energy Unit)
  Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**
  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 *"Mindscapes* - English for Technologists and Engineers", Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, "Strengthen Your Writing", 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, "The Most Common Mistakes in English Usage", 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. "Spoken English: A Self-Learning Guide to Conversation Practice", 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, "Examine Your English", 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to:

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools.
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, “Introduction to Computers”, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

✓ *Identify suitable data types for an application.*

✓ *Apply control statements for decision making problems.*

✓ *Use multidimension array for matrix application.*

✓ *Design a program to calculate average of a class.*

✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L- 10, T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L- 9, T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L- 9, T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L- 9, T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L- 8, T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

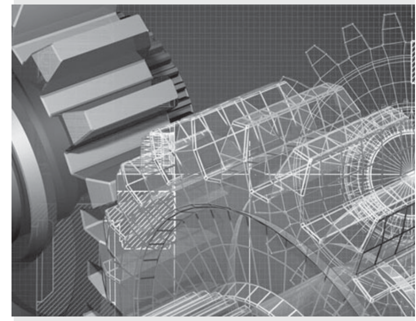
TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1^{st} edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2^{nd} edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4^{th} edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4^{th} edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a Lighting scheme for specific working environment.*

✓ *Design a composition of Heating element for a particular application.*

✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

✓ *Provide an earthing for Domestic Outlet.*

✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L- 9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L- 10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks, Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, "Electrical engineering - Electrical machines and Appliances Theory, 1st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, "Electrical engineering - Electrical machines and Appliances Theory", 1st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, "How Stuff Works", 1st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, "Basic Mechanical Engineering", 1st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to:

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*

✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*

✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

Listening – Following long conversations / Interviews

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

PRACTICE: Objective PET Units 25 – 30

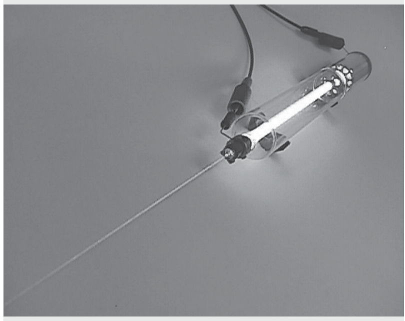
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, "Introduction to PET", Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course Description and Objectives:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

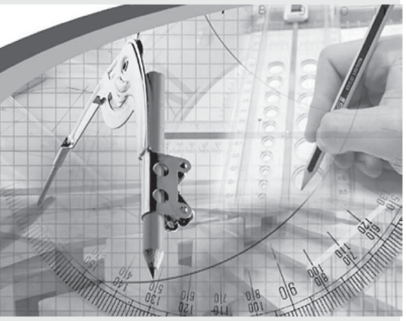
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments, field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- carry out the basic operations of matrix algebra.
- use row operations to reduce a matrix to echelon form, normal form.
- determine consistency of a system linear equations.
- compute eigen values and eigen vectors.
- evaluate double integrals and triple integrals.
- evaluate double integrals in polar coordinates.
- utilize Cartesian and polar coordinates to find area.
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals.

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L- 9, T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L- 9, T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L- 9, T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L- 9, T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L- 9, T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

- ✓ *Analyse the total hardness of water sample.*
- ✓ *Understand the basic principles involved in various batteries.*
- ✓ *Understand the mechanisms of corrosion and various controlling methods.*
- ✓ *Synthesize various polymers.*
- ✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.

2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.

2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.

3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.

4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to:

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*

✓ *Draw geometrical objects like polygons, solids of different types.*

✓ *Visualize the objects in real time situations.*

✓ *Develop 3D views (isometric views).*

UNIT - 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT - 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT - 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT - 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT - 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

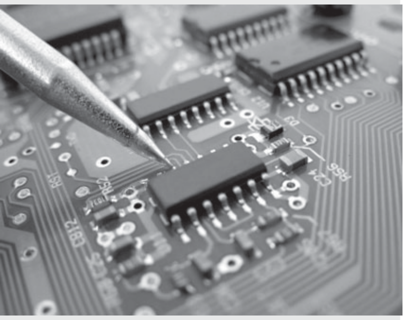
1. N.D.Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal , C.M.Agrawal "Engineering Drawing" , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC, AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT - 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT - 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT - 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT - 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT - 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, "Basic Electrical and Electronics Engineering", 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, "Integrated Electronics", McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, "Electrical Technology", Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, "Basic Electrical Engineering", 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about
   Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to:

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to:

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*

✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*

✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*

✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*

✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES: Environmental studies - Definition scope and its importance, Need for public awareness; Natural resources - Forest resources, Deforestation, Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources, Land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY: Ecosystem - Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems; Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forest community, Bio-villages; Green technology for sustainable development; Life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental protection act; Environmental Impact Asssssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation - Food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions; Role of youth in the development, Promoting activities, Youth as initiators, Field work/environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment, Common plants, Insects, Birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/ water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik and CP Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016
2. Benny Joseph, “Environmental studies”, 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008.
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

16ME102 ENGINEERING MECHANICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	-	5	-	5

Course Description and Objectives:

Engineering Mechanics applies principles of mechanics to solve common engineering problems. The goal of this course is to expose students to problems in mechanics as applied to real-world scenarios.

The course uses the Laws of Mechanics to predict forces in machines and structures. This course is prerequisite for courses like Mechanics of Machines, Stress Analysis, Design of Mechanical Systems and others.

Course Outcomes:

The student will be able to:

- use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- apply basic knowledge of mathematics and physics to solve real-world problems such as dams, bridges, fly overs, buildings, large structures etc.,

SKILLS:

✓ Solving classical mechanics problems involving system of forces

✓ In-depth understanding of rigid bodies.

✓ Applying principles of centre of gravity and moment of inertia

UNIT-1 **L-10, T-3**

GENERAL PRINCIPLES: Introduction to engineering mechanics; idealization in mechanic's basic concepts; vectors and scalar quantity; laws of mechanics.

Force system and resultant: Concept of force; representation of force; system of forces; resolution of forces using rectangular components.

Moments and couples: Introduction; moment of force; varignon's theorem; resultant of parallel forces; couple and moment of couple; characteristic of couple.

UNIT -2 **L-8, T-3**

EQUILIBRIUM OF BODIES: Conditions of equilibrium for a coplanar force system and coplanar non parallel non concurrent force system; principle of equilibrium (two ; three ; force principle) ; Lami's theorem

Truss: Introduction; classification of truss; fundamental of truss; analysis of truss (method of joints and method of section)

UNIT-3 **L-10, T-3**

FRICTION: Introduction ; classification of friction ; coefficient of friction ; laws of friction ; angle of friction ; angle of repose ; cone of friction ; ladder friction ; wedge friction

UNIT-4 **L-10, T-3**

CENTROID: Introduction; centroid of lines; centroid of surfaces; determine of centroid of simple figures; centroid of composite figures; centroid of a parabolic spandrel

Center of Gravity: Introduction; center of gravity; location of center of gravity - right circular cone and solid hemisphere; center of mass; theorem of Pappus.

UNIT-5 **L-10, T-3**

MOMENT OF INERTIA: Moment of inertia of plane areas ; polar moment of an area ; radius of gyration of area; parallel axis theorem ;perpendicular axis theorem; moment of inertia of composite areas. Mass moment of inertia; introduction; radius of gyration of mass; mass moment of inertia of rod; rectangular plate ; right circular cylinder ; circular ring ; circular plate.

TEXTBOOKS:

1. A K Dhiman, P Dhiman. And D. C Kulshreshtha, "Engineering Mechanics: Statics and Dynamics", Mc Graw Hill ,2015
2. Basudeb Bhattacharyya, "Engineering Mechanics", 2nd Edition, Oxford University Press 2014.

REFERENCE BOOKS:

1. N H Dubey" Engineering Mechanics : statics and dynamics",1st Edition, Mc Graw Hill,2015.
2. S SBhavikatti, "Engineering Mechanics", 1st edition, New age International, reprint 2015.
3. J. L. Meriam, L. G. Kraige, "Engineering Mechanics: Statics", 8th Edition d., John Wiley and sons, 2015.

URL:

1. https://www.youtube.com/user/mySeriesEM
2. https://www.youtube.com/channel/UCSeYfmhG5Z25uvm9C7gdrWw
3. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-engineering-mechanics-i-fall-2007/index.htm

ACTIVITIES:

- *Analysis of forces acting on a structure*
- *Model preparation of simple bridges*
- *Compare different types of frictions acting on the body*
- *Locate centre of gravity and moment of intertia of plain figures*
- *Determine mass moment of intertia of simple solid bodies.*

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	20	-	-

Course Description and Objectives :

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes :

The student will be able to:

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

✓ *Prepare wooden and metal furniture.*

✓ *Electrical wiring and power supply in residences.*

✓ *Make funnels, trays, locker, steel almirahs etc.*

✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*

✓ *CNC machines and various machining operations and processes.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin smithy and Black smithy.
4. House wiring.
5. Foundry and welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS:

1. S.K. Hazra Choudhury, “Elements of workshop Technology”, 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., “A first course on workshop practice: Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S, “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai, 1999.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

II

YEAR

CIVIL ENGINEERING

B.Tech.

I SEMESTER

- 16HS202 - Probability and Statistics
- 16CE201 - Building Materials and Concrete Technology
- 16CE202 - Fluid Mechanics
- 16CE203 - Solid Mechanics
- 16CE204 - Surveying - I
- 16CE205 - Material Testing Laboratory
- 16HS301 - Professional Ethics
- \- Employability and Life Skills

II SEMESTER

- 16CE206 - Building Construction and Planning
- 16CE207 - Environmental Engineering - I
- 16CE208 - Hydraulics and Hydraulic Machines
- 16CE209 - Structural Analysis - I
- 16CE210 - Surveying - II
- 16EL102 - Soft Skills Laboratory
- \- Department Elective
- \- Other Elective
- \- Employability and Life Skills

COURSE CONTENTS

I SEM & II SEM

16HS202 PROBABILITY AND STATISTICS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

CS	WA/RA	SSH	SA	S	BS
-	10	45	-	-	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation, regression, and their applications, probability, theoritical distributions and testing of hypothesis. The objective of this course is to enable the student to understand and apply statistical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L-12**

DESCRIPTIVE STATISTICS: Basic Definitions, Frequencies, Graphical Representation, Histogram, Ogive curves, Measures of Central tendency, Arithmetic mean, Median, Mode, mean deviation, standard deviation, Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT - 2 **L-12**

CURVE FITTING, CORRELATION AND REGRESSION: Least squares method, curve fitting (straight line and parabola only), Covariance, Correlation, Types, Pearson's Coefficient of correlation, Rank correlation, Spearman's rank correlation.Regression, Regression lines.

UNIT - 3 **L-12**

PROBABILITY: Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L-12**

DISTRIBUTIONS: Random variables, Discrete and Continuous variables, Introduction to Distributions.

BINOMIAL DISTRIBUTION: Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION: Definition, Mean and Standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION: Definition, Normal curve, Mean and Standard deviation, Median, Mode, Normal Distribution applications.

UNIT - 5 **L-12**

TESTING OF HYPOTHESIS: Population and sampling, Parameters and Statistics, Types of sampling, Test of hypothesis and test of significance, Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion, t-distribution for small sample, difference between means of small sample, Chi square test for goodness of fit, Chi-square test for test of independence.

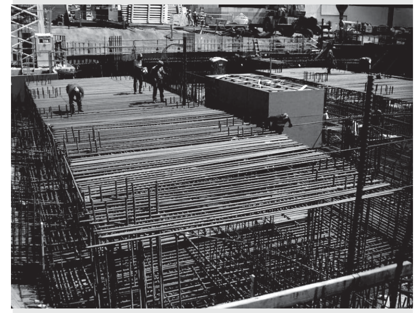
TEXT BOOKS:

1. Miller and Freund, "Probability and Statistics for engineers", 8th edition, Pearson publishers, 2013.
2. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", S. Chand and Co., Third revised edition, 2014.

REFERENCE BOOK:

1. S. C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Co., New Delhi, 2005.

16CE201 BUILDING MATERIALS AND CONCRETE TECHNOLOGY



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	20	48	6	12	3	5

Course Description and Objectives:

This course provides an understanding of various engineering properties of building materials like stones, bricks, lime, timber, steel and paints. The objective of this course is to provide basic knowledge about properties and testing of various building materials used in civil constructions.

Course Outcomes:

The student will be able to:

- understand the properties of all construction materials including bricks, lime, timber etc.
- understand the properties of ingredients of concrete.
- analyse behavior of concrete in its fresh and hardened state.
- analyse concrete design mix.

SKILLS:

✓ *Identify different composition of building materials*

✓ *Make concrete mix proportions for different grades*

✓ *Test concrete cube to calculate characteristic compressive strength.*

✓ *Test fresh concrete to understand creep and shrinkage.*

✓ *Analyse engineering properties of special concretes such as green concrete, light weight concrete, fiber reinforced concrete etc.*

ACTIVITIES:

- *Calculate the water cement ratio of a concrete for a specified grade.*
- *Prepare different grades of concrete.*
- *Test concrete cube of M20 and M30 grade and find out their characteristic compressive strength using UTM.*
- *Prepare special concrete mixes like green concrete, pervious concrete and test their engineering properties.*
- *Calculate the strength of concrete at age of 7days and 28 days of curing.*

UNIT - 1 **L-9, T-3**

BUILDING MATERIALS:

STONES: Qualities of a good building stones, Common building stones of India.

BRICKS: General, Composition of good brick earth, Harmful ingredients in brick earth, Manufacturing of bricks by clamp burning and kiln (Hoffman's kiln only) burning, Qualities of good bricks, Tests for bricks, Classification of bricks, Size and weight of bricks.

LIME: General, Definitions, Sources of lime, Constituents of limestones, Classification of limes, Properties of fat lime and hydraulic lime, Manufacture of lime.

TIMBER: Definition, Structure of a tree, Qualities of good timber, Decay of timber, Seasoning of timber, Preservation of timber, Advantages of timber construction.

UNIT - 2 **L-9, T-3**

CEMENT AND AGGREGATES: CEMENTS: Portland cement, Chemical composition, Hydration, Setting of cement, Structure of hydrated cement, Tests on physical properties, Different grades of cement.

AGGREGATES: Classification, Source, Size and shape, Texture and influence of texture on strength, Specific gravity of aggregates, Moisture in aggregates, Bulking of fine aggregate, Methods used for determination of moisture content of aggregates, Grading of aggregates, Sieve analysis, Standard grading curve, Grading limits of fine aggregates as per BIS.

UNIT - 3 **L-9, T-3**

FRESH CONCRETE AND ADMIXTURES: Workability, Factors affecting workability, Measurement ofworkability by different tests, Setting times of concrete, Effect of time and temperature on workability, Segregation and bleeding, Mixing and vibration of concrete, Methods of curing, Quality of mixing water.

ADMIXTURES: General, Plasticizers and super plasticizer, Dosage, Mixing procedure, Equipment, Effect of super plasticizers on the properties of hardened concrete, Retarders, accelerators, Air-entraining admixtures, Factors affecting amount of air-entrainment, Effect of air-entrainment on the properties of concrete, Fly ash, Effect of fly ash on fresh and hardened concrete, High volume fly ash concrete, Silica fume, Available forms, Effect of silica fume on compressive strength of concrete, Construction chemicals for curing, Construction chemicals for water proofing.

HARDENED CONCRETE: General, Water-cement ratio, Gel/space ratio, Gain of strength with age, Maturity concept of concrete, Effect of maximum size of aggregate on strength.

TESTING OF HARDENED CONCRETE: Compression tests, Factors affecting strength, Flexure test, Splitting tests, Non-destructive testing methods, Codal provisions for NDT.

UNIT - 4 **L-9, T-3**

ELASTICITY, CREEP & SHRINKAGE: Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep of concrete, Factors influencing creep, Relation between creep and time, Nature of creep, Effects of creep, Shrinkage, Types of shrinkage.

DURABILITY OF CONCRETE: Factors contributing to cracks in concrete, Sulphate attack and methodsof controlling sulphate attack, Chloride attack, Corrosion of steel and its control.

UNIT - 5 **L-9, T-3**

MIX DESIGN: Factors in the choice of mix proportions, Quality Control of concrete, Statistical methods, Acceptance criteria, proportioning of concrete mixes by various methods, BIS method of mix design.

SPECIAL CONCRETES: Light weight aggregates, Light weight aggregate concrete, Fiber reinforced concrete, Different types of fibers, Factors affecting properties of F.R.C, High performance concrete, Self-Compacting Concrete and High Performance Concrete.

TEXT BOOKS:

1. M. S. Shetty, "Concrete Technology", 1st edition, S.Chand and Co publications, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, 2009.

REFERENCE BOOKS:

1. M. L. Gambhir, "Concrete Technology", 5th edition, Tata McGraw Hill Publishers, New Delhi, 2013.
2. A.R. Santha Kumar, "Concrete Technology", 3rd edition, Oxford University Press, New Delhi, 2009.

16CE202 FLUID MECHANICS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	20	48	6	12	3	5

Course Description and objectives:

This course deals with the basic concepts of fluid flow, basic equations of continuity, energy and momentum. In addition, the course offers knowledge on various flow measuring devices. The objective of this course is to provide knowledge on basic properties of fluid in static and kinematic state and study of laminar and turbulent flow through pipes.

Course Outcomes:

The student will be able to:

- gain insights into properties of fluids like viscosity, density, specific weight etc,.
- understand basic definitions related to fluids and fluid mechanics.
- measure pressure in fluid-flowing pipes and vessels.
- handle different kinds of pressure measuring instruments.
- apply continuity equation and energy equations in flow measurements.

SKILLS:

✓ *Differentiate between Newtonian and Non Newtonian fluids*

✓ *Determine fluid pressure using different types of gauges*

✓ *Determine hydrostatic forces on a body immersed in a fluid*

✓ *Use flow measuring devices like pitot tube*

ACTIVITIES:

- *Measure weight and volume to calculate specific weight, mass density and specific gravity of various fluids like water, petrol, oil etc.*
- *Measure pressure at different points of a tank containing two or three immiscible liquids using a simple manometer.*
- *Prepare a model of hydraulic lift to demonstrate the concept of Pascal's law.*
- *Measure the depth of immersion of a floating object using the buoyancy principle.*

UNIT - 1 **L-9**

FLUIDS: Definition, Ideal fluids, Real fluids, Newtonian and non-Newtonian fluids.

PROPERTIES OF FLUIDS: Units of measurement, Mass density, Specific weight, Specific volume, Specific gravity, Viscosity, Surface tension and Capillarity, Compressibility and Elasticity.

MEASUREMENT OF PRESSURE: Pressure at a point in a static fluid, Pressure variation in an incompressible static fluid, Atmospheric pressure, Gauge pressure, Vacuum pressure, Absolute pressure, Manometers, Bourdon pressure gauge.

UNIT - 2 **L-9**

HYDROSTATIC FORCES: Forces acting on immersed plane surfaces, Center of pressure, Forces on curved surfaces.

BUOYANCY: Conditions of equilibrium for floating bodies, Meta-center and meta-centric height, Experimental and analytical determination of meta-centric height.

UNIT - 3 **L-9**

FLUID KINEMATICS: Types of Flows, Steady and unsteady flows, Uniform and non-uniform flows, Stream lines, path lines, Stream tubes, Principles of conservation of mass, Equation of continuity, Acceleration of fluid particles, local and convective, Rotational and irrotational motions, Free and forced vortex, Velocity potential and stream function, Flow net.

FLUID DYNAMICS: Euler's equations of motion and integration of Euler's equations, Bernoulli's equation for incompressible fluids.

UNIT - 4 **L-9**

FLOW MEASURING DEVICES: Pitot tube, Venturimeter, Orifice meter, Orifices and mouth pieces, Time of emptying of tanks by orifices, Sharp edged rectangular, Triangular and trapezoidal notches, Francis formula, Velocity of approach, End contractions, Cippoletti Weir.

MOMENTUM EQUATION AND ITS APPLICATION: Development of momentum equation by control volume concept, Momentum correction factor, Applications, Forces on pipe bend.

UNIT - 5 **L-9**

ANALYSIS OF PIPE FLOW: Darcy's equation, Minor losses, Pipes in series, Pipes in parallel, Total energy line and hydraulic gradient line, Hydraulic power transmission through a pipe, Siphon, Water hammer.

LAMINAR FLOW: Reynolds experiment, Characteristics of laminar flow, Steady laminar flow through a circular pipe (Hazen poiseuilles equation).

TURBULENT FLOW IN PIPES: Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, Friction factor for pipe flow, Variation of friction factor with Reynolds number, Moody's chart.

LABORATORY EXPERIMENTS

LIST OF EXPERMENTS Total hours: 30

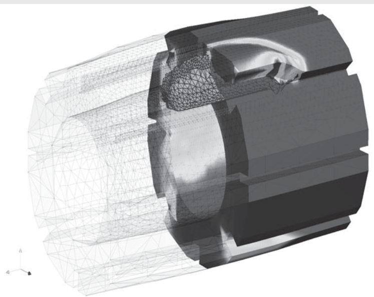
1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Friction factor for a given pipe line.
4. Head loss due to sudden contraction in a pipeline
5. Verification of Bernoulli's equation
6. Coefficient of discharge of Mouthpiece
7. Coefficient of discharge of Orifice
8. Discharge by V-Notch
9. Discharge by Rectangular – Notch

TEXT BOOKS:

1. P. N. Modi and S. N. Seth, "Hydraulics and Fluid Mechanics", 20th edition, Standard book house, New Delhi, 2013.
2. R. K. Bansal, "Fluid Mechanics and Hydraulic Machines", 9th edition, Laxmi Publications, New Delhi, 2005.

REFERENCE BOOKS:

1. V. L. Streeter and E.B. Wyile, "Fluid Mechanics", 9th edition, McGraw-hill Publications, 2011.
2. S. K. Som and G. Biswas, "Fluid Mechanics", 2nd edition, Tata Mc Graw Hill, 2008.
3. John F. Douglas, Janusz M. Gasiorek and John A. Swaffield, "Fluid Mechanics", 5th edition, Pearson Education Publishers, 2005



16CE203 SOLID MECHANICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	20	46	6	12	3	5

Course Description and Objectives:

The course deals with various engineering properties of solid materials and calculation of internal stresses and strains produced in the material. The objective of this course is to determine shear force and bending moment in beams and columns and also to impart students the knowledge to understand the behavior of metal rods, cables and thin cylinders under the action of applied loads.

Course Outcomes:

The student will be able to:

- calculate internal stresses and strains to know mechanical behavior of solid material under the externally applied loads and forces.
- find out of shear forces and bending moments of structural components like beams, columns, and slabs, for different load cases.
- calculate the developed internal stresses in beams under flexural actions.
- calculate torsional forces developed in components with circular cross sections.
- analyse thin cylinders filled with fluid at an internal pressure.

SKILLS:

✓ *Determine shear force and bending moment at a given section of a beam.*

✓ *Determine principal stresses and principal strains.*

✓ *Determine shear stress and bending stresses in all types of beams.*

✓ *Calculate biaxial stresses on an inclined plane.*

✓ *Analyse stability of columns by applying* Euler's and Rankine's formula.

UNIT - 1 **L-9, T-3**

SIMPLE STRESSES AND STRAINS: Elasticity and plasticity, Types of stresses and strains, Hook's law, Stress, Strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic moduli and the relationship between them, Bars of varying section, Composite bars, Temperature stresses.

UNIT - 2 **L-9, T-3**

PRINCIPAL STRESSES AND STRAINS: Introduction, Stresses on an inclined section of a bar under axial loading, Compound stresses, Normal and tangential stresses on an inclined plane for biaxial stresses, Two perpendicular normal stresses accompanied by a state of simple shear, Mohr's circle of stresses, Principal stresses and strains, Analytical and graphical solutions. Introduction to Failure Theories.

THIN CYLINDRICAL SHELLS: Introduction, Hoop and Longitudinal stresses and strains, Thin spherical shell stresses.

UNIT - 3 **L-9, T-3**

SHEAR FORCE AND BENDING MOMENT: Definition of beam, Types of beams, Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, Simply supported and overhanging beams subjected to point loads, Uniformly distributed load, Uniformly varying loads and combination of these loads, Point of contra flexure, Relation between S.F, B.M and rate of loading at a section of a beam.

SHEAR STRESSES: Derivation of formula, Shear stress distribution across various beam sections like rectangular, Circular, triangular, I, T, angle sections.

UNIT - 4 **L-9, T-3**

FLEXURAL STRESSES: Theory of simple bending, Assumptions, Derivation of bending equation: M/I = f/y = E/R, Neutral axis, Determination bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.

TORSION: Introduction, Torsion equation, Shear stress distribution for circular solid and hollow shafts, Stepped shafts, Shafts fixed at both the ends.

UNIT - 5 **L-9, T-3**

DIRECT AND BENDING STRESSES: Stresses under the combined action of direct loading and B.M, core of a section, Determination of stresses in the case of dams, Conditions for stability.

COLUMNS AND STRUTS: Introduction-types of columns, Euler's formula, Equivalent length-end conditions, Rankine's formula, Slenderness ratio.

TEXT BOOKS:

1. S. S. Bhavikatti, "Strength of Materials", 3rd edition, Vikas Publishing House, 2008.
2. S. Ramamrutham, "Strength of Materials", 7th edition, DhanpatRai Publishing House, 2011.

REFERENCE BOOKS:

1. L. N. Srinath, "Advanced Mechanics of Solids", 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
2. S. Timshenko, "Strength of Materials", 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.
3. Vazirani and Ratwani, "Analysis of Structures", 17th edition, Khanna Publishers, 2007.
4. Sadhu Singh, "Strength of Materials", 8th edition, Khanna Publishers, 2003.

ACTIVITIES:

- *Analyze stress strain variation in MS bar under tension, draw stress strain curve and find out Young's modulus for the tested specimen.*
- *Draw Mohr's circles for all possible combinations of biaxial stresses on an inclined plane and find out principal stresses .*
- *Calculate all possible forces acting on an simply supported beam in U-Block and draw bending moment and shear force diagrams along the span.*
- *Find out torsional rigidity of circular shaft by conducting laboratory test.*
- *Find out slenderness ratio for all columns in the class room and analyze them using Rankine's formula.*

16CE204 SURVEYING-I

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	20	48	6	12	3	2

Course Description and Objectives:

This course provides knowledge on various equipments for land surveying, such as chains, tapes, compass, theodolites and plane tables along with their accessories. The objective of this course is to impart knowledge of various surveying instruments to find out horizontal and vertical measurments.

Course Outcomes:

The student will be able to:

- measure all the land details including horizontal distances, elevations, and areas with chain, compass, and levelling instruments.
- find horizontal and vertical angles to simplify the calculations involved in height and distance measurements of inaccessible points.
- utilise Compasses and Theodolites to construct closed and open traverses for finding out land areas in large scales.

SKILLS:

✓ *Draw a contour map by taking levels using auto level.*

✓ *Create a longitudinal profile of a road.*

✓ *Create a transverse profile of a road.*

✓ *Map an area using chain survey.*

✓ *Map an area using compass survey.*

UNI T- 1 **L-9**

SURVEYING AND MEASUREMENTS: Surveying, History, Definition, Classification, Principles of surveying, Plan and map, Measurements, Basic Measurements and methods, Scale, Scales used for Maps and plans.

CHAIN SURVEYING: (Linear Measurements**)** Different methods, Ranging out, Chaining a line on a flat ground, Chaining on an uneven or a sloping ground, Chain and Tape corrections, Degree of accuracy, Principles of chain surveying, Basic definitions, Well, Conditioned Triangle, Instruments used in chain survey, Field book, Field work, Offsets, Cross Staff survey, Obstacles in chain survey.

UNIT - 2 **L-9**

COMPASS SURVEYING: COMPASS: Types, Bearings and Angles, Prismatic compass, Magnetic Dip and Declination, Local attraction, Compass traversing, Fieldwork, Plotting of a compass traverse, Errors in Compass surveying, Limits of accuracy.

UNIT - 3 **L-9**

SIMPLE LEVELLING: Basic definitions, Curvature and Refraction, Different methods of levelling, Classification of direct levelling methods, Levels, Dumpy level, Tilting level, Auto level, Sensitivity of a level tube, Levelling staff, Level field book, Profile levelling, Cross sectioning, Reciprocal levelling, Sources of errors in levelling, Degree of Precision.

CONTOURING: Methods of representing Relief, Contouring, Contour interval, Characteristics of contours; Methods of locating contours, Direct and indirect methods contouring, Interpolation and sketching of contours, Location of a contour gradient, Ceylon Ghat Tracer, Uses of contour maps, Indian Pattern Tangent Clinometers.

UNIT - 4 **L-9**

VERNIERTHEODOLITE: Basic definitions, Fundamental lines and desired relations, Temporary adjustments, Measurement of a horizontal angle, Repetition and reiteration methods of horizontal angle measurement, Measurement of vertical angle, Sources of errors in Theodolite survey.

UNIT - 5 **L-9**

PLANE TABLE SURVEYING: Plane table and its accessories, Setting up, Plane tabling methods, Resection by trial and error method, Three point problem, Errors in plane tabling.

ERRORS IN SURVEYING: Accuracy, Precision, Sources of errors, Types of errors and their propagation, Measures of precision, Weights of measurements, Degree of accuracy.

ACTIVITIES:

- *Transfer Benchmark from near-by established control points.*
- *Take details of an area using prismatic compass.*
- *Map a large area by using plane table after doing resection using two and three point problem methods.*
- *Create a contour map using auto-level by shifting the instrument.*

ACTIVITIES:

- *Transfer Benchmark from near-by established control points.*
- *Take details of an area using prismatic compass.*
- *Map a large area by using plane table after doing resection using two and three point problem methods.*
- *Create a contour map using auto-level by shifting the instrument.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Chain & Compass Survey

1. Chaining of a line using Chain / Tape and Recording of details along the chain line.
2. Measurement of area – Cross staff survey.
3. Traversing by compass and graphical adjustment.
4. Determination of distance between two inaccessible points.

Simple Levelling

5. Measurement of elevation difference between two points using any levelling Instrument
6. Elevation difference between two points by reciprocal levelling method.
7. Profile levelling – plotting of profile.
8. Contouring of a small area by method of blocks using plane table survey
9. Determination of the distance between two inaccessible points.
10. Plotting of a building by plane table traversing
11. Resection by trial and error method by using theodolite
12. Measurement of horizontal and vertical angles.
13. Determination of distance between two inaccessible points.

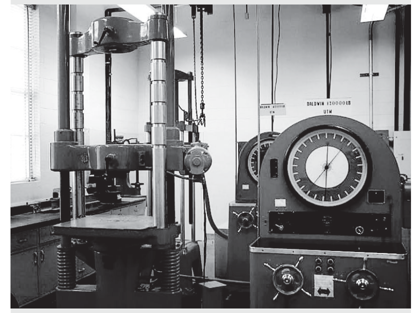
TEXT BOOKS:

1. B. C. Punmia, “Surveying” Vol.1 and 2,15th edition, Laxmi publishers, 2005.
2. Dr. K. R. Arora, “Surveying” Vol. 1, 10th edition, Standard Book House, 2008.

REFERENCE BOOKS:

1. A. M. Chandra, “Plane Surveying”, 2nd edition, New Age International (P) Ltd.2006.
2. Arthur Bannister and Stanly Reymond, “Surveying”, 7th edition, Prentice Hall and Reymand Baker Addison - Wesly, 1998.

16CE205 MATERIAL TESTING LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	5

Course Description and Objectives:

The course provides methods to evaluate the mechanical and physical properties of steel, wood and cement by conducting various experiments. The objective is to give students hands on experience in testing of engineering material and analysis of experimental results.

Course Outcomes:

The student will be able to:

- find the Young Modulus, torsional strength, hardness and tensile strength of given specimens
- determine impact value and crushing value of coarse aggregates
- calculate the compressive strength of concrete cubes and bricks
- find the physical properties of given coarse aggregate, fine aggregate and cement samples

SKILLS:

✓ *Test the tensile strength of steel.*

✓ *Test the cement quality.*

✓ *Determine the strength of concrete cube.*

✓ *Find out workability of concrete.*

Note: A minimum of nine (09No) shall be done and recorded.

ACTIVITIES:

- *Study of characteristics of HYSD bars*
- *Testing of initial and final setting time of cement.*
- Finding the impact resistance of the given materials.
- Compressive strength of Cement.

1. To study the stress-strain characteristics of HYSD bars by UTM.
2. To find young's modulus of the given material (steel or wood) by conducting bending test on simply supported beam.
3. To find modulus of rigidity by conducting torsion test on solid circular shaft.
4. To find the hardness of the given material by Brinnel's or Vickers hardness tester.
5. To find impact resistance of the given material by conducting Charpy test on Impact testing machine.
6. To determine the ultimate shear strength of steel rod in single and double shear.
7. To determine the modulus of rigidity of the spring.
8. Normal consistency and Initial setting and final setting time of cement
9. Fineness of cement.
10. Compressive strength of Cement.
11. Slump cone test to determine workability of concrete.

16HS301 PROFESSIONAL ETHICS

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
5	30	-	5	-	2

Course Description and Objectives:

This course offers insight into workplace rights of people, their safety concerns and more importantly the ethics that are to be followed by professionals and corporates. The objective of the course is to bring in awareness among the students about human values, social responsibility and the ethics to be followed by engineering professionals.

Course Outcomes:

The student will be able to:

- understand professional responsibilities and ethics in the workplace.
- have knowledge of contemporary issues related to personal and professional interactions at the workplace.
- understand the impact of engineering solutions in global and societal context.

SKILLS:

✓ *Analyze the issues faced by society and business world related to safe technologies/ practices, employee rights, resource sharing and allocation, team work, organizational dynamics, legislations related to business and technology, discrimination.*

✓ *Appreciate the need for workplace etiquette and proper code of conduct.*

✓ *Construct and evaluate arguments during decision making by considering viewpoints of all the stakeholders.*

✓ *Analyze one's own beliefs and values during interpersonal and intra-organizational conflicts.*

✓ *Detect inconsistencies and common errors in reasoning during discussions and practices.*

ACTIVITIES:

- *Discuss a typical case study on workers strike and analyze the conflict of interest among different stakeholders.*
- *Reading and analyzing a prisoner's narrative of police abuse in custody.*
- *Watching and discussing a video report on mishaps such as space shuttle mishap.*
- *Analyze and comment on disasters such as Chernobyl, Bhopal etc.*
- *Analyzing the HR policies documents of a typical company on issues such as working hours, employee security and health care.*

UNIT - 1 **L-6**

HUMAN VALUES : Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue – Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT - 2 **L-6**

ENGINEERING ETHICS & **ENGINEERING AS SOCIAL EXPERIMENTATION :** Engineering Ethics - Variety of moral issues – types of inquiry moral dilemmas – moral autonomy – The problems of Many Hands – Kohlburg's theory – Gilligan's theory Impediments to Responsible Action; Engineering as social experimentation - Codes of ethics - A balanced outlook on law - The challenger case study.

UNIT - 3 **L-6**

ENGINEER'S RESPONSIBILITY FOR SAFETY : Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal.

UNIT - 4 **L-6**

WORKPLACE RIGHTS AND RESPONSIBILITIES & WORK ENVIRONMENT : Workplace Rights and Responsibilities - Engineers and Managers, Organizational complaint procedures, Government agencies, Resolving Employee concerns, Limits on acceptable behaviour in large corporation; Work Environment - Ethical and legal considerations, Organizational responses to offensive behaviour and harassment, Ethics in a Global Context.

UNIT - 5 **L-6**

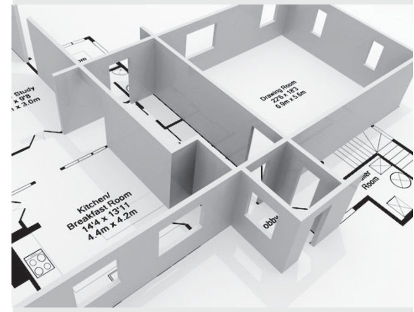
GLOBAL ISSUES : Multinational Corporations; Business Ethics; Environmental Ethics; Computer Ethics; Role in Technological Development; Weapons Development; Engineers as Managers; Consulting Engineers; Engineers as Expert Witnesses and Advisors; Honesty; Moral Leadership; Sample code of conduct.

TEXT BOOK:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.

REFERENCE BOOKS:

1. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.



16CE206 BUILDING CONSTRUCTION AND PLANNING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	20	35	4	10	2	-

Course Description and Objectives:

This course deals with construction processes of building components such as foundation, walls, beams and columns. This course also covers planning of construction and principles of planning. The objective of this course is to provide knowledge of planning and construction of residential, industrial and public buildings.

Course outcomes:

The Students will be able to:

- understand different properties of brick and stone masonry.
- understand different types of foundations and their specifications.
- plan and construct residential and commercial buildings.
- understand building bye laws.

SKILLS:

- ✓ *Find out engineering properties of brick and stone.*
- ✓ *Identify suitable type of foundation for given site conditions.*
- ✓ *Design stair cases.*
- ✓ *Design scaffolding and formwork.*
- ✓ *Apply byelaws for construction of a new project.*

ACTIVITIES:

- Construct a wall using English bond. and Flemish bond.
- Prepare a model of scaffolding.
- Make a plan of 2BHK house.
- Make a plan of U Block of Vignan's University.
- Prepare a model of various Blocks of Vignan's University.

UNIT - 1 **L-9**

STONE AND BRICK MASONRY: Technical terms, Types of bonds in brickwork and their suitability, Classification of stone masonry, Walls, Classification of walls, Floors, Technical terms, Types of ground floors, Roofs, Technical terms, Classification of roofs, Steel sloping roofs, Roof covering materials, Types of flat roofs.

UNIT - 2 **L-9**

FOUNDATIONS: Shallow foundations, Spread, combined strap and mat footings, Deep foundations, pile foundations, cofferdam, caissons (Basic description only).

FINISHINGS (BASIC DESCRIPTION ONLY): Plastering and pointing, White washing and distempering, Painting, Constituents of paint, Types of paints, Painting of new/old Wood, Varnish.

STAIRCASES: Technical terms, Types of staircases, Design considerations.

DAMPNESS AND DAMP PROOFING: Causes of dampness, Methods of preventing dampness, Damp proofing materials, Methods of providing DPC under different situations.

SCAFFOLDING & FORM WORK: Types of scaffolding, Types of formwork, Centering.

UNIT - 3 **L-9**

PRINCIPLES OF PLANNING: An Approach to planning , Principles of Planning, Aspect, prospect, Privacy, Roominess, Furniture requirements, Grouping, Circulation, Orientation, Flexibility, Sanitation, Lighting, Ventilation, Elegance and economy, Climatic considerations, Flow diagram and line plan, Space for equipment for air–conditioning, Space for machinery etc.

UNIT - 4 **L-9**

BUILDING RULES AND BYE–LAWS: Zoning regulations, Regulations regarding layouts or sub divisions, Building regulations, Rules for special type of buildings, Calculation of plinth, Floor and carpet area, Floor space index.

BUILDING ELEMENTS: Conventional signs, Guidelines for staircase planning, Guidelines for selecting doors and windows, Terms used in the construction of door and window, Specifications for the drawing of door and window.

UNIT - 5 **L-9**

RESIDENTIAL BUILDINGS: Minimum standards for various parts of buildings, Requirements of different rooms and their grouping, characteristics of various types of residential buildings.

PUBLIC BUILDINGS: Planning of educational institutions, Hospitals, Dispensaries, Office buildings, Banks, Industrial buildings, Hotels and motels, Buildings for recreation.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Conventional signs.
2. Plan, section and elevation of doors and windows.
3. English and Flemish bonds King-post and Queen-post trusses.
4. Plan, Section and Elevation of a single storied residential building.
5. Generating Plan, Section and elevation of a two storied residential building.
6. Generating plan, Section and elevation of a post-office/Bank.
7. Learning basic commands of CAD software.
8. Drawing the line diagram of basic building components like door, window by CAD software.
9. Drawing plan, section and elevation of a single storied residential building by CAD software.

TEXT BOOKS:

1. B. C. Punmia, "Building construction", 11th edition, Laxmi Publications, New Delhi, 2008.
2. N. Kumaraswamy, "Building Planning and Drawing", 2nd edition, Charotar Publishing House, 2007.

REFERENCE BOOKS:

1. M. G. Shah, C. M. Kale and S. Y. Patki, "Building Drawing", 4th edition, Tata McGraw-Hill, New Delhi, 2002.
2. McKay, "Building Construction", Vol. I, II, III and IV, 4th edition, Orient Long Man, 2004.

16CE207 ENVIRONMENTAL ENGINEERING - I

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	5

Course Description and Objectives:

This course offers fundamental concepts on various types of water sources, estimation of quantity requirements of water, treatment of water to the desired degree. It also includes design concepts of various water treatment methods. The objective of this course is to provide knowledge about sedimentation, filtration and disinfection methods in water treatment process. It also provides basic understanding of various appurtenances in the water distribution system.

Course Outcomes:

The students will be able to:

- estimate water requirements for a given city.
- analyze characteristics of water and wastewater.
- estimate the quantity of wastewater generated from different uses
- design components of water supply systems.

SKILLS:

✓ *Evaluate the contamination level of water bodies.*

✓ *Design a filter medium.*

✓ *Design of Water softening models.*

✓ *Prepare, review, and update environmental investigation and recommendation reports.*

✓ *Design a water distribution system for a given city.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO WATER SUPPLY ENGINEERING: Need for protected water supplies, Objectives of water supply systems, Role of environmental engineers.

QUANTITY OF WATER: Estimating requirements, Design period, Per capita consumption, Factors affecting per capita consumption, Fire demand, Fluctuations in demand, Prediction of population.

UNIT - 2 **L-9, T-3**

SOURCES & INTAKE WORKS: Classification of sources of water supply, Choice of source, Suitability with regard to quality and quantity, Lake, River, Reservoir and canal intakes.

TRANSPORTATION AND PUMPING OF WATER: Types of conduits, Capacity and design, Materials for pipes, Laying and Jointing of pipes, Testing of pipe line, Classification of pumps, Efficiency and choice of pumps.

UNIT - 3 **L-9, T-3**

QUALITY OF WATER: Impurities in water, Routine water analysis, Physical, Chemical and bacteriological tests, BIS Standards for drinking water, Water borne diseases.

Purification of Water: Methods of purification of water, Sequence of treatment.

PLAIN SEDIMENTATION AND COAGULATION: Theory of sedimentation, Stoke's law, Sedimentation tanks, Design aspects, Principle of coagulation, Chemicals used for coagulation, Units of coagulation plant, Optimum dose of coagulant.

UNIT - 4 **L-9, T-3**

FILTRATION OF WATER: Theory of filtration, Filter materials, Slow and and rapid sand filters, Construction operation and design, Under drainage system design in rapid sand filters, Troubles in rapid sand filters, Pressure filters.

DISINFECTION OF WATER: Different methods of disinfection, Chlorination, Types of chlorination.

OTHER TREATMENT METHODS: Water softening, Methods of removing temporary hardness, Methods of removing permanent hardness, Removal of color, Odour and taste from water, De-fluoridation, Reverse osmosis.

UNIT - 5 **L-9, T-3**

DISTRIBUTION SYSTEM: General requirements, Classification, Methods of supply, Available pressure in the distribution system, Layouts of distribution networks, Distribution reservoirs, Functions, Types, Capacity of balancing tank, Analysis of distribution system, Methods of analysis, Design of Pipe network

PIPE APPURTENANCES: Appurtenances in the distribution system, Service connection, Sluice valves, Check valve, Air valve, Drain valve, Hydrants, Meters.

TEXT BOOKS:

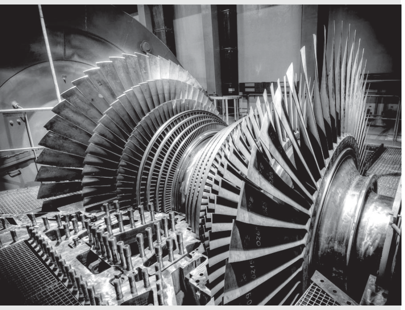
1. B. C. Punmia, "Environmental Engineering", Vol.1, 2nd edition, Laxmi Publishers, 2009.
2. S. K. Garg, "Environmental Engineering", Vol.1, 10th edition, Khanna Publishers, Delhi, 2005.

REFERENCE BOOKS:

1. S. Peavy and Rowe, "Environmental Engineering", 7th edition, Tata Mc Graw-Hill, New York, 2013.
2. E. W. Steel and Terrance J, "Water Supply and Sewerage", 6th edition, Tata Mc Graw-Hill, Singapore, 2001.

ACTIVITIES:

- Estimate water requirement for Guntur city.
- Study the suitability of sources of water around campus.
- Visit a water purification plant and make a report covering all water purification methods involved.
- Design layouts of distribution networks suitable for a city.



16CE208 HYDRAULICS AND HYDRAULIC MACHINES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
6	40	5	15	3	-

Course Description and Objectives:

The course deals with basic concepts of flow in open channel and working principles of different types of turbines and pumps. The objective of this course is to provide knowledge regarding uniform and non-uniform flows in open channels, impact of jet, study of different types of turbines and working of centrifugal and reciprocating pumps.

Course Outcomes:

The students will be able to:

- understand and analyse uniform, gradually and rapidly varied flows in an open channel.
- prepare and analyse models using concepts of similitude.
- understand working principles of turbines and pumps and their analysis and design.

SKILLS:

✓ *Study different flow conditions in open channels*

✓ *Analyse critical and sub-critical flow in open channel*

✓ *Analyse gradually and rapidly varied flow in open channel*

✓ *Study impact of jet on blades of turbines*

✓ *Determine performance characteristics of different types of pumps*

UNIT - 1 **L-9**

DIMENSIONAL ANALYSIS AND SIMILITUDE: Dynamical similarity and dimensional homogenity model experiment, Geometric, Kinematic and Dynamic similarity, Reynold's, Froude, Weber, Euler and Mach numbers, Distorted and undistorted models, Principle of dimensional analysis Rayleigh method, Buckingham theorem, Applications of dimensional analysis to pipe Friction problems, Resistance to motion of partially and fully submerged bodies.

UNIT - 2 **L-9**

OPEN CHANNEL FLOW:

UNIFORM FLOW: Introduction, Classification of flows, Types of channels, Chezy, Manning's, Bazin, Kutter's Equations, Hydraulically efficient channel sections, Rectangular, Trapezoidal and circular channels, Velocity distribution, Energy and momentum correction factors, Pressure distribution.

NON-UNIFORM FLOW: Concept of specific energy, Specific energy curves, Critical flow, Critical flow in a rectangular channel, Critical slope, Different slope conditions, Channel transitions, Reduction in width of channels, Hump, Momentum principle applied to open channel flow, Specific force, Specific force curve.

UNIT - 3 **L-9**

OPEN CHANNEL FLOW:

GRADUALLY VARIED FLOW: Dynamic equation, Surface Profiles, Computation of surface profiles by single step and multi step methods, Examples of various types of water surface profiles, Control section.

RAPIDLY VARIED FLOW: Hydraulic jump, Elements and characteristics of hydraulic jump, Types of hydraulic jumps, Sequent depths, energy loss in a hydraulic jump.

UNIT - 4 **L-9**

IMPACT OF FREE JETS: Impact of a jet on a flat or a curved vane, Moving and stationary vane, Flow over radial vanes.

TURBINES: Classification, Efficiencies, Pelton wheel turbine, Francis turbine and Kaplan turbine, Governing of Pelton turbines, Draft-tube, Specific and unit quantities, Characteristic curves, Selection of turbines, Model tests.

UNIT - 5 **L-9**

CENTRIFUGAL PUMP: Components, Working principle, Manometric efficiency, Work done, Minimum starting speed, Pumps connected in series and parallel, Priming, Net positive suction head, Specific speed, Characteristic curves, Model testing.

RECIPROCATING PUMPS: Working principle, Single acting and double acting, Discharge slip, Work done, Indicator diagram, Air vessels.

ACTIVITIES:

- *Prepare a model to demonstrate geometric similarity.*
- *Design a channel section for uniform flow.*
- *Prepare a model of Hydraulic Jump.*
- *Design a model of Pelton turbine.*
- *Design a model of centrifugal pump*.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Impact of jets on Vanes.
2. Pelton wheel performance test.
3. Francis turbine performance test.
4. Multi stage centrifugal pump performance test.
5. Reciprocating pump performance test.

TEXT BOOKS:

1. P. N. Modi and S. N. Seth, “Hydraulics and Fluid Mechanics”, 20th edition, Standard Book house, New Delhi, 2013.
2. Dr. R. K. Bansal, “Fluid Mechanics and Hydraulic Machines”, 9th edition, Laxmi Publications, New Delhi, 2005.

REFERENCE BOOKS:

1. K. Subramanya, “Open channel flow”, 3rd edition, Tata McGraw Hill Publisher, 2008.
2. A. K. Jain, “Fluid Mechanics”, 8th edition, Khanna Publishers, Delhi, 2002.

16CE209 STRUCTURAL ANALYSIS- I

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	6	10	3	5

Course Description and Objectives:

This course offers fundamental concepts to analyse all structural components for different load conditions. It gives a detailed idea about different methods involved in calculating the deformations in a structure. The objective is to make students understand the influence of loads and forces on a determinate structures. In addition to that, provide knowledge about strain energy concepts for analyzing determinate and indeterminate structures.

Course Outcomes:

The students will be able to:

- understand the classification of structures.
- understand the deflection profile of a beam.
- calculate the strain energy due to Flexure and Axial loading.
- analyze the structures using conventional methods and strain energy concepts.
- estimate the influence and effect of force on any parameter chosen.
- analyze the determinate and indeterminate structures.

SKILLS:

✓ *Classify different types of structures based on degrees of freedom.*

✓ *Identify the deflection profile of structures subjected to several types of loadings.*

✓ *Analyze the behavior of structures subjected to moving loads.*

✓ *Analyze pin jointed frames for dead and live loads.*

✓ *Analyze steel beams and columns.*

ACTIVITIES:

- *Classify the structures with the help of live examples.*
- *Choose a live example and analyze bridge member under moving load.*
- *Analyze a fixed beam considering the loading conditions in your classroom.*
- *Discuss in detail about several methods and processes adopted for analyzing determinate structures.*
- *Discuss in detail about several methods and processes adopted for analyzing determinate structures.*

UNIT - 1 **L-9, T-3**

DEFLECTION OF BEAMS: Introduction to structural analysis, Classification of structures, Deflection equation for elastic curve of a beam, Deflection and slope for cantilever beam and simply supported beams using double integration method, Macaulay's method, Area moment method.

UNIT - 2 **L-9, T-3**

ENERGY METHODS : Displacements of determinate structures using energy methods, Maxwell's reciprocal theorem, Maxwell-Betti's generalized reciprocal theorem, Castigliano's theorems, Application of Castigliano's theorem for calculating deflection of beams, Frames and trusses, Virtual work method for deflections.

UNIT - 3 **L-9, T-3**

PROPPED CANTILEVER: Analysis of propped cantilever by method of consistent deformation.

FIXED BEAMS: Fixed end moments for a fixed beam of uniform section for different types of loading, Effect of sinking of supports, Effect of rotation of a support, bending moment diagram for fixed beams.

CLAPEYRON'S THEOREM OF THREE MOMENTS: Analysis of continuous beam by Clapeyron's theorem of three moments.

UNIT - 4 **L-9, T-3**

STRAIN ENERGY METHOD: Strain energy method for analysis of continuous beams and rigid joined plane frames up to second degree redundancy.

REDUNDANT PIN JOINTED FRAMES: Analysis of pin jointed frames up to second degree redundancy, Forces in indeterminate pin jointed frames due to temperature variation and lack of fit.

UNIT - 5 **L-9, T-3**

INFLUENCE LINES FOR STATICALLY DETERMINATE STRUCTURES: Moving loads and influence lines, Influence lines for beam reactions, Influence lines for shear force, Influence lines for bending moment, Calculation of maximum shear force and bending moment at a section for rolling loads, Calculation of absolute maximum bending moment, Influence lines for simple trusses.

TEXT BOOKS:

1. Vazirani and Ratwani, "Analysis of Structures", Vols.1 and 2, 20th edition, Khanna Publishers, Delhi, 2001.
2. S. S. Bhavikatti, "Structural Analysis", Vol.1, 3rd edition, Vikas PublishingHouse Pvt. Ltd, 2009.

REFERENCE BOOKS:

1. C. K. Wang, "Indeterminate Structural Analysis", 1st edition, McGraw-HillPublications, 1984.
2. Junnarkar and Shah, "Mechanics of Structures–II", 20th edition, CharotarPublishing House, 2008.

16CE210 SURVEYING - II

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	5

Course Description and Objectives:

This course offers an introduction to surveying equipments like Theodolite, Tacheometer, Total Station etc. in order to ascertain the ground profile by creating contour maps. In addition it offers methods to calculate areas and volumes of earth to be excavated for various structures like roads, canals, buildings, etc. The main objective the course is to introduce the students to survey methods employed in different construction projects. Another objective of this subject is to introduce the triangulation methodology which is used for surveying larger areas such as countries, finding out the curvature of the Earth, etc.

Course Outcomes:

The Students will be able to:

- understand the way an EDM and a Total Station works.
- understand various methods used calculate areas and volumes.
- employ tacheometry and trigonometric levelling based on site conditions.

SKILLS:

✓ *Create a contour map by using total station.*

✓ *Find out 2D and 3D surface areas of ground.*

✓ *Mark out the foundation for a building.*

✓ *Design the levels and stake out the centre line of a road or a rail or a canal.*

✓ *Use a tachometer and theodolite for finding out elevations and distances.*

ACTIVITIES:

- *Create a digital contour map using a total station survey results.*
- *Design the levels of a road such that the haul is minimum.*
- *Execute a simple curve on the ground.*
- *Find out the levels of a hilly region using tachometry and creating a contour map.*
- *Find out the levels using trigonometric leveling.*

UNIT - 1 **L-9**

ELECTORNIC DISTANCE MEASUREMENTS: Basic concepts, Classification of Electronic Radiation, Basic principle of Electronic Distance Measurement, Computing the distance from the phase differences, Electronic Total Station, Types, Measurement, Recording, Traversing, Data retrieval, Instrumental errors in EDM.

UNIT - 2 **L-9**

AREAS: INTRODUCTION: Simpson's rule, Boundaries with offsets at irregular intervals, Meridian distance methods, Coordinate method, Planimeter, Area of zero circle.

VOLUMES: Area of cross sections, Two level section only, Trapezoidal rule, Prismoidal formula, Volume from spot levels, Volume from contour plan, Capacity of a reservoir.

SETTING OUT WORKS: Control station, Horizontal control, Reference grid, Vertical control, Positioning of a structure, Setting out a foundation, Setting out with a theodolite, Grade stakes, Setting out a sewer, Setting out a culvert.

UNIT - 3 **L-9**

THEODOLITE TRAVERSE: Selection of traverse stations, Traversing fast needle method, Sources of errors in theodolite traversing, Field checks in traversing, Traverse Computations, Gale's traverse table, Methods of adjustments, Omitted measurements.

TACHEOMETRIC SURVEYING: Advantages of tacheometric surveying, Basic systems of tacheometric measurements, Determination of constants K and C, Inclined sight with staff vertical, Inclined sight with staff normal to the line of sight.

UNIT - 4 **L-9**

TRIANGULATION: Principles of triangulation, Uses of triangulation survey, Classification of triangulation, Signals and towers, Satellite station, Base line & Extension of the base line.

TRIGONOMETRIC LEVELING: Introduction, Determination of level of top of object, Base accessible, Base inaccessible, Axis signal correction, Difference in elevation by single observation and reciprocal observations.

UNIT - 5 **L-9**

CIRCULAR CURVES: Basic definitions, Designation of a curve, Relationship between radius and degree of curve, Elements of a simple circular curve, Location of the tangent points, Selection of peg interval, Methods of setting out simple curves, Problems in setting out curves.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Total Station

1. Study of instrument, determination of distances, directions and elevations.
2. Determination of boundaries of a field and computation of area.
3. Determination of heights of objects.

Setting out simple curves and works using

4. Tape and theodolite.
5. Total Station.
6. Setting out foundations for a Building.

Survey Camp is to be conducted for a minimum period of seven days Using Total Station to train in one of the following areas:

7. Preparation of a contour Plan/ Map.
8. Earth work computations for a high way / canal projects.
9. Marking of a sewer line/ water supply line.
10. Or any other type of construction work.

TEXT BOOKS:

1. B. C. Punmia, "Surveying", Vol.1 and 2, 15th edition, Laxmi Publishers, 2005
2. Dr. K. R. Arora, "Surveying", Vol. 1 and 2, 10th edition, Standard Book House, 2008

REFERENCE BOOKS:

1. A. M. Chandra, "Plane Surveying", 2nd edition, New Age International (P) Ltd. 2006.
2. Arthur Bannister and Stanly Reymond, "Surveying", 10th edition, Prentice Hall and Reymand Baker Addison - Wesly, 2002.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- identify and introspect on individual strengths and weaknesses.
- improve levels of self-awareness and self-worth for greater efficacy at workplace.

SKILLS:

- ✓ *Communicate and understand the difference between soft skills and hard skills.*
- ✓ *Professionalism and employability skills.*
- ✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*
- ✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*
- ✓ *Prepare resumé and learn how to face interview.*
- ✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan and NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa and Co, 2004.

VFSTR UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

B.Tech.	**III Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE317 DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Description and Objective:

To understand the loads coming onto the structure, methods of design and codes of practices used. To understand the analysis of singly reinforced, doubly reinforced, flanged sections by working stress and limit state methods. To understand the design for shear, development length, deflection and cracking.

Course Outcomes:

- *Design the Reinforced Concrete beams using limit state and working stress methods*
- *Design Reinforced Concrete slabs*
- *Design the Reinforced Concrete Columns and footings*
- *Design structures for serviceability*

UNIT - I

Methods of Design of Concrete Structures: Concept of working stress method and limit state method- advantages of limit state method -design codes and specifications of limit state philosophy as per current IS code

Limit State Design of Beams: Singly and doubly reinforced rectangular and flanged beams

UNIT – II

Limit State Design for Shear, Torsion, Bond and Anchorage: Behavior of RC beams in shear and torsion-shear and torsion reinforcement-limit state design of R C members for combined bending shear and torsion- use of design aids.

UNIT – III

Limit State Design of Slabs: Analysis and design of one way , two way and continuous slabs –boundary conditions and corner effects.

UNIT – IV

Limit State Design of Columns: Types of columns-analysis and design of short columns for uni-axial and bi-axial bending-design of long columns-use of design aids.

Limit State Design of Footings: Design of wall footing-design of axially and eccentrically loaded rectangular footing-design of combined rectangular footing for two columns only.

UNIT – V

Working Stress Method: Assumptions; Permissible stresses in concrete and steel; Balanced design; Transformed area method; Analysis and design for flexure of singly reinforced, doubly reinforced sections.

Limit State Design For Serviceability: Design of members for serviceability requirements of deflection and cracking.

TEXT BOOKS:

1. Varghese P C, “Limit State Design of Reinforced Concrete”, 2nd ed., Prentice Hall of India Private Limited, New Delhi, 2009.

2. B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain “Limit State Design of Reinforced Concrete(AS PER IS 456:2000)”, 1st ed., Laxmi Publications, 2007.

REFERENCE BOOKS:

1. Ashok K. Jain, “Reinforced Concrete (limit state design)”, 23rd ed., Roorkee, Nem Chand & Bros, 2003.

2. S Unnikrishna Pillai & Devdas Menon, “Reinforced Concrete Design”, 2nd ed., Tata McGraw-Hill Education Publishers , May 2003.

3. H. J. Shah, “Reinforced concrete”, 15th ed., Charotar Publishing House, 2000.

B.Tech. III Year	L	T	P	To	C
	4	-	-	4	4

CE319 STRUCTURAL ANALYSIS – II

Course Description and Objective:

At the end of the course, the student is able to analyze continuous beams and multi-storey frames by various methods like slope deflection, moment distribution and Kani's method.

Course Outcomes:

- *Analyze multistoried structures.*
- *Analyze three hinged arches and two hinged arches*

UNIT – I

Slope Deflection Method: Slope - deflection equations; Principles of the method; Applications of the method to the analysis of continuous beams and portal frames (Single bay, single storey with vertical legs without side sway).

UNIT – II

Moment Distribution Method: Principles of the method; Application of the method to analysis of continuous beams and portal frames (Single bay, single storey with vertical legs only) without and with side sway.

UNIT – III

Multi Storey Frames (Approximate Methods): Portal method and cantilever method for lateral loads.

UNIT – IV

Kani's Method: Principles of the method; Application to continuous beams and portal frames (single bay, single storey with vertical legs only) without and with side-sway

UNIT – V

Three-Hinged Arches: Introduction; Eddy's theorem for bending moment; parabolic arch; circular arch; Horizontal thrust; arch supported at different levels.

Two-Hinged Arches: Introduction; Horizontal thrust;circular and parabolic arches carrying concentrated load & uniformly distributed load; Effect of change in temperature .Introduction to fixed arches.

TEXT BOOKS :

1. Vazirani & Ratwani, "Analysis of Structures vols. 1 & 2", 12th ed., Khanna Publishers, Delhi, 1992.
2. S.S.Bhavikatti, "Structural Analysis Vols.1&2", 3rd ed., Vikas Publishing House Pvt.Ltd., Delhi, 2008.

REFERENCE BOOKS :

1. C. K. Wang, "Indeterminate structural analysis", 4th ed., McGraw-Hill Publications, 2003.
2. C.S.Reddy, "Basic Structural Analysis", 2nd ed., Tata Mc Graw Hill Publications, 2009.

B.Tech. III Year	**L**	**T**	**P**	**To**	**C**
	4	-	-	4	4

CE 321 GEOTECHNICAL ENGINEERING- I

Course Description and Objective:

This subject is meant to understand the significance of the basic principles of the soil mechanics and their applications and also to go through the basic definitions, simple tests, plasticity characteristics, flow of water through soil, permeability and seepage effective stress principle and shear strength of soil.

Course Outcomes:

- Characterize and classify soils
- Identify shear strength parameters for field conditions
- Compute and analyze the consolidation settlements

UNIT - I

Introduction: Soil formation and soil types; Regional soil deposits of India, Phase diagrams; Simple definitions; some important relationships.

Index Properties: Grain size distribution; Mechanical analysis – Sieve analysis, Stoke's law, hydrometer Analysis; Atterberg Limits; Significance of other Soil Aggregate properties

UNIT - II

Soil Classification: Introduction, Particle size classification as per IS code; Unified soil classification system; Indian standard soil classification system.

Permeability: Capillary rise; Darcy's law and its Validity; Determination of coefficient of permeability - constant and variable head methods, indirect methods, Factors affecting permeability; Permeability of stratified soil deposits.

UNIT - III

Seepage Through Soils: Total, neutral and effective stresses; seepage forces and quicksand condition; Flownets- Characteristics and Uses.

Stress Distribution in Soils: Introduction; Boussinesq's equation; vertical stress distribution diagrams; vertical stress beneath loaded areas; Newmark's influence chart; approximate stress distribution methods for loaded areas; Westergaard's equation.

UNIT - IV

Compaction of Soils: Introduction; Laboratory tests; Factors affecting compaction; Effects of compaction on soil properties. Compaction in the field; Compaction specifications and field control.

Compressibility of Soil and Consolidation: Introduction; Compressibility; Time-rate of consolidation; Consolidation test; Computation of settlement; extrapolation of field consolidation curve; Settlement analysis.

UNIT - V

Shear Strength of Soils: Introduction; Stress at a point- Mohr Circle of stress; Mohr–coulomb Failure Criterion; Measurement of Shear Strength; Shear strength of Clayey soils; Shear Strength of Sands; Drainage conditions and Strength parameters.

TEXT BOOKS:

1. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain , "Soil Mechanics

and Foundation", 16th ed., Laxmi Publications Pvt.Ltd., New Delhi, 2005.

2. K.R. Arora, "Soil Mechanics and Foundation Engineering", 7th ed., Standard Publishers and Distributors, Delhi, 2009.

REFERENCE BOOKS:

1. Manoj Datta, S Gulhati, "Geotechnical Engineering", 1st ed., Mcgraw-hill Education (india) Ltd (2008)
2. P. PurushotthamaRaj , "Soil Mechanics and Foundation Engineering", 2nd ed., Pearson Education, 2013.
3. Alam Singh, "Basic Soil Mechanics & Foundations", 1st Ed, CBS Publisher (2012),
4. Gopal Ranjan & ASR Rao , "Basic and Applied Soil Mechanics", 2nd ed., New age International Pvt . Ltd., New Delhi, 2004.

B.Tech.	**III Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE323 ENVIRONMENTAL ENGINEERING – I

Course Description and Objective:

Water is a basic need of the society and pure form of water is not available on the earth now a days. Identification of source, estimation of quantity required, treatment of water to the desired degree and conveyance of water to the community are the essential features of water supply. At the end of the course the student is expected to familiarize with the water supply.

Course Outcomes:

- *Analyze characteristics of water and wastewater*
- *Estimate the quantity of drinking water and domestic wastewater generated*
- *Design components of water supply systems*

UNIT – I

Introduction to Water Supply Engineering: Need for protected water supplies, Objectives of water supply systems, Role of Environmental Engineers.

Quantity of Water: Estimating requirements, Design period, Per capita consumption, Factors affecting per capita consumption, Fire demand, Fluctuations in demand, Prediction of population.

UNIT - II

Sources & Intake Works: Classification of sources of water supply, Choice of source, Suitability with regard to quality and quantity, Lake, river, reservoir and canal intakes.

Transportation and Pumping of Water: Types of conduits, Capacity and design, Materials for pipes, Laying and Jointing of pipes, Testing of pipe line, Classification of pumps, Efficiency and choice of pumps.

UNIT – III

Quality of Water: Impurities in water, Routine water analysis, physical, chemical and bacteriological tests, BIS Standards for drinking water, Water borne diseases.

Purification of Water: Methods of purification of water, Sequence of treatment.

Plain Sedimentation and Coagulation: Theory of sedimentation, Stoke's law, Sedimentation tanks, Design aspects, Principle of coagulation, Chemicals used for coagulation, Units of coagulation plant, Optimum dose of coagulant.

UNIT – IV

Filtration of Water: Theory of filtration, Filter materials, Slow sand and rapid sand filters, Construction operation and design, Under drainage system design in rapid sand filters, Troubles in rapid sand filters, Pressure filters.

Disinfection of Water: Different methods of disinfection, Chlorination, Types of chlorination.

Other Treatment Methods: Water softening, Methods of removing temporary hardness, Methods of removing permanent hardness, Removal of color, odour and taste from water, De-fluoridation, Reverse osmosis.

UNIT – V

Distribution System: General requirements, Classification, Methods of supply, Available pressure in the distribution system, Layouts of distribution networks, Distribution reservoirs, Functions, Types, Capacity of balancing tank, Analysis of distribution system, Methods of analysis, Design of Pipe network

Pipe Appurtenances: Appurtenances in the distribution system, Service connection, Sluice valves, Check valve, Air valve, Drain valve, Hydrants, Meters.

TEXT BOOKS :

1. B.C.Punmia, "Environmental Engineering", Vol.1, 2nd ed., Laxmi Publishers, 2009.
2. S. K.Garg, "Environmental Engineering", Vol.1, 10th ed., Khanna Publishers, Delhi, 2005.

REFERENCE BOOKS:

1. Peavy and Rowe, "Environmental Engineering", 7 th ed., Mc Graw-Hill, New York, 1987.
2. CPH and EEO, "Manual on Water Supply & Treatment", CPH and EEO, Ministry of Urban Development, Govt. of India, New Delhi,1999.
3. E.W. Steel and Terrance J, "Water Supply and Sewerage", 6 th ed., Mc Ghee, Mc Graw-Hill, Singapore,1991.

B.Tech	III Year	L	T	P	To	C
		4	-	-	4	4

CE325 WATER RESOURCES ENGINEERING – I

(Dept. Elective-I)

Course Description and Objective:

By the end of the course, the student should be able to estimate the quantity of water available, irrigation requirement and design of irrigation canals & diversion head works.

Course Outcomes:

- *Estimation of rainfall,Plan an Irrigation System*
- *Design irrigation canals and canal network*
- *Plan and design diversion head work*

UNIT – I

Hydrology : Hydrologic cycle; Precipitation types; Rain gauges; Computation of average rain fall over a basin; Run off; Factors affecting run off; Computation of run-off; Estimation of maximum rate of run-off.

Hydrographs : Hydrograph analysis; Unit hydrograph; S-hydrograph; Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; Application of unit hydrograph to construction of a flood hydrograph resulting from two or more periods of rainfall; Construction of unit hydrograph of different unit duration from a unit hydrograph of some given unit duration.

UNIT – II

Ground Water - Introduction to Irrigation : Introduction;Aquifer; Aquicludes; Aquifuge; Specific yield; Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; Well hydraulics; Steady radial flow to a well– Dupuit's theory for confined and unconfined aquifers; Yield of an open well– Constant level pumping test, Recuperation test.

Introduction to Irrigation : Definition; Necessity; Scope of irrigation science; Benefits of irrigation; Ill-effects of irrigation; Types of irrigation.

Methods of Irrigation : Methods of applying water to crops; Uncontrolled or wild flooding; Free flooding; Contour laterals; Border strip method; Check flooding; Basin flooding; Zig zag method; Furrow method; Contour Famring; Sub-surface irrigation; Sprinkler irrigation; Drip irrigation.

UNIT – III

Water Requirement of Crops : Functions of irrigation water; Classes and availability of soil water; Saturation capacity; Field capacity; Wilting point; Available moisture and readily available moisture; Moisture equivalent; Soil – moisture deficiency; Limiting soil moisture conditions; Depth and frequency of irrigation; Duty and Delta; Base period; Relation between Duty and Delta; Factors affecting duty; Methods of improving duty; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; Consumptive use of water (Evapo – Transpiration); Irrigation efficiencies – Water conveyance efficiency, Water application efficiency, Water distribution efficiency and Consumptive use efficiency; Determination of irrigation requirements of crops; Assessment of irrigation water.

UNIT – IV

Irrigation Channels - SILT Theories & Design Procedure : Classification; Canal alignment; Cross–section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Silt theories–Kennedy's theory, Lacey's regime theory; Kennedy's method of channel design; Silt supporting capacity according to Kennedy's theory; Use of Garret's diagram in channel design; Lacey's theory applied to channel design; Use of Lacey's regime diagrams; Comparison of Kennedy's theory and Lacey's theory; Sediment transport.

Water Logging : Water logging; Effects of water logging; Causes of water logging; Remedial measures; Losses in canal; Land drainage; Tile drains; Lining of irrigation channels – necessity, advantages and disadvantages.

UNIT – V

Diversion Head Works : Component parts of a Diversion Head work; Types of weirs; Causes of failure of weirs and their remedies; Design of weirs– Bligh's creep theory, Lane's weighted creep theory and Khosla's theory; Silt control at head works;

Canal Outlets and Regulation Works : Types of outlets; Non– modular outlets; Semi-module outlets; Rigid modules; Canal falls; Necessity and location of falls; Development of falls; Classification of falls; Canal regulators; Off-take alignment; Head regulators and cross-regulators; Canal escape.

TEXT BOOKS:

1. Dr. B.C. Punmia & Dr. Pande B.B. Lal, " Irrigation and water power Engineering ", 12th ed., Laxmi Publications Pvt. Ltd., New Delhi, 1992.
2. S. K. Garg, "Irrigation Engineering and Hydraulic structures", 23rd ed., Khanna Publishers, Delhi, 2009.

REFERENCE BOOKS:

1. Dr. P.N. Modi, "Irrigation, Water Resources & Water Power Engineering", 7th ed., Standard Book House, New Delhi, 2008.
2. K. Subramanya, "Engineering Hydrology", 3rd ed., Tata McGraw Hill, New Delhi, 2010.

B.Tech	**III Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE327 OPERATION RESEARCH

(Dept. Elective-I)

Course Description and Objective:

To make the students aware about the solutions to the problems in management for efficient utilization and optimum allocation of resources

Course Outcomes:

- *Identify and develop operational research models from the verbal description of the real system.*
- *Understand the mathematical tools that are needed to solve optimisation problems.*
- *Use mathematical software to solve the proposed models. Develop a report that describes the model and the solving technique*
- *analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering*

UNIT – I

Introduction: History and development of operation research, Applications, modeling in operation research, operation research models and their applications.

Linear Programming-I: Introduction, requirements of LP problem, basic assumptions, Formulation of problem, Graphical solution,

UNIT – II

Linear Programming-II: Introduction, Principle of Simplex Method, procedure for maximization and minimization, Two-phase simplex method, Duality concept

UNIT – III

Transportation Model: Mathematical formulation, methods to obtain initial basic feasible solution, North West Corner method, Vogel's Approximation method, conditions for testing optimality, MODI method for testing optimality solution of balanced and unbalanced problems, Degeneracy and its resolution.

UNIT – IV

Project Management: Introduction, critical path method (CPM), Programme evaluation and review technique (PERT), distinction between PERT and CPM

UNIT – V

Dynamic Programming: Introduction, Bellman's Principle of optimality, shortest route (stage coach) problem, maximization problem

TEXT BOOKS:

1. Hamdy Taha, "Operations Research – An Introduction", 8th ed., PHI, 2007.
2. S. D. Sharma, "Operation Research", 15th ed., Kedarnath and Rannalt Publications, 2010.

REFERENCE BOOKS:

1. Susy Philipose, "Operations Research", 3rd ed., T.M.H., New Delhi, 2001.
2. Hira and Gupta, "Operation Research", 3rd ed., S. Chand and Co., 2001.
3. Manohar Mahajan, "Operations Research",10th ed., Dhanpat Rai & Co., 2005.
4. R. Panneerselvam, "Operations Research", 16th ed., PHI, 2002.

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		4	-	-	4	4

CE329 CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES

(Dept. Elective-I)

Course Description and Objective:

The main objective of this course is to make the student aware of the various construction techniques, practices and the equipment needed for different types of construction activities. At the end of this course the student shall have a reasonable knowledge about the various construction procedures for sub to super structure and also the equipment needed for construction of various types of structures from foundation to super structure.

Course Outcomes:

- Cycle Times
- Production Rates
- Equipment Knowledge
- Dirt Work Estimations

UNIT I

CONCRETE TECHNOLOGY : Cements – Grade of cements - manufacture of cement – concrete chemicals and Applications –Mix design concept – mix design as per BIS & ACI methods – manufacturing of concrete –Batching – mixing – transporting – placing – compaction of concrete – curing and finishing. Testing of fresh and hardened concrete – quality of concrete - Non – destructive testing.

UNIT II

CONSTRUCTION PRACTICES: Specifications, details and sequence of activities and construction co-ordination – Site Clearance – Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints – pre cast pavements – Building foundations – basements – temporary shed –centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick –– weather and water proof –roof finishes – acoustic and fire protection.

UNIT III

SUB STRUCTURE CONSTRUCTION: Techniques of Box jacking – Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam -cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting -well points -Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV

SUPER STRUCTURE CONSTRUCTION: Launching girders, bridge decks, off shore platforms – special forms for shells - techniques for heavy decks – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks.

UNIT V

CONSTRUCTION EQUIPMENT: Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, front end waders, earth movers – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling,

TEXT BOOKS:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.

2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 1997.

REFERENCE BOOKS:

1. Jha J and Sinha S.K., Construction and Foundation Engineering, Khanna Publishers, 1993.

2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 1988.

3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 1988.

4. Dr. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi-, 1983.

5. Gambhir, M.L, Concrete Technology, Tata McGraw – Hill Publishing Company Ltd, New Delhi, 2004.

6. Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi, 2007.

7. Sheety, M.S, Concrete Technology, Theory and Practice, S. Chand and Company Ltd, New Delhi, 2005.

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		-	-	3	3	2

CE331 GEOTECHNICAL ENGINEERING LAB

Course Description and Objective:

Determination of various properties of soil like water content, permeability and to conduct compaction test, shear test, consolidation test etc. on soil.

Course Outcomes:

- *Determine index properties of soils*
- *Classify soils*
- *Determine engineering properties of soils.*

1. Determination of water content by oven drying method.
2. Determination of specific gravity by
   a) Density bottle method b) Pycnometer method.
3. Gradation analysis
   a) Mechanical Sieve analysis b) Hydrometer analysis.
4. Determination of Atterberg limits
5. Determination of free swell index
6. Determination of field unit weight by
   a) Core cutter method. b) Sand replacement method.
7. Determination of permeability by
   a) Constant head permeameter. b) Variable head permeameter.
8. Direct shear test.
9. Vane shear test.
10. Unconfined compression test
11. Standard proctor compaction test
12. Modified proctor compaction test
13. Triaxial shear test.
14. Consolidation test.

B.Tech	III Year	L	T	P	To	C
		-	-	3	3	2

CE333 COMPUTER APPLICATIONS IN CIVIL ENGINEERING

Course Description and Objective:

Students are expected to write and execute programmes to solve the following problems. Programmes shall be in C or C++ language or MS-Office Software's.

Course Outcome:

- *Design of civil engineering elements using softwares like excel and c*

Note: A minimum of twelve (10No) shall be done and recorded

(Write any Four programmes)

1. Design of Reinforced Beam for flexure by limit state method.
2. Design of T- Beam for flexure by limit state method.
3. Design of Reinforced beam for Shear by limit state method.
4. Design of R.C.C. section subjected to Bending moment, Shear force and Torsional moment.
5. Design of simply supported one-way slab.

(Write any THREE programmes)

6. Classification of soil by Indian standard classification system.
7. Stresses due to applied loads both Boussinesq and Westerguard analysis
   a) Concentrated load
   b) Circular loaded area
   c) Rectangular loaded area
8. Determination of permeability coefficient by constant head and falling permeability tests.
9. Determination of index properties of soil.

(Write any THREE programmes)

10. Design of an open channel
12. Analysis of water distribution networks (Hardy cross method).
13. Determination of the height of the building when base is accessible.
14. Determination of included angles from the given bearing and check for local attraction.

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		-	-	3	3	2

CE335 BUILDING DRAWING USING AUTOCAD

Course Description and Objective:

The Course Description and Objectives is to make the student competence in building drawing by conventional as well as CAD software.

Course Outcomes:

- *Prepare plans*
- *section and elevations of Buildings by using AutoCAD software*

1. Conventional signs
2. Plan, section and elevation of doors and windows
3. English and Flemish bonds King-post and Queen-post trusses
4. Plan, Section and Elevation of a single storied residential building
5. Generating Plan, Section and elevation of a two storied residential building
6. Generating plan, Section and elevation of a post-office/Bank
7. Learning Basic commands of CAD software
8. Drawing the line diagram of basic building components like door, window by CAD software

9.. Drawing plan, section and elevation of a single storied residential building by CAD software

B.Tech	**III Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE320 DESIGN OF STEEL STRUCTURES

Course Description and Objective:

To design tension and compression members. To design laterally supported and unsupported beams.To understand the behaviour of riveted and welded connections and their design. To draw design details of built-up columns with lacing of battering, grillage foundations.

Course Outcomes:

- *Limit state design of tension members*
- *compression members*
- *Beams,Plate Girder*

UNIT - I

Introduction: Type of steel structures, Methods of Design of Steel Structures, Limit States for Steel Design, Partial Safety factors, Types of loads, Types of Bolts and Bolted Joints, Design of Bolted Connections (Lap and Butt Joint connections), Failure of Bolted Joints.

UNIT – II

Design of Tension Members: Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failures, Design Strength of Tension Members, Slenderness Ratio, Design Procedure, Tension Member Splices, Lug Angles, Gusset Plate.

UNIT – III

Design of Compression Members: Introduction, Effective length, Slenderness Ratio, Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Design of Built-Up Columns(Latticed Columns) , Design of Laced and Battened Columns, Design of Column Splices, Design of Slab Base and Gusseted Base.

UNIT – IV

Design of Beams: Plastic Moment Carrying Capacity of a Section, Types of Sections, Bending Strength of Laterally Supported Beam, Web Buckling, web Crippling, Design of simple beams based on strength and stiffness as per IS code- Design of built up beams and curtailment of flange plates.

UNIT – V

Design of Bolted Beam Connections: Types of Beam Connections, Design of Framed Connections Using Bolt, Design of Unstiffened and Stiffened Seated Connections, Design of Moment Resistant Connections.

Plate Girder: Elements of Plate Girder, General Considerations, Shear Strength of Web; Proportion of Web and flanges, Stiffeners and their connections (using welding); Web splice (using bolts); Design Procedure up to Main Section.

TEXT BOOKS:

1. Ram Chandra, "Design of steel structures", 12th ed., Standard Publishers, New Delhi, 2009.
2. S K Duggal, "Limit State Design of Steel Structures", 2nd ed., Tata McGraw-Hill Education Publishers , May 2010.

Reference Book:

1. Subramanian, "Design of Steel Structures", 1st ed., Pearson Education, 2008.
2. . SS Bhavikatti, "Design of Steel Structures", 2nd ed., PHI Publishers, 2010.

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		4	-	-	4	4

CE322 STRUCTURAL ANALYSIS – III

Course Description and Objective:

At the end of the course, the student is able to analyze curved beams, cables and plastic analysis of beams and also it is expected to analyze beams and frames by matrix approach.

Course Outcomes:

- *Analyze cables and curved beams*
- *analyze one dimensional and two dimensional structures using matrix methods of structural analysis*

UNIT – I

Curved Beams: Analysis for internal forces – circular beams supported on equally spaced columns – semicircular beams on three equally spaced supports.

UNIT – II

Plastic Behavior of Structures: Idealized stress - strain curve for mild steel; Ultimate load carrying capacity of members carrying axial forces; Moment - Curvature relationship for flexural members; Evaluation of fully plastic moment; Shape factor; Collapse load factor; Upper and lower bound theorems; Collapse load analysis of simply supported, propped cantilever and fixed beams.

UNIT – III

Cables: Analysis of cables under uniformly distributed and concentrated loads; Shape of the cable under self weight; Effect of temperature changes in suspension cables; Anchor cables.

UNIT – IV

Flexibility Method (Matrix Approach): Flexibility matrix Analysis of continuous beams and rigid jointed plane frames (Single bay, single storey with vertical legs only) by flexibility method with matrix approach.

UNIT – V

Stiffness Method (Matrix Approach): Stiffness matrix; Relationship between flexibility matrix and stiffness matrix. Analysis of continuous beams, rigid jointed plane frames (Single bay, single storey with vertical legs only) by stiffness method with matrix approach.

TEXT BOOKS :

1. Vazirani & Ratwani "Analysis of Structures Vols.1 & 2", 12th ed., Khanna Publishers, Delhi, 1992.
2. G. S. Pandit & S. P. Gupta, "Structural Analysis – A matrix approach", 2nd ed., Tata Mc. Graw – Hill Publishing Co. Ltd., New Delhi, 2009.

REFERENCE BOOKS :

1. C.S.REDDY, "BASIC STRUCTURAL ANALYSIS", 2ND ED., TATA MC GRAW HILL PUBLICATIONS, NEW DELHI, 2009.
2. S.S. Bhavikatti, "Strucutral Analysis Vol. 2", 3rd ed., Vikas Publishing House Pvt. Ltd., New Delhi, 2008.

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	4	-	-	4	4

CE324 GEOTECHNICAL ENGINEERING - II

Course Description and Objective:

The primary objective of this course is to equip the student with the knowledge of how to explore the soil, design the foundations for different conditions and check the stability of structures.

Course Outcomes:

- *Determine the earth pressures on foundations and retaining structures*
- *Analyze shallow and deep foundations*
- *Calculate the bearing capacity of soils and foundation settlements*
- *understand soil exploration methods*

UNIT - I

Sub–Soil Investigation and Sampling: Introduction; Methods of exploration; Methods of Boring; Soil Samples; Soil samples and Sampling; Number and disposition of trial pits and borings; Depth of exploration; Ground water observations; Field tests visà- vis Laboratory tests; Plate load test; Penetrometer tests; Geophysical methods; Borehole logs; Site investigation report;

UNIT – II

Lateral Earth Pressure & Retaining Walls: Introduction; Effect of wall movement on Earth Pressure; Earth Pressure at rest; Rankine's theory of Earth pressure; Coulomb's theory of earth pressure; Culmann's graphical method for active earth pressure; Design considerations for retaining walls.

UNIT – III

Stability of Slopes: Introduction; Infinite slopes and translational slides; Definitions of factor of safety; Finite slopes- forms of slip surface; Total stress and Effective stress methods of analysis; Cu-0 Analysis (Total Stress Analysis) ; C- Analysis- Method of slices; Location of most Critical Circle; Stability of Earth Dam Slopes; Friction Circle Method; Taylor's Stability Number.

UNIT – IV

Shallow Foundations: Concept of foundations; Types of foundations and their applicability; General requirements of foundations; Location and Depth of foundation.

Bearing Capacity of Shallow Foundation: Terminology relating to bearing capacity; Bearing Capacity of Shallow Foundations; Terzaghi's Bearing Capacity theory; Skempton's Bearing Capacity Analysis for Clay soils; IS-Code Recommendations for Bearing Capacity; Influence of water table on bearing capacity.

Settlement Analysis: Settlement of Shallow foundation – types; Methods to reduce differential settlements; Allowable Bearing Pressure; Immediate settlemtent –Terzaghi's Method; Allowable Bearing pressure of Granular Soils based on Standard Penetration Test Value – Terzaghi and IS methods;

UNIT – V

Pile Foundations: Introduction; Uses of Piles; Types of Piles; Cast- in-situ Pile construction; Selection of Pile type; Pile driving; Pile load carrying capacity in compression – Static Pile Load formula, Load tests, Dynamic Pile formulae; Correlations with Penetration test data; Group action of Piles – load carrying capacity and settlement; Negative skin friction.

Well Foundations: Types of wells; Components of well foundation; Shapes of wells; Forces acting on well foundation; Construction and Sinking of wells;

TEXT BOOKS :

1. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain , "Soil Mechanics and Foundation", 16th ed., Laxmi Publications Pvt. Ltd., New Delhi, 2005.
2. K.R. Arora, " Soil Mechanics and Foundation Engineering", 7th ed., Standard Publishers and Distributors, Delhi, 2009.

REFERENCE BOOKS :

1. Dass, B.M, "Principles of Foundation Engineering", 7th ed., Cengage Learning India,2013.
2. Bowles, J.E., "Foundation Analysis and Design" 5th ed., McGraw-Hill Education India Pvt.Ltd - New Delhi
3. P.Purushotthama Raj, "A Text book of Soil Mechanics and Foundation Engineering", 1st ed., Pearson Education, 2004.
4. Gopal Ranjan & ASR Rao , "Basic and Applied Soil Mechanics", 4th ed., New Age International Pvt. Ltd, New Delhi, 2004.

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CE326 ENVIRONMENTAL ENGINEERING – II

Course Description and Objective:

Water is a basic need of the society and pure form of water is not available on the earth now a days. Identification of source, estimation of quantity required, treatment of water to the desired degree and conveyance of water to the community are the essential features of water supply. At the end of the course the student is expected to familiarize with the water supply and wastewater disposal.

Course Outcomes:

- *determine the sewage characteristics and design various sewage treatment plants*
- *analyze the status of surface water and ground water quality and the remediation technologies*
- *carry out municipal water and wastewater treatment system design and operation*
- *manage hazardous wastes, risk assessment and treatment technologies*
- *apply environmental treatment technologies and design processes.*

UNIT – I

Introduction To Sanitary Engineering: Sanitation; Conservancy and water carriage systems – sewage and storm water estimation – time of concentration – storm water Overflows combined flow characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. Equations, design of sewers - Sewer appurtenances – Man holes, Drop man holes, Lamp holes, Flushing tanks, Inverted syphons; Street inlets; Catch basins

UNIT – II

Primary Treatment of Sewage: Layout and general out line of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design

UNIT – III

Secondary Treatment of Sewage: Biological treatment – Trickling filters – Standard and high rate - Activated sludge process; Principle of action; Activated sludge process vs. Trickling filter process; Sewage Disposal: Objects; Methods; Disposal by dilution; Disposal by irrigation; Sewage sickness; Reuse of treated sewage; Ground water recharge.

UNIT – IV

Sludge Treatment and Disposal: Characteristics of sewage sludge - Sludge digestion – factors effecting the sludge digestion – Sludge disposal by drying – sludge thickening - sludge conditioning - methods of dewatering the sludge - methods of sludge disposal.

UNIT – V

Urban Solid Waste Management: Sources of the solid waste - Quantities and characteristics of the solid waste - Classification; Collection and transportation - Recovery and reuse - Treatment methods of the solid waste: composting, incineration, sanitary landfill and pyrolysis.

TEXT BOOKS :

1. K. N. Duggal, "Elements of Environmental Engineering", Vol. II, 7th ed., S.Chand & Company Ltd., New Delhi, 2010.
2. S. K. Garg; "Environmental Engineering", Vol.-II, 4th ed., Khanna Publishers, Delhi, 2005.

REFERENCE BOOKS:

1. Met Calf & Eddy, "Wastewater Engineering Treatment, Disposal & Reuse", 2nd ed., Tata Mc. Graw – Hill publishing Co. Ltd., New Delhi, 2001.
2. Peavy and Rowe, "Environmental Engineering", Vol.-I, 4th ed., McGrawhill, Newyork, 1998.
3. Ministry of Works and Housing, "Manual on Sewerage & Sewage treatment", 2nd ed., CPH and EEO, Govt. of India, New Delhi,1996.
4. C. S. Rao, "Environmental pollution control engineering", Vol.-I, 5th ed., Wiley Eastern Limited, New Delhi, 2006.

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CE328 WATER RESOURCES ENGINEERING – II

(Dept.Elective-II)

Course Description and Objective:

Student is expected to plan and design reservoirs and dams at the end of the course.

Course Outcomes:

- *Selection of Cross drainage work, Analyze gravity and earth dam and spillways*
- *Planning a Reservoir*
- *Fundamentals of Hydropower engineering*

UNIT – I

Stream Gauging : Necessity; Selection of gauging sites; Methods of discharge measurement; Area-Velocity method; Measurement of velocity; Floats – Surface floats, Sub–surface float or Double float, Twin float, Velocity rod or Rod float; Pitot tube; Currentmeter; Measurement of area of flow; Measurement of width - Pivot point method; Measurement of depth – Sounding rod, Echo-sounder.

Cross Drainage Works : Introduction; Types of cross - drainage works; Selection of suitable type of cross - drainage work; Classification of Aqueducts and Syphon Aqueducts; Selection of a suitable type.

UNIT – II

Reservoir Planning: Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Reservoir sedimentation; Life of reservoir; Reservoir sediment control; Multipurpose reservoir, flood routing; Methods of flood routing-Graphical Method (Inflow – storage discharge curves method), Trial and error method.

UNIT – III

Dams in General : Introduction; Classification; Gravity dams, Arch dams, Buttress dams, Earth dams and rock fill dams; Physical factors governing selection of type of dam and selection of site for a dam.

Gravity Dams : Introduction; Forces acting on a gravity dam; Modes of failure and criteria for stability requirements; Stability analysis; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam; High and low gravity dams;Design of gravity dams–single step method; Galleries; Joints; Keys and water seals;

UNIT – IV

Earth Dams: Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams; Section of an earth dam; Design to suit available materials; Seepage control measures; Slope protection.

Spillways : Introduction; Types of spillways; Profile of ogee spillway; Energy dissipation below spillways for relative positions of jump height curve and tail water curve; Stilling basins; Indian standards on criteria for design of hydraulic jump type stilling basins with horizontal and slopping aprons; Spillway crest gates-Types and description only.

UNIT – V

Water Power Engineering : Introduction; Hydropower - Advantages & disadvantages; Estimation of hydro-power; Flow duration curve; Power duration curve; Load curve; Load factor; Capacity factor; Utilization factor; Diversity factor; Load duration curve; Firm Power; Secondary power; Types of hydel schemes; Forebay; Intake structures; Penstocks; Surge tank; Tail race; Turbines; Selection of suitable type of turbine.

TEXT BOOKS:

1. Dr. B.C. Punmia & Dr. Pande B.B. Lal, “Irrigation and water power Engineering”, Laxmi Publications Pvt. Ltd., New Delhi, 12th ed., Laxmi Publication, 1992.
2. S. K. Garg, “Irrigation Engineering and Hydraulic Structures”, 23rd ed., Khanna Publishers, Delhi, 2009.

REFERENCE BOOKS:

1. Dr. P.N. Modi, “Irrigation, Water Resources & Water Power Engineering”, 7th ed., Standard Book House, New Delhi, 2008.
2. K. Subramanya, “Engineering Hydrology”, 3rd ed., Tata Mc Graw Hill, New Delhi, 2010.
3. M.M. Dandekar and K. K. Sharma, “Water Power Engineering”, 4th ed., Vikas Publishing House Pvt. Ltd., New Delhi.

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CE330 ADVANCED REINFORCED CONCRETE DESIGN

(Dept. Elective - II)

Course Description and Objective:

The course is prepared to know the advance procedures to design reinforced concrete structures like Grid floors, raft foundation, water tanks and beams.

Course Outcomes:

- *Design Raft foundation using grid beams*
- *Design underground and elevated water tanks*
- *Design bunkers and silos*

UNIT – I

Grid Floors: Introduction, Analysis and Design of Grid Floors.

Raft Foundation: Introduction**,** Analysis and Design of Raft Foundation using grid beams.

UNIT – II

Underground Circular water tanks: Design of Underground Circular water tanks, Design of elevated INTZ Tanks including staging.

UNIT – III

Flat slabs: Design of flat slabs

UNIT – IV

Bunkers And Silos: Design of rectangular and circular bunkers; design of silos.

UNIT – V

Yield line Theory: Introduction; assumptions; analysis by virtual work method; analysis by equilibrium method; analysis and design of simply supported square, rectangular slabs.

TEXT BOOKS:

1. N.Krishna Raju, “Advanced Reinforced Concrete Design”, 2nd ed., CBS Publishers, 2007.
2. H.J Shah, “Reinforced Concrete”, Volume II, 4th ed., Charotar, 2002.

REFERENCE BOOKS:

1. P.C. Varghese, “Advanced Reinforced Concrete Design”, 2nd ed., PHI, 2009.
2. S. S. Bhavikatti, “Advanced Reinforced Concrete Design”, (Vol-II), 6th ed., New age international, 2002.

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		3	1	-	4	4

CE332 PRESTRESSED CONCRETE

(Dept. Elective - II)

Course Description and Objective:

The primary objective of this course is to equip the student with the knowledge of prestressed concrete designs and its related IS codes practice in the design.

Course Outcomes:

- design a prestressed concrete beam accounting for losses
- design the anchorage zone for post tensioned members
- design composite members
- deflections of prestressed concrete beams
- introduction to design water tanks

UNIT – I

Introduction: Historic development – General principles of prestressing pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics. I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning – Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

UNIT – II

Losses of prestress : Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

UNIT – III

Flexure : Analysis of sections for flexure in accordance with elastic theory-Allowable stresses-Design criteria as per I.S code of practice –Elastic design of Beams (rectangular, I and T sections) for Flexure –Introduction to partial prestressing.

UNIT – IV

Shear, bond, Bearing and Anchorage: Shear in PSC beams –Principal stresses – Conventional elastic design for shear-transfer of prestress in pretensioned member transmission length –Bond stresses-bearing at anchorage –Anchorage zone stresses in post tensioned members-Analysis and design of end blocks by Guyon, Magnel and approximate methods – Anchorage zone reinforcements.

UNIT – V

Composite section: Introduction – Analysis of stress – Differential shrinkage – General designs considerations.

Deflections of prestressed concrete beams: Importance of control of deflections – factors influencing deflections – short term deflections of uncracked member prediction of long term deflections.

TEXT BOOKS :

1. Krishna Raju, “Prestressed Concrete”, 4th ed., Tata McGraw Hill Publications, 2009.
2. N.Rajasekharan, “Prestressed Concrete”, 3rd ed., Narosa Publications, 1999.

REFERENCE BOOKS :

1. Ramamrutham, “Prestressed Concrete”, 12th ed., Dhanpatrai Publications, 2000.
2. T.Y. Lin & Ned H.Burns, “Design of Prestressed Concrete Structures”, 4th ed., John Wiley & Sons, 2000.
3. Codes**:** BIS code on prestressed concrete, IS 1343.

B.Tech	III Year	L	T	P	To	C
		-	-	3	3	2

CE334 COMPUTER AIDED ANALYSIS AND DESIGN OF STRUCTURES LAB

Course Description and Objective:

Students are required to analyze and design the following structures using software package like STAAD Pro.

Course Outcome:

- *Design of structural elements using STAAD Pro softaware*

1. (At least five of the following)

1. Analysis and design of simply supported continuous beam.
2. Analysis and design of fixed end supported continuous beam.
3. Analysis of single storey unsymmetrical portal frame
4. Analysis and design of plane frame subjected to gravity loads and Lateral load (wind load)
5. Analysis and design of plane roof truss
6. Detailing of continuous beam
7. Detailing of isolated footing and R.C.C footing with steel column.

2. (At least four of the following)

1. Design of one-way and two way slabs.
2. Design of Retaining wall.
3. Design of Pile foundation.
4. Detailing of welded column base.

3. (At least one of the following)

1. Analysis and design of two-storied R.C.C.Framed building.
2. Analysis and design of Industrial steel building.

B.Tech	III Year	L	T	P	To	C
		-	-	3	3	2

CE336 ENVIRONMENTAL ENGINEERING LAB

Course Description and Objective:

Students are expected to determine water quality, properties of wastewater and its analysis.

Course Outcomes:

- *Determine physical*
- *chemical and biological characteristics of water and wastewater*
- *Determine optimum dosage of coagulant*
- *Assess the quality of water and wastewater*

Note: A minimum of ten (10 No.) shall be done and recorded

1. Determination of total, suspended and dissolved solids in water / sewage sample.
2. Determination of fixed and volatile solids in water / sewage sample.
3. Determination of Settle able Solids.
4. Determination of turbidity of water / sewage sample.
5. Determination of ---pH value of water / sewage sample.
6. Determination of optimum dose of coagulant.
7. Determination of residual chlorine.
8. Determination of temporary and permanent hardness of water sample.
9. Determination of chloride concentration of water / sewage sample.
10. Determination of acidity of water sample.
11. Determination of alkalinity of water sample.
12. Determination of fluorides in water sample.
13. Determination of Dissolved Oxygen of water / sewage sample.
14. Determination of Biochemical Oxygen Demand (BOD) of waste water.
15. Determination of Chemical Oxygen Demand (COD) of waste water.

VFSTR UNIVERSITY

IV Year - B.Tech

SYLLABUS

I SEM & II SEM

B.Tech	IV Year	L	T	P	To	C
		4	-	-	4	4

CE 425 ESTIMATION & CONSTRUCTION PLANNING

Course Description and Objective:

By the end of the course students will be in a position to estimate quantities of various items of a residential building. He will also be in a position to estimate the earth work required in roads and canals. He will be able to calculate rates of various items of work. He will learn the methods of building valuation and rent fixation.

Course Outcomes:

- *Prepare quantity estimates for buildings*
- *roads, rails and canal works*
- *Calculate the quantity of materials required for civil engineering works as per specifications*
- *Evaluate contracts and tenders in construction practices*

UNIT – I

Procedure of Estimating : Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement.

Methods of Building Estimates : Individual wall method; Centre line method; Arch masonry calculation; Estimate of steps.

UNIT – II

Estimate of Buildings : Centre line method - Estimate of residential building ;Estimate of a building from line plan.

Estimate of Buildings : Individual Wall Method - Estimate of residential building; Estimate of a building from line plan.

UNIT – III

Estimate of RCC works : Standard hooks and cranks; Estimate of RCC slab; RCC beam; RCC T–beam slab and RCC column with foundation.

Road Estimate : Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections; Estimate of earthwork in hill roads.

Canal Estimate : Earthwork in canals–different cases; Estimate of earthwork in irrigation channels.

UNIT – IV

Specifications : Purpose and method of writing specifications; General specifications. Detailed Specifications for Brick work; R.C.C; Plastering; Mosaic Flooring; R.R.Stone Masonary.

Analysis of Rates : Task or out – turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work:

i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) CC flooring vi) White washing.

UNIT – V

PWD Accounts and Procedure of Works : Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

Valuation : Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for estimating cost depreciation; Valuation of building.

Miscellaneous Topics : Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.

TEXT BOOK :

1. B.N. Dutta, “Estimating & Costing in Civil Engineering”, 22nd ed., U.B.S. Publishers & Distributors, New Delhi, 2001.

REFERENCE BOOK :

1. S. C. Rangwala, “Valuation of Real properties”, 12th ed., Charotar Publishing House, Anand, 2002.

B.Tech	**IV Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE427 TRANSPORTATION ENGINEERING

Course Description and Objective:

At the end of this course, students are expected to know planning of highways, fixing of the best alignment, design of various Geometric elements, pavement design, and construction of the roads. Also the students are expected to design surface drainage system for pavements.

Course Outcomes:

- *Plan highway networks*
- *Design highway geometrics*
- *Design Intersections and prepare traffic management plans*
- *Design flexible and rigid pavements*
- *understand the principles of construction and maintenance of highways*

UNIT – I

Highway Development and Planning: Brief Introduction; necessity of highway planning; surveys; preparation of master plan; highway planning in India.

Highway alignment: Factors controlling alignment; Engineering surveys, Drawings & reports.

UNIT – II

Highway Geometric Design: Highway cross section elements; Sight distance; Design of horizontal alignment; Design of vertical alignment.

Highway materials: Sub grade soils- CBR tests; Stone aggregates; Bitumen materials; Paving mixes.

UNIT – III

Design of Highway Pavements: Design factors; Design of flexible pavements – IRC method, IRC recommendations; Design of Rigid pavements - Westergard's stress equation for wheel loads and temperatures stress; IRC recommendations.

UNIT – IV

Highway construction and maintenance: Construction of water bound macadam roads; Bituminous pavements and cement concrete pavements; Construction of joints in cement concrete pavements; Maintenance of highways- Water bound macadam roads, Bituminous pavements, Cement concrete pavements,Highway drainage.

UNIT – V

Traffic engineering: Basic Parameters of Traffic-Volume, Speed and Density-Traffic Volume Studies- Data Collection and Presentation-speed studies-Data Collection and Presentation

Design of Traffic Signals –Webster Method –IRC Method.Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design criteria-Types of Grade Separated Intersections.

TEXT BOOKS :

1. S. K. Khanna & C. E. G. Justo , “Highway Engineering”, 8th ed., Nemchand & Brothers, Roorkee, 2001.
2. Partha Chakroborty & Animesh Das, “Principles of Transportation Engineering”, 2nd ed., Prentice Hall of India, New Delhi, 2003.

REFERENCE BOOKS :

1. G. Venkatappa Rao, “Principles of Transportation Engineering and Highway Engineering”, 3rd ed., Tata Mc Graw-Hill Publishing Company Limited, New Delhi, 2000.
2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna publications – 6th Edition – 1997

B.Tech IV Year	L	T	P	To	C
	4	-	-	4	4

CE429 ENGINEERING GEOLOGY

Course Description and Objective:

The course is intended to explore the scope of geology in terms of Civil Engineering applications and to explain the geological agents and their role in constantly moulding the surface of the earth.

Course Outcomes:

- *Understand weathering process and mass movement*
- *Distinguish geological formations*
- *Identify geological structures and processes for rock mass quality*
- *Identify subsurface information and groundwater potential sites through geophysical investigations Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels*

UNIT - I

Introduction : Branches of Geology, Importance of geology from Civil Engineering Importance of Physical geology, Petrology and Structural geology.

Physical Geology : Weathering -process with reference to dams, reservoirs and tunnels weathering of common rock like "Granite".

Mineralogy : Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Physical properties of minerals. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartz , Flint, Jasper, Olivine , Augite , Hornblende, Muscovite , Biotite , Asbestos, Chlorite , Kyanite, Garnet, Talc, Calcite. Study of other common economic minerals such as Pyrite, Hematite,Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

UNIT - II

Petrology : Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common tructures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laerite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble.

UNIT – III

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types. Earthquakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and land slides.

UNIT – IV

Geophysical methods: Importance of geophysical studies principles of geophysical study by gravity methods. Magnetic methods, electrical methods. Seismic methods, radio metric methods and geothermal method. special importance of electrical resistivity methods and seismic refraction methods.

UNIT – V

Geology of Dams and Reservoirs: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors Contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs.

Tunnels: Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations in tunneling, over break and lining in tunnels.

TEXT BOOKS:

1. K.V.G.K. Gokhale, “Principals of Engineering Geology”, 1st ed., B.S Publications, New Delhi, 2005.

2. N.Chennakesavulu, “Engineering Geology”, 2nd ed., MacMillan, India Ltd., New Delhi, 2009.

REFERENCE BOOKS:

1. D.Venkata Reddy, “Engineering Geology for Civil Engineers”, 1st ed., Oxford & IBM Publishing Company Pvt. Ltd., New Delhi., 1997.

2. Parbin Singh, “Engineering & General Geology”,6th ed., S.K.Kataria & Sons, NewDelhi, 2001.

3. F.G. Bell, “Fundamental of Engineering Geology”, 1st ed., B.S Publications, New Delhi, 2005.
4. Krynine & Judd, “Principles of Engineering Geology & Geotechnics”, 1st ed., MC Graw-Hill Book Company, 1957.

B.Tech	**IV Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE431 FINITE ELEMENT METHODS IN CIVIL ENGINEERING

(Dept. Elective -III)

Course Description and Objective:

This course deals with the theory and application of the finite element methods for analyzing structural systems and other civil engineering problems. To equip the students with the Finite Element Analysis fundamentals. To enable the students to formulate the design problems into FEA.

Course Outcomes:

- *Develop shape functions and stiffness matrices for spring and bar elements*
- *Develop global stiffness matrices and global load vectors*
- *Apply natural and arial coordinate systems to constant strain triangle and linear strain triangle elements*

UNIT – I

Introduction: A brief history of FEM, Need of the Method, Finite Difference Method, Equilibrium equations, linear strain-displacement relations; linear constitutive relations– Plane stress and plane strain.

UNIT – II

Finite Element formulation technique: Virtual Work and Variational Principle, Galerkin Method, Finite Element Method: Displacement Approach, Stiffness Matrix and Boundary Conditions, Potential energy; Principle of stationary potential energy

UNIT –III

Element Properties: One Dimensional FEM: Stiffness matrix for bar element

- shape functions for one-dimensional elements – one-dimensional problems. Two Dimensional FEM: Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates.

UNIT – IV

Direct Stiffness method and Solution Technique : Assemblage of elements– Obtaining Global stiffness matrix and Global load vector; Governing equilibrium equation for static problems; Application of boundary conditions; Solution to resulting simultaneous equations using Gauss elimination method.

UNIT – V

Solution to one- and two- dimensional problems: Solution to plane truss, plane-frame, plane-stress and plane-strain problems. Axis-symmetric analysis- Basic principles-Formulation of 4-node isoparamatric axis-symmetric element, Gauss Quadrature, Numerical integration

TEXT BOOKS:

1. C.S.Krishna Murthy, “Finite Element Analysis”, 2nd ed., Tata McGraw-Hill Publishing Company Ltd., 2009.
2. S. S.Rao, “The finite element method in engineering”, 3rd ed., Butterworth- Heinemann, New Delhi, 2000.

REFERENCE BOOKS :

1. S.S. Bhavakatti, “Finite element analysis”, 2nd ed., New age International Publishers, 2010.
2. Robert D. Cook et al, Concepts and Application of Finite Element Analysis, Fourth Edition, John Wiley &jons (Asia) Pte. Ltd.,.

B.Tech IV Year

L	T	P	To	C
4	-	-	4	4

CE433 GROUND WATER DEVELOPMENT & MANAGEMENT

(Dept. Elective - III)

Course Description and Objective:

The student is expected to have thorough knowledge on occurrence and movement of ground water, analyzing the data of pumping test and artificial recharge of ground water at the end of the course.

Course Outcomes:

- *Evaluate groundwater resources using geophysical methods*
- *Estimate aquifer parameters*
- *Model regional groundwater flow and design water wells*
- *Design water wells*

UNIT – I

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT – II

Ground Water Movement: Permeability, Darcy's law, storage coefficient. Transmissivity, differential equation governing ground water flow in three dimensions, derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

UNIT – III

Analysis of Pumping Test Data – I: Steady flow groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theim's equations, Assumptions, Formation constants, yield of an open well.

UNIT – IV

Analysis of Pumping Test Data – II: Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jocob and Chow's simplifications, Leak aquifers. Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

UNIT – V

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies. Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion.,Groundwater Basin Management: Concepts of conjunction use, Case studies.

TEXT BOOKS:

1. David Keith Todd, "Ground water Hydrology", 6th ed., John Wiley & Son, New York, 2001.
2. H.M.Raghunath, "Groundwater", 5th ed., Wiley Eastern Ltd., 2002.

REFERENCES BOOKS:

1. R.Willes & W.W.G.Yeh, "Groundwater System Planning & Management", 4th ed., Printice Hall, 1998.
2. C.W.Fetter, "Applied Hydrogeology", 7th ed., CBS Publishers & Distributers, 2002.

B.Tech	IV Year	L	T	P	To	C
		4	-	-	4	4

CE435 REMOTE SENSING AND GIS APPLICATIONS

(Dept. Elective - III)

Course Description and Objective:

These sensors collect data in the form of images and provide specialized capabilities for manipulating, analyzing, and visualizing those images. Remote sensed imagery is integrated within a GIS. A geographic information system (GIS) is a computer-based tool for mapping and analyzing features and events on earth. GIS manages location based information and provides tools for display and analysis of various statistics, including population characteristics, economic development opportunities, and vegetation types.

Course Outcomes:

- *Retrieve the information content of remotely sensed data*
- *Analyse the energy interactions in the atmosphere and earth surface features*
- *Interpret the images for preparation of thematic maps*
- *Analyze spatial and attribute data for solving spatial problems*

UNIT – I

Basic Principles: Introduction, Electromagnetic waves and their properties, interaction with Earth surface materials, recent developments in Remote sensing, Social and legal implications of Remote Sensing, status of Remote Sensing.

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

UNIT – II

Data Acquisition Platforms & Sensors: Introduction, Characteristics of imaging and remote sensing instruments, satellite remote sensing system – a brief over view, other remote sensing satellites.

Pre-Processing Of Remotely Sensed Data: Introduction, cosmetic operation; Geometric connection and registration, atmospheric correction.

UNIT – III

Digital image processing: Digital image and its characteristics, satellite data formats, Image rectification and restoration, Image Enhancement- Contrast Manipulation, Spatial Feature Manipulation, Multi-image manipulation, Image Classification- Unsupervised and Supervised Classification, Classification Accuracy, Details of digital image processing software packages.

UNIT - IV

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT – V

Applications of remote sensing in Natural resources management, Environmental impact assessment and water resources management.

TEXT BOOKS:

1. LRA Narayana, "Remote Sensing and its applications" 3rd ed., University Press, 1999.
2. C.P.Lo. & Albert K.W. Yonng, "Concepts & Techniques of GIS", 2nd ed., Prentice Hall (India) Publications, 2009.

REFERENCE BOOKS:

1. John R Jensen, "Introductory Digital Image Processing, A Remote Sensing Prospective", 4th ed., Printicehall, 1986.
2. Paul Jumani, "Principles of Remote Sensing", 4th ed., ELBS, 1985.
3. Peter A Burragh and Rachael A. Mc Donnell, "Principals of Geo physical Information Systems", 1st ed., Oxford Publishers, 2010.
4. M.Anji Reddy, "Remote Sensing and Geographical Information systems", 3rd ed., B.S.Publications, 2010.
5. S.Kumar, "Basics of Remote sensing & GIS", 1st ed., Laxmi Publications, 2005.

B.Tech	IV Year	L	T	P	To	C
		4	-	-	4	4

CE437 AIR POLLUTION AND CONTROL

(Dept. Elective - IV)

Course Description and Objective:

This course serve to provide the student with an introduction or refresher in the basics of air pollution control. After completing this course, the student should be familiar with the various interrelated aspects of air pollution control, understand the basic terminology, and have a rudimentary understanding of some of the technical aspects of regulating, measuring, and controlling air pollution. The student will find links to the Environmental Protection Agency (EPA) Web site for further research in the air pollution control field.

Course Outcomes:

- *Identify sampling and analysis techniques for air quality assessment*
- *Describe the plume behaviour for atmospheric stability conditions*
- *Apply plume dispersion modelling and assess the concentrations*
- *Design air pollution controlling devices*

UNIT – I

Introduction to air pollution : Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution-stationary and mobile sources.

UNIT – II

Effects of air pollution: Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT - III

Air pollution Modeling : Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SOx, NOx, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion.

UNIT – IV

Meteorology of air pollutants : Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams. Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

UNIT - V

Control of air pollution : Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators. General Methods of Control of NOx and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.,Air Quality Management – Monitoring of SPM, SO; NO and CO Emission Standards.

TEXT BOOKS:

1. M.N.Rao and H.V.N.Rao , "Air pollution controlling" ; Vol.-I, 4th ed. , Tata Mc.Graw Hill Company,1998.
2. Wark and Warner, "Air Pollution", Vol.-II, 6th ed., Harper & Row, New York, 1996.

REFERENCE BOOK:

1. R.K. Trivedy and P.K. Goel , "An introduction to Air pollution", Vol.-I, 1st ed., B.S. Publications, 2005

B.Tech	IV Year	L	T	P	To	C
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CE439 GROUND IMPROVEMENT TECHNIQUES

(Dept. Elective - IV)

Course Description and Objective:

At the end of course work the student is expected to learn various techniques of insitu ground modification. He is also expected to know other stabilization techniques depending upon the soil characteristics.

Course Outcomes:

- *Identify ground conditions and suggest method of improvement*
- *Design and assess the degree of improvement*
- *understand the principles of soil reinforcement and confinement in engineering constructions*
- *Design reinforced soil structures*

UNIT – I

Ground Improvement in Cohesion less Soil: Need for Ground Improvement, Objectives of Ground Improvement, Different types of problematic soils, and emerging trends in ground Improvement.

Shallow and deep compaction: Requirements, Principles and methods of soil compaction, Shallow compaction and methods. Properties of compacted soil and compaction control, Deep compaction and Vibratory methods, Dynamic compaction.

UNIT - II

Ground Improvement in Cohesive Soil: Drainage and Dewatering: Drainage techniques - Well points - Vacuum and electro osmotic methods,Preloading with and without vertical drains: Compressibility, vertical and radial consolidation, preloading methods. Types of Drains, Design of vertical Drains, Construction techniques,Stone Column: Function Design principles, load carrying capacity, construction techniques, settlement of stone column foundation.

UNIT - III

Geosynthetics & Reinforced Earth: Geosynthetics: Introduction, Types of Geosynthetics, Functions and applications of different Geosynthetics. Geotextiles: Types of Geotextiles, tests for Geotextiles.

Reinforced Earth: Principles, components of reinforced earth, design principles of reinforced earth walls.

UNIT - IV

Soil Stabilization: Mechanical Stabilization: Soil aggregate mixtures, properties and proportioning techniques, soft aggregate stabilization,Cement Stabilization: Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques, Lime and Bituminous Stabilization: Type of admixtures, mechanism, factors affecting, design of mixtures, construction methods.

UNIT - V

Grouting: Types of grouts - Grouting equipment and machinery - Injection methods – Grout Monitoring – Stabilization with Cement, Lime and Chemicals - Stabilization of Expansive Soils.

Foundations in Expansive Soils: Identification of expansive soil; Field conditions that favour swelling; consequences of swelling; Different alternative foundation practices in swelling soils; Construction practice of UR piles in swelling soils.

TEXT BOOKS:

1. Purushothama Raj. P, “Ground Improvement Techniques”, 2nd ed., Laxmi Publications (p) Ltd., New Delhi, 1998.
2. Craig, R.F., “Soil Mechanics”, 3rd ed., Van Nostrant Reinhold Co.,New York, 1993.

REFERENCE BOOKS:

1. Moseley M.P., “Ground Improvement Blockie Academic and Professional”, 2nd ed., Chapman and Hall, Glasgow, 1993.
2. Jones J.E.P., “Earth Reinforcement and Soil Structure”, 3rd ed., Butterworths, 1995.

B.Tech	IV Year	L	T	P	To	C
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CE441 RAILWAY AND AIRPORT ENGINEERING

(Dept. Elective - IV)

Course Description and Objective:

In Railway Engineering, the students are taught various components of permanent way, design of geometric elements of railway track and types of stations and yards and signaling and control systems in railways. In Air transportation the growth of air transport, aircraft characteristics, planning of airports, imaginary surfaces, and the design of runways are dealt.

Course Outcomes:

- *Design and analyze the railway track system*
- *Understand the process of execution of railway projects*
- *Carryout the geometrical design of the airport infrastructure*
- *Prepare structural designs of runway*
- *taxiway, and apron-grate area*

UNIT - I

Introduction: Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways.

Railway Track Permanent way: Gauges in Railway track, Railway track cross – section; Coning of wheels.

Rails & Rail Joints: Functions of rails; Requirements of rails; Types of rails sections; Standard rail sections; Length of rails; Rail failures; Wear on rails, Requirements of an ideal joint; Types of rail joints; Welding of rails.

Sleepers: Functions of sleepers; Requirements of sleepers; Classification of Sleepers – Timber sleepers, Metal sleepers & Concrete sleepers; Comparison of different types of sleepers.

UNIT – II

Fish Plates: Fish plates, section of fish plates, failure of fish plates.

Ballast: Functions and requirements of ballast; Types of ballast; Renewal of ballast.

Geometric Design of Track: Necessity; Gradients & Grade Compensation; Elements of horizontal alignment; Super elevation; Cant deficiency and Cant excess; Negative Super elevation; Length of Transition Curve, Length of vertical curve.

UNIT – III

Points And Crossings: Functions of components of turnouts; Crossings.

Stations And Yards: Site selection for railway station; Requirements of railway station; Classifications; Station yards; Level crossings.

Signaling: Objects of signaling; Classification of signals; Controlling- absolute block system. Standards of inter locking.

UNIT – IV

Introduction to Airport Planning: Development of air transportation system with particular reference to India; Air craft components; Air–craft characteristics.

Airport planning and layout: Selection of site; Apron; Hangar; Typical airport layouts; Airport markings; Airport lighting; Drainage systems.

Airport Obstruction: Zoning laws; Classification of obstructions; imaginary surfaces; Approach zone; Turning zone.

UNIT – V

Runway Design: Runway orientation; Basic runway length; Corrections for elevation, temperature and gradient; Runway geometric design.

Specifications for Structural Design of Airport Pavements: Design factors methods for flexible and rigid pavements; LCN system of pavement design.

TEXT BOOKS:

1. S.C.Saxena and S.Arora, “Railway Engineering”, 12th ed., Dhanpat Rai & Sons, 2009.
2. S. K. Khanna & M. G. Arora, “Airport Planning and Design”, 16th ed., Nemchand & Bros, Roorkee, 2007.

REFERENCE BOOKS:

1. M.M.Agarwal, “Railway Engineering” 1st ed., Prabha & Co., New Delhi, 2010.
2. G.V.Rao, “Airport Engineering”, 2nd ed., Tata Mc Graw Hill, New Delhi, 2000.

B.Tech	**IV Year**	**L**	**T**	**P**	**To**	**C**
		-	-	3	3	2

CE443 ENGINEERING GEOLOGY LAB

Course Description and Objective:

To provide hands on experience on identification, methods to find properties of various geographical materials.

Course Outcomes:

- *Identify minerals and rocks*
- *Measure strike and dip of the bedding planes*
- *Interpret geological maps*

1. Physical Properties of Minerals
2. Physical Properties of Rocks
3. Identification of Minerals in Hand Specimen
4. Identification of Rocks in Hand Specimen
5. Identification of Geological features through wooden Models
   a) Structural Geological Diagrams
   b) Petrological Diagrams
   c) Engineering Geological Diagrams
6. Interpretation of Geological Map (10 Nos.)
7. Study of Satellite Imageries
8. Determination of Strike and Dip of formations
9. Electrical Resistivity Method
10. Seismic Hammer Sounding Method
11. Study of Structural Models
12. Study of Tunnel Models
13. Study of Survey of India Topographical Maps

Note : A minimum of Eight (08 Nos) shall be done and recorded

B.Tech	**IV Year**	**L**	**T**	**P**	**To**	**C**
		-	-	3	3	2

CE445 QUANTITY ESTIMATION & PROJECT MANAGEMENT LAB

Course Description and Objective:

Students are required to analyze and design the following structures using software package like MS EXCEL.

Course Outcome:

- *Design and estimate civil engineering exercise using Excel.*

Quantity Surveying

*(At least **SIX** of the following using softwares like MS Excel/ Qty./Road Estimate/ Super Rate analysis etc.)*

1. Quantity estimation of a single storey residential building (different items).
2. Cost estimation of a single storey residential building.
3. Quantity estimation of a B.T.Road (different items).
4. Cost estimation of a B.T.Road.
5. Quantity estimation of a Canal (different items).
6. Cost estimation of a Canal.
7. Find out the labour requirement and preparing the Rate Analysis for different items of work.
   a) C.C
   b) R.C.C
   c) Brick work
   d) Flooring

Project Management

*(Any **THREE** of the following using softwares like MS Project / Primavera etc.)*

1. Preparing the Project management report for a single storey residential building/Road/Canal by using the Bar Chart/Mile stone chart.
2. Preparing the Project management report for a single storey residential building by using the network technique (PERT/CPM).
3. Preparing the Project management report for a B.T.Road by using the network technique (PERT/CPM).

4. Preparing the Project management report for a Canal by using the network technique (PERT/CPM).

Quantity Estimation

*(At least **THREE** of the following by using softwares like MS Excel)*

1. Quantity estimation of RCC roof slab and preparing schedule of bars.
2. Quantity estimation of RCC beam and preparing schedule of bars.
3. Quantity estimation of RCC Column with foundation footing and preparing schedule of bars.
4. Quantity estimation of RCC retaining wall and preparing schedule of bars.

B.Tech	IV Year	L	T	P	To	C
		-	-	3	3	2

CE447 TRANSPORTATION ENGINEERING LABORATORY

Course Description and Objective:

Students are expected to conduct the experiments on Aggregates, Bituminous materials and mixes and also on subgrade soils to find out their properties.

Course Outcome:

- *Characterize the pavement materials*
- *Perform quality control tests on pavements and pavement materials.*

Tests on Aggregates

1. Aggregate Crushing value test.
2. Aggregate impact value test.
3. Los Angeles abrasion test.
4. Deval's attrition value test.
5. Shape test: a) Flakiness index test b) Elongation index test c) Angularity number test. .
6. Specific gravity Test.

Tests on Bituminous Materials

7. Penetration test.
8. Softening point test.
9. Flash and fire point test.
10. Ductility test.
11. Viscosity test.
12. Bitumen Extractions Test.
13. Specific gravity of Bitumen.

Test on Bituminous Mixes

14. Marshall stability test.

Test on Soil Sub-grade

15. California bearing ratio test

B.Tech	**IV Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE416 DESIGN & DRAWING OF HYDRAULIC STRUCTURES

(Dept. Elective - V)

Course Description and Objective:

At end of the course the student will be in a position to understand the design principles and able to design and draw the hydraulic structures.

Course Outcome:

- *Design of Tank sluice with tower head*
- *Design of surplus weir*
- *Design of canal regulator*

Design and drawing of the following hydraulic structures.

1. Sloping glacis weir.

2. Tank sluice with tower head
3. Type III Syphon aqueduct.
4. Surplus weir.
5. Trapezoidal notch fall.
6. Canal regulator.

Final Examination pattern:

Any two questions of the above six designs may be asked out of which the candidate has to answer one question. The duration of examination will be three hours.

TEXT BOOKS:

1. C.Satyanarayana Murthy, "Design of minor irrigation and canal structures", 3rd ed., Wiley Eastern Ltd., 1998.
2. S.K.Garg, "Irrigation engineering and Hydraulic structures", 4th ed., Standard Book House, 2002.

REFERENCE BOOKS:

1. Introduction To Water Resources And Waterpower Engineering, Dr. P N Modi , - Standard Publication, Delhi
2 Irrigation And Water Resources Engineering, By G L Asawa, - Pub:- New Age Int. Ltd.

B.Tech. IV Year	L	T	P	To	C
	4	-	-	4	4

CE418 EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Dept. Elective - V)

Course Description and Objective:

This course integrates information from various engineering and scientific disciplines in order to provide a rational basis for the design of earthquake-resistant structures.

Course Outcomes:

- *apply the basics of Earthquake Engineering*
- *demonstrate the dynamics of structural system under earthquake load*

- *analyze the influence of the structural / geometrical design in building characteristics*

UNIT-I:

Design forces for buildings : Introduction; Equivalent static method; Mode superposition technique; Dynamic inelastic-time history analysis; Advantages and disadvantages of these methods; Determination of lateral forces as per IS1893(Part 1) – Equivalent static method, Model analysis using response spectrum.

UNIT-II

Earthquake resistant design of a long two-storey , two-bay RCC building : Determination of lateral forces on an intermediate plane frame using Equivalent static methods and Model analysis using response spectrum; Analysis of the intermediate frame for various load combinations as per IS1893(Part 1); Identification of design forces and moments in the members; Design and detailing of typical flexural members ,typical column, footing and detailing of a exterior joint as per IS13920.

UNIT-III

Steel Buildings: Behavior of steel; Materials and workmanship; Steel frames – unbraced, braced; Ductile design of frame members; Flexural members; Frame members subjected to axial compression and bending; Connection design and joint behaviour ; Stee Panel zones; Bracing members

UNIT-IV

Seismic protection of structures: Introduction; Considerations for seismic isolation; Basic elements of seismic isolation; seismic-isolation design principle; Feasibility of seismic isolation; Seismicisolation configurations-Seismic dampers - Types of Dampers: Viscous, Friction, Yielding dampers – Seismic vibration control-Seismic Strengthening Measures.

UNIT-V

Ductility considerations in earthquake resistant design of RCC buildings: Introduction; Impact of ductility; Requirements for ductility; Assessment of ductility– Member/element ductility, Structural ductility; Factor affecting ductility; Ductility factors; Ductility considerations as per IS13920.

TEXT BOOKS :

1. Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrikhande, Prentice-Hall of India, 2006.
2. Seismic design of reinforced concrete and masonry buildings by T.Paulay and M.J.N.Priestley, John Wiley & Sons, 1991.

REFERENCE BOOKS:

1. Earthquake resistant design of structures by SK Duggal , Oxford University Press.2007
2. The seismic design handbook, Edited by F.Naeim, Kluwer Academic

B.Tech. IV Year	L	T	P	To	C
	4	-	-	4	4

CE420 TRAFFIC ENGINEERING

(Dept. Elective - V)

Course Description and Objective:

The course is meant to give a brief account on characteristics of vehicles, traffic analysis and traffic control systems. It also deals with various aspects of traffic management.

Course Outcomes:

- *Conduct traffic studies for estimating traffic flow characteristics*
- *Design of traffic signal*
- *caonduct accident studies*

UNIT - I

Traffic Characteristics: Road user's characteristics **-** general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory.

Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

UNIT - II

Traffic Studies : Spot Speed Studies, Volume Studies; Speed and Delay Studies**:** Purpose, causes of delay, methods of conducting speed and delay studies.

Origin and Destination Studies (O & D) : Various methods, collection and interpretation of data, planning and sampling.

Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service.

Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

UNIT - III

Traffic Operations and Control : Traffic regulations and various means of control - One way streets- advantages and limitations.

Traffic signals: Traffic signals, isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

UNIT - IV

Street Lighting : Design of street lighting system; Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors; Different types of light sources used for street lighting; Fundamental factors of night vision.

UNIT - V

Accident Studies : Causes of accidents, accident studies and records, condition and collision diagrams, preventive measures.

Expressways and freeways : problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

TEXT BOOK :

1. L.R. Kadiyali, "Traffic Engineering and Transport Planning", 5th ed., Khanna Publishers, Delhi, 2008.

REFERENCE BOOKS :

1. R.J. Slater,N.B. Hounsell, "Highway Traffic Analysis and Design", 12th ed., Palgrave Macmillan Publishers, 2001.
2. W.S.Smith & F.W. Hurd, "Traffic Engineering by Matson", 3rd ed., Mc Graw Hill Publishers, New York, 2002.
3. G.J. Pingnataro, "Principles of Traffic Engineering", 4th ed., Mc Graw Hill Publishers, New York, 2000.

B.Tech.	**IV Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE422 ENVIRONMENTAL IMPACT ASSESSMENT

(Dept. Elective - VI)

Course Description and Objective:

The course is designed to know the various environmental aspects like assessment of soil, surface water environment, impact of air pollution, which are essential to consider before establishment of any civil engineering projects at a particular location. It also deals with different legislative acts and environment audits regarding selection of location of the project.

Course Outcomes:

- *Identify the environmental attributes to be considered for the EIA study*
- *Formulate objectives of the EIA studies*
- *Identify the methodology to prepare rapid EIA*
- *Prepare EIA reports and environmental management plans*

UNIT – I

Basic concepts of EIA : Initial Environmental Examination; Elements of EIA; Factors affecting EIA; Impact evaluation and analysis; Preparation of Environmental Base map; Classification of Environmental parameters. EIA Methodologies; Introduction; criteria for the selection of EIA Methodology; EIA Methods: Ad-hoc methods, Matrix methods, Network method, Environmental media quality index method; Overlay methods; Cost/benefit Analysis.

UNIT – II

Impact of Developmental Activities and Land Use : Introduction and Methodology for the assessment of soil and ground water; Delineation of study area; Identification of activities. Procurement of relevant soil quality; Impact prediction; Assessment of Impact significance; Identification and Incorporation of mitigation measures.

UNIT – III

EIA in surface water, Air and Biological Environment : Methodology for the assessment of Impacts on surface water environment; Air pollution sources; Generalized approach for assessment of Air pollution Impact. Assessment of Impact of Development activities on vegetation and wildlife; Environmental Impact of Deforestation; Causes and effects of deforestation.

UNIT - IV

Environmental Audit and Environmental legislation : Objectives of Environmental Audit; Types of Environmental Audit; audit protocol; stages of Environmental Audit; On-site activities; Evaluation of Audit data and preparation of Audit report.

UNIT - V

Post Audit activities; The Environmental Pollution Act, The Water Act; The Air (Prevention and Control of Pollution) Act; Wild life protection Act. Case Studies and preparation of Environmental Impact Assessment statement for various industries.

TEXT BOOK :

1. Y. Anjaneyulu; "Environmental Impact Assessment Methodologies", Vol.-I, 2nd ed., B.S. Publication, Sultan Bazar, Hyderabad, 2007.

REFERENCE BOOKS :

1. J. Glynn and Gary W. Hein Ke, "Environmental Science and Engineering", Vol-I, 3rd ed., Prentice Hall Publishers,1998.
2. K. Dhameja, S.K. Kataria, "Environmental Science and Engineering", Vol-II, 2nd ed., Suresh & Sons Publications, New Delhi, 2001.
3. Dr. H.S. Bhatia, "Environmental Pollution and Control", Vol-I, 4th ed., Galgotia Publications Pvt. Ltd., 1998.

B.Tech. IV Year	L	T	P	To	C
	4	-	-	4	4

CE424 BRIDGE ENGINEERING

(Dept. Elective - VI)

Course Description and Objective:

The student is expected to know the various types of a bridge and its related specifications. Is also deals with design considerations of bridge and its substructure and foundation. (Working stress method is to be adopted for all designs)

Course Outcomes:

- *Design the slab culvert, Box culvert*
- *Design the T beam bridge and substructures*
- *Design the Bridge bearings.*

UNIT – I

Introduction & Investigation For Bridges : Components of a Bridge; Classification; Standard Specifications; Need for Investigation; Selection of Bridge Site; Preliminary Data to be Collected; Preliminary Drawings; Determination of Design Discharge; Economical Span; Location of Piers and Abutments; Vertical clearance above HFL; Scour depth; Traffic Projection; Choice of Bridge type; Importance of Proper Investigation.

UNIT – II

Concrete Bridges : Various types of bridges; I. R. C. Specifications for road bridges.

Culverts : Design of R. C. slab culvert.

UNIT – III

T – Beam Bridge : Pigeaud’s method for computation of slab moments; Courbon’s method for computation of moments in girders; Design of simply supported T – beam bridge.

UNIT – IV

Sub Structure For Bridges : Pier and abutment caps; Materials for piers and abutments; Design of pier; Design of abutment; Backfill behind abutment; Approach slab.

UNIT – V

Bearings For Bridges : Importance of bearings; Bearings for slab bridges; Bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.

Foundations For Bridges : Scour at abutments and piers; Grip length; Types of foundations; Design of well foundation.

TEXT BOOK :

1. Dr. Johnson Victor, “Essentials of Bridge Engineering”, 4th ed., Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2000.

REFERENCE BOOKS:

1. S. Ponnuswami, “Bridge Engineering”, 2nd ed., Tata Mc Graw Hill Publishing House, New Delhi, 2002.
2. T.R. Jagadeesh and M.A. Jayaram, “Design of Bridge Structures”, 2nd ed., PHI Learning Pvt. Ltd., New Delhi, 2010.
3. N. Krishna Raju, “Design of Bridges”, 4th ed., Oxford Publishnig Co. Pvt. Ltd., New Delhi, 2001.

B.Tech.	**IV Year**	**L**	**T**	**P**	**To**	**C**
		4	-	-	4	4

CE426 REPAIR & REHABILITATION OF STRUCTURES

(Dept. Elective - VI)

Course Description and Objective:

The course seeks to recognize the mechanisms of degradation of concrete structures, provide the students with the knowledge of available techniques and their application for

strengthening or upgrading existing structural systems. It also provides how to conduct field monitoring and non-destructive evaluation of concrete structures.

Course Outcomes:

- *Assess strength and materials deficiency in concrete structures*
- *Suggest methods and techniques used in repairing / strengthening existing concrete structures*
- *Apply Non Destructive Testing techniques to field problems*

UNIT-I

Introduction: Deterioration of structures with aging; Need for rehabilitation. Effects due to climat, temperature, chemicals , wear and erosion , design and construction errors , corrosion mechanism , Effects of cover thickness and cracking, Method of corrosion production., corrosion inhibitors , corrosion resistant steels , coatings , cathodic production Distress in concrete /steel structures Types of damages; Sources or causes for damages; effects of damages; Case studies.

UNIT-II

Structural Health Monitoring: An overview of Structural Health Monitoring, Structural Health Monitoring and Smart Materials, Structural Health Monitoring versus Non Destructive Testing, A broad overview of smart materials, Overview of Application potential of SHM.

UNIT-III

Maintenance and Repair Strategies: Definitions: Maintenance, Repair , Rehabilitation, Facets of maintenance , Importance of maintenance , preventive measures on various aspects , assessment procedure for evaluating damaged structure, causes of deterioration – Testing techniques.

UNIT-IV

Materials and Methods of Repair: Special concrete and mortar , Concrete chemicals , special elements for accelerator, strength gain, expansive cement , polymer concrete , sulphur infiltrated concrete , ferro cement, fibre reinforced concrete. Shortcreting; Grouting; Epoxy-cement mortar injection; Crack ceiling.

UNIT-V

Seismic Retrofitting of reinforced concrete buildings: Introduction; Considerations in retrofitting of structures; Source of weakness in RC frame building – Structural damage due to the discontinuous load path; Structural damage due to lack of deformation; Quality of workmanship and materials; Classification of retrofitting techniques; Retrofitting strategies for RC buildings – Structural level (global) retrofits methods; Member level (local) retrofit methods; Comparative analysis of methods of retrofitting.

TEXT BOOKS:

1. Diagnosis and treatment of structures in distress by R.N.Raikar, Published by R&D Centre of Structural Designers & Consultants Pvt.Ltd., Mumbai, 1994.
2. Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrikhande, Prentice-Hall of India, 2006.

REFERENCE BOOKS:

1. Handbook on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi, 2002.
2. Denison Campbell, Allen and Harold Roper , Concrete Structures, materials, maintenance and repair , Long man, Scientific and Technical UK 1991.

I

YEAR

COMPUTER SCIENCE AND ENGINEERING

B.Tech.

I SEMESTER

4	16HS103	-	Engineering Mathematics - I
4	16HS102	-	Engineering Physics
4	16HS105	-	Technical English Communication
4	16CS101	-	Basics of Computers and Internet
4	16CS102	-	Computer Programming
4	16EE101	-	Basics of Engineering Products
4	16HS104	-	English Proficiency and Communication Skills
4	16HS110	-	Engineering Physics Laboratory

II SEMESTER

4	16HS108	-	Engineering Mathematics - II
4	16HS107	-	Engineering Chemistry
4	16ME101	-	Engineering Graphics
4	16EE102	-	Basics of Electrical and Electronics Engg.
4	16HS111	-	Engineering Chemistry Laboratory
4	16HS109	-	Environmental Science and Technology
4	16EC202	-	Electronic Devices and Circuits
4	16ME103	-	Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS101 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of Matlab related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

ü *Solve given differential equation by suitable method.*

ü *Compute numerical solutions of differential equation by apt method.*

ü *Compute maxima/minima of given function.*

ü *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with Matlab output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*

UNIT - 1 **L- 9**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form : e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation: Partial derivatives, Partial derivatives of higher order, Homogeneous function, Euler's theorem, Total differential coefficient. Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS: Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L- 9**

PARTIAL DIFFERENTIAL EQUATIONS : Formation of Partial Differential Equations, Linear (Lagrange) Equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method.Second order linear equations with constant coefficients only, classifications, rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Basic mathematical operations using MatLab
2. Solving simple expressions
3. Limits
4. Continuity
5. Symbolic differentiation
6. Symbolic integration
7. Plotting of curves
8. Plotting of surfaces
9. Maxima & minima of functions of one variable
10. Maxima & minima of functions of two variable
11. Solving first order O.D.E.
12. Euler's Method and R-K Method

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd revised edition, S. Chand & Co., 2014
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MatLab", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill Education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	45	30	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibres, Photonics, Nano and funcational materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to :

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fibre which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

ü *Determine the velocity of ultrasonics in a given liquid using interferometer.*

ü *Study the wavelengths of light sources and lasers.*

ü *Estimate the efficiency of a given solar cell.*

ü *Learn about the type of the optical fibre and their ability to propagate light waves from its numerical aperture.*

ü *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves, Piezoelectric method, Properties of ultrasonic waves, Types of ultrasonic waves, Determination of Velocity of ultrasonic waves in solids and liquids, SONAR, Medical Applications.

NDT: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray Radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of Laser light, Spontaneous and Stimulated emission of radiation, He-Ne Laser, CO_2 Laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and Applications.

FIBER OPTICS: Principle of optical fibre, Acceptance angle, Numerical Aperture, Types of fibres, Dispersion and Attenuation in optical fibres, Optical fibre communication system, Fibre Optic sensors.

UNIT - 3 **L- 9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and Applications.

UNIT - 4 **L- 9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non-linear optical behaviour of materials, Applications.

UNIT - 5 **L- 9**

NANO MATERIALS: Introduction, Fabrication of nano materials, Ball milling, Sol-Gel, Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics / metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, TMH Publications, 2014
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd, 1992.
3. Sukhatme S.P, "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Finding height of a room using laser.*
- *Identifying the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measuring temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The teaching efforts in this course will be directed towards making students develop their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to :

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

ü *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

ü *Apply different sub skills like top down, bottoms up approachs to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

ü *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

ü *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

ü *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **Environmental Consciousness**
  (Climate Change – Green Cover – Pollution - Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles – Prepositions – Sentence Types and Construction
- Vocabulary : Root – Prefixes - Suffixes
- Composition : Paragraph Writing (Descriptive and Narrative)
- Laboratory Practice : Introduction to Phonetics
  (Organs of Speech; Consonants, Vowels & Diphthongs; Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **Emerging Technologies**
  (Solar Power – Cloud Computing – Nanotechnology- Wind energy (to be covered from Energy unit))
- Grammar : Time and Tense (Present-Past-Future; Helping Verbs; Modals)
- Vocabulary : Synonyms – Antonyms
- Composition : Letter Writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **Travel and Tourism**
  (Advantages and Disadvantages of Travel-Tourism – Atithi Devo bhava – Tourism in India)
- Grammar : Subject-Verb Agreement - Sentence Construction
- Vocabulary : Idioms & Phrases
- Composition : Letter Writing (Formal)
- Laboratory Practice : Situational Conversations – Role-Plays
  (Introducing; Greeting; Enquiring; Informing; Requesting; Inviting)

UNIT - 4 **L-9**

- Text : **Engineering Ethics**
  (Challenger Disaster – Biotechnology – Genetic Engineering – Protection from Natural Calamities- How pertinent is the nuclear option? An Environment of Energy (from Energy unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence Transformation (Degrees, Voice, Speech & Synthesis)
- Vocabulary : Phrasal Verbs
  Composition : Note-making – Text - Nandan Nilekani's In search of our energy solutions (from Energy Unit)
  Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational Conversations – Role-Plays (Emotions; Directions; Descriptions; Agreements; Refusals; Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD & CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **Media Matters**
  (History of Media – Language and Media – Milestones in Media – Manipulation by Media – Thousands march against nuclear power in Tokyo (from Energy Unit) - Entertainment Media – Interviews)
- Grammar : Common Errors
- Vocabulary : One-word Substitutes
- Composition : E-mail – Short Message Service (SMS) - Writing Advertisements, Reporting, Social Media: Blogging, Facebook, Twitter (acceptable & non acceptable content)
- Laboratory Practice : Group Discussions – (Topics from Energy unit) – Dumping of nuclear wastes, Exploration of eco-friendly energy options- lifting of subsidies on Petrol, Diesel, LPG etc)

TEXT BOOK:

1 “Mindscapes - English for Technologists and Engineers”, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, “A Textbook of English Phonetics for Indian Students”, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. “Spoken English: A Self-Learning Guide to Conversation Practice”, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine your English”, 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, “Effective Technical Communication”, Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to :

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

ü *Assemble and disassemble the personal computer system.*

ü *Install different desktop operating systems.*

ü *Use the basic text processing, simple data analysis and data presentation tools.*

ü *Configure network parameters.*

ü *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L- 10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L- 10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L- 08**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and Database management systems.

UNIT - 4 **L- 8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and Other internet applications.

UNIT - 5 **L- 9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours: 30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, “Introduction to Computers”, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

- ü *Identify suitable data types for an application.*
- ü *Apply control statements for decision making problems.*
- ü *Use multidimension array for matrix application.*
- ü *Design a program to calculate average of a class.*
- ü *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L- 10,T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L- 9,T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L- 9,T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L- 9,T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L- 8,T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours: 30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1^{st} edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2^{nd} edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4^{th} edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4^{th} edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

ü *Identify UPS requirements for a given load.*

ü *Provide a Lighting scheme for specific working environment.*

ü *Design a composition of Heating element for a particular application.*

ü *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

ü *Provide an earthing for Domestic Outlet.*

ü *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembling and Assembling of Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Providing Earthing for Domestic Outlet.*
- *Designing Electric Wiring system for a prototype house.*
- *Designing UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L- 9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air-conditioner and Refrigerator-components, Assembly and Disassembly, Working principle of Centrifugal and Reciprocating pumps - Types, Parts and Applications; Working principle of Screw jack and its components, Working principle of IC engines - 2 stroke and 4 stroke.

UNIT - 2 **L- 10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks.

Timber: Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel. Simple layout design, Paints, Tiles,fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L- 08**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems.

Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods.

Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and Applications.

MOTOR: Electric Motors, Classification, Construction and Working principles of motors used in Domestic Applications, Mixer Grinder, Ceiling and Exhaust Fan, Hair Dryer, Washing Machine, Water Pump, Air Coolers, Vacum Cleaner, Computer Cooling Motor, Electric Bike.

UNIT - 5 **L- 8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of Television, Radio, Remote Control, Telephone, Microwave Oven, Cell phone, PA system, Induction Stove, WiFi Router and DTH.

LABORATORY EXPERIMENTS

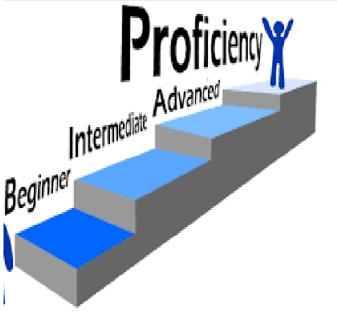
LIST OF EXPERIMENTS Total hours: 30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectificatio understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 stroke and 4 stroke engines
3. Reciprocating pumps
4. Power screw jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of cement
7. Toughness value of coarse aggregates
8. Bulking of sand
9. Fan and Immersion heater
10. Solar panel connections to different loads with Battery and without battery
11. Television
12. Radio
13. Remote Control
14. Telephone
15. Fax Machine
16. Mobile phone
17. PA system

TEXT BOOKS:

1. M.S.Shetty, “Concrete Technology”, 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition., Charotar Publishing House, Anad, 2009.
3. Govindasamy, A Ramesh et al, “Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, “Electrical engineering - Electrical machines and Appliances Theory”, 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, “How Stuff Works”, 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, “Basic Mechanical Engineering”, 1 st edition, Pearson Publishers, 2013.



16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. Students will strengthen their comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to :

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

ü *Use appropriate words in right order for effective sentence formation, and writing short texts.*

ü *Read and extract information from different texts & draw inferences by understanding elements like tone and transitional words.*

ü *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

ü *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/others; Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, intonation and accent

Speaking – Articulating syllables clearly, speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, use of nouns, adjectives, verbs, prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things, Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages – True or False

Writing – Rewording – Sentence transformation - Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, short conversations

Vocabulary / Grammar – Use of adjectives/adverbs, Comparatives and Superlatives

PRACTICE : Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations; Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines – Inferences – True/False

Writing – Developing hints - Writing short messages/paragraphs

Listening – Searching for factual information - Gap filling

Speaking – Snap talks, JAM, Elocution

Vocabulary / Grammar – Prepositions; Phrasal Verbs; PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating; Predicting; Negotiating; Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation - Comprehension

Writing – Letters – e-mails – 7 C's

Listening – Following long conversations / interviews

Speaking – Discussions – Debate - Descriptions

Vocabulary / Grammar – Modals – Conditionals - verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

UNIT - 5 **P-6**

FUNCTIONS: Requesting; Denying; Suggesting; persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements - Presentations

Vocabulary / Grammar – Punctuation – Cloze tests

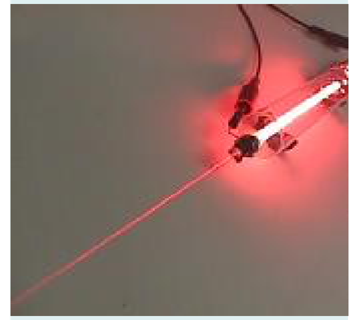
PRACTICE: Objective PET Units 25 – 30

TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, “Objective PET”, Student’s Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8
2. Annette Capel and Rosemary Nixon, “Introduction to PET”, Oxford University Press,



16HS110 ENGINEERING PHYSICS LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Description and Objectives:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the following experiments.The students have to perform at least 10 experiments from the list of experiments.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

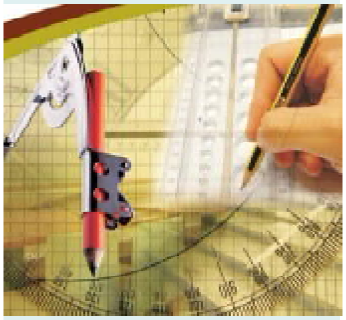
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory, thermal conductivity by conducting experiments of field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration, to make the student to use different mathematical tools of Mat lab related to above concepts.

Course Outcomes:

The student will be able to :

- carry out the basic operations of matrix algebra.
- use row operations to reduce a matrix to echelon form, normal form.
- determine consistency of a system linear equations.
- compute eigen values and eigen vectors.
- evaluate double integrals and triple integrals.
- evaluate double integrals in polar coordinates.
- utilize Cartesian and polar coordinates to find area.
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals.

SKILLS:

ü *Appreciate various methods to find the rank of a matrix.*

ü *Solve given system of linear equations.*

ü *Compute Eigen values and Eigen vectors of a matrix.*

ü *Compute the power of a matrix by suitable method.*

ü *Evaluate Multiple integrals.*

ü *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from; Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L- 9**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, diagonalisation of a matrix.

UNIT - 3 **L- 9**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in Polar coordinates, Change of order of integration, Change of variables, Applications to Area in Cartesian coordinates and polar coordinates; Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L- 9**

VECTOR DIFFERENTIATION: Vector Function, Differentiation, Scalar and Vector point function, Gradient, Normal, Divergence, Directional Derivative, Curl, Vector identities.

UNIT - 5 **L- 9**

VECTOR INTEGRATION: Line Integral, Surface Integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Matrix Algebra.
2. Rank of a matrix
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc.).
13. Interpolation.

TEXT BOOKS :

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS :

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with Matlab output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with Matlab output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with Matlab output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to :

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

ü *Analyse the total hardness of water sample.*

ü *Understand the basic principles involved in various batteries.*

ü *Understand the mechanisms of corrosion and various controlling methods.*

ü *Synthesize various polymers.*

ü *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L- 9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water - Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water-Scales and Sludges - Caustic embrittlement - Boiler Corrosion - Priming and Foaming; Softening Methods - Zeolite process, Ion Exchange process; Desalination of Brackish water-Reverse Osmosis, Electrodialysis.

UNIT - 2 **L- 9**

ELECTRO CHEMISTRY: Electrode Potential, Electrochemical Series, Nernst Equation, Reference Electrodes - Calomel and Standard Hydrogen Electrode, Ion Selective Electrode, Glass Electrode; Determination of pH by pH meter, Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cell - Hydrogen Oxygen, Methanol Oxygen.

UNIT - 3 **L- 9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion - Mechanisms of wet corrosion; Bimetallic corrosion - Concentration cell corrosion; Factors influencing the rate of corrosion, Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L- 9**

POLYMERS: Introduction, Types of Polymerization - Preparation, Properties and applications of Polyethylene, PVC, Teflon, Bakelite, Urea Formaldehyde, Silicones, Rubber – Vulcanization; Synthetic Rubbers - Buna-S, Buna-N, Neoprene; Introduction to Conducting polymers - Poly thiophene.

UNIT - 5 **L- 9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV - Visible Spectroscopy - Beer-Lambert's law - Qualitative and Quantitative Analysis; Block diagram of UV- Visible Spectrophotometer ; IR Spectroscopy - Types of Vibrations - Block diagram of IR Spectrophotometer.

TEXT BOOKS :

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry" 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
5. J.D. Bares, M.Thomas, B. Siva Sankar,J.Mendham, R.C Denney, "Vogel's Text book of qualitative Chemical Analysis", 6th edition, Pearson Publications, 2009.
6. Dr.Sunita Rattan, "Experiments in Applied Chemistry" by S.K. Kataria & Sons publications, 2008.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
15		45	6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to :

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

ü *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*

ü *Draw geometrical objects like polygons, solids of different types.*

ü *Visualize the objects in real time situations.*

ü *Develop 3D views (isometric views).*

UNIT – 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Introduction to Engineering Drawing - Types of lines, Lettering, Dimensioning construction of polygon and conics (Ellipse, Parabola and hyperbola by general method), Ellipse by Oblong method.

UNIT – 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection - Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes; Projections of planes - Simple planes, Planes inclined to one reference planes.

UNIT – 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT – 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder; Simple orthographic views into isometric views through AutoCAD.

UNIT – 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS :

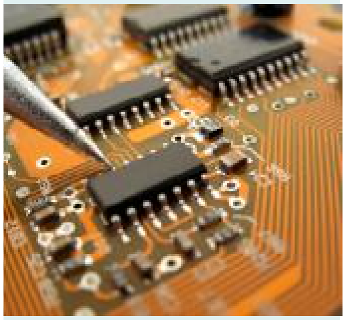
1. N.D.Bhatt, “Engineering Drawing”, 53rd edition., Charotar Publication, 2014.
2. Basant Agrawal , C.M.Agrawal “Engineering Drawing” , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS :

1. J. hole, *“Engineering Drawing”*, 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, *“Engineering drawing”*, 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC. AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of Semiconductor devices and their operation.

SKILLS:

ü *Distinguish between linear and nonlinear elements by looking at VI characteristics.*

ü *Develop a simple loop generator.*

ü *Design a voltage regulator using Zener diode.*

ü *Design a half wave rectifier using PN junction diode.*

ü *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts - Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law, Kirchhoff's Laws - Application to simple series, parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only; Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator - Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems).

D.C. Motor - Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar Junction Transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, "Basic Electrical and Electronics Engineering", 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, "Integrated Electronics", McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, "Electrical Technology", Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, "Basic Electrical Engineering", 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http://nptel.ac.in/courses/108108076/
2. https://books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course Description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to :

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS :

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas & B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I 2009.

2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to :

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

ü *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*

ü *Gain perspectives to adrress the challenges, improvise and devise solutions.*

ü *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*

ü *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*

ü *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT – 1 **L-6**

NATURAL RESOURCES: Environmental Studies - Definition, Scope and its importance; Need for public awareness, Natural resources, Forest resources, Deforestation, Water resources - Properties and conflicts; Mineral resources - Extraction and impacts; Food resources - Modern agriculture methods, Fertilizer-pesticide problems; Water logging, Salinity, Energy resources - Renewable and non-renewable energy resources; Harness technology, Solar energy technologies, Land resources - land degradation, Soil erosion, Role of an individual in conservation of natural resources.

UNIT – 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY : Ecosystem - Concept, Structure and functions of an ecosystem; Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems, Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT – 3 **L -6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and Noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, Definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forestry-community; Bio-villages, Green technology for sustainable development, Life cycle assessment and its concept.

UNIT – 4 **L -6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods Watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental Protection act; Environmental Impact Assssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / Developmental activity.

UNIT – 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation **-** Food and drugs act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions, Role of youth in the development, Promoting activities - Youth as initiators and activities; Field work/Environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment - common plants, insects, birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik- CP Kaushik, "Perspectives in Environmental Studies", 5th edition, 2016
2. Benny Joseph, "Environmental studies", 2nd edition, Mc Graw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, "A Text book of Environmental Studies", HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, "A Text book of environmental science and Technology", B S Publications, 2008.
3. Dr. K. Mukkanti, "A Text book of Environmental Studies", S.CHAND & Company Ltd, 2009.
4. EHILRS and ST, "Text book of Municipal and Rural Sanitation", M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, "Environmental Pollution Control Engineering", New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, "Introduction to Remote Sensing", B S Publications, 2004.
7. Kurian Joseph and R.Nagendram, "Essentials of environmental studies", Pearson

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

16EC202 ELECTRONIC DEVICES AND CIRCUITS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	-	12	3	2

Course Description and Objectives:

This course is aimed at offering fundamental concepts of semiconductor devices and circuits. The objective of the course is to introduce the student to Junction Diode, Transistor, FET and other basic devices that are designed with semiconductor materials. As a first-level course in electronics, it forms the basis for the understanding of advanced electronic courses that are offered in subsequent semesters.

Course Outcomes:

The student will be able to:

- understand semiconductor devices through energy band diagrams.
- analyze characteristics of semiconductor junctions.
- differentiate between bipolar and unipolar conduction.
- understand physics of optical devices.
- understand the usefulness of semiconductor devices in circuit making.
- use these basic circuits to develop various useful applications.

SKILLS:

ü *Identify a Semiconductor Diode for a specific application and power handling capacity.*

ü *Identify the transistor type for a given application (switch/amplifier).*

ü *Recognize the required specifications of the transistor.*

ü *Identify the amplification factor of the given transistor.*

ü *Test the working condition of the transistor.*

UNIT - 1 **L-9**

P-N JUNCTION DIODE: Formation of P-N junction, Energy band diagram of open circuited P-N junction, Operation of forward and reverse biased P-N junction diode, Volt-Ampere characteristics, Temperature dependence on V–I characteristic, Diode resistances and capacitances, Diode equation, Special diodes-Breakdown Mechanisms in a Semi Conductor Diode, Zener diode, V-I characteristics and zener diode as voltage regulator, Tunnel diode, Varactor diode, SCR, LED and photodiode.

UNIT - 2 **L-9**

DIODE APPLICATIONS: The P-N junction diode as a rectifier - Half wave rectifier, Full wave rectifier and bridge rectifier, Harmonic components in a rectifier circuit; Filters - Analysis and comparison of various filters, Inductor filter, Capacitor filter, L- section filter and π-section filter in terms of ripple factor, A simple regulated power supply circuit; Clipping and clamping circuits - Elementary diode clippers and clamping circuits.

UNIT - 3 **L-9**

TRANSISTOR: Bipolar junction transistor (BJT) - Construction, Principle of operation of PNP and NPN transistors, Characteristics of transistor in common emitter, Common base and common collector configurations; Field effect transistor (FET)-Construction, Symbol and principle of operation of JFET, Pinch-off voltage, JFET characteristics, Comparison of BJT and FET; MOSFET - Construction, working and V-I characteristics of enhancement and depletion MOSFET.

UNIT - 4 **L-8**

BJT and FET BIASING: Transistor biasing and thermal stabilization, DC and AC load lines, Operating point, types of BJT biasing, Thermal runaway and thermal stability, Stabilization against variations in V_{BE}, â and I_{co} , Stability factors, Bias compensation using diodes and transistors **,** Biasing of FET.

UNIT - 5 **L-10**

SINGLE STAGE BJT AND FET AMPLIFIERS: Transistor as an amplifier, Two port network representation and h parameter model of a transistor, Exact and approximate analysis of CE small signal low frequency transistor model, Expressions for voltage gain, Current gain, Input impedance and output impedance using h-parameters, Comparison of transistor amplifier configurations in terms of A_i, R_i, A_v, R_o; FET amplifiers - FET small signal model, Analysis of FET amplifiers (CS, CD and CG configurations) at low frequencies, Expressions for voltage gain, Input impedance and output impedance.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

1. Understand the V-I characteristics of P-N junction diode and hence determine the diode forward, reverse currents, static and dynamic resistances.
2. Analyze the V-I characteristics of zener diode under reverse biased condition and observe the application as voltage regulator.
3. Calculate the efficiency and ripple factor of all rectifiers and analyze their performance with and without filter.
4. Understand the input and o/p characteristics of all BJT configurations in active region and determine its current amplification factors.
5. Understand the drain and transfer characteristics of FET and determine its amplification factor.
6. Understand the diode application as a clipper.

ACTIVITIES:

- *Choose a diode for a Cell-phone/ Laptop/Tablet adapter/for various ratings.*
- *Design voltage regulator using zener diode.*
- *Design three types of biasing circuits and determine the stability factors in each case.*
- *Transistor as an amplifier for the given specifications.*
- *Design a wideband amplifier with FET.*

LIST OF EXPERIMENTS Total hours-30

1. P-N Junction diode characteristics.
2. Zener diode characteristics and Zener diode as Voltage regulator.
3. To determine the ripple factor and efficiency of Half wave Rectifier with and without filter.
4. To determine the ripple factor and efficiency of Center tapped Full wave Rectifier with and without filter.
5. To determine the ripple factor and efficiency of Bridge Rectifier with and without filter.
6. Construction of various diode clipping circuits.
7. Transistor CB characteristics (Input and Output).
8. Transistor CE characteristics (Input and Output).
9. Transistor CC characteristics (Input and Output).
10. FET characteristics.

TEXT BOOKS:

1. J. Millman and C.C.Halkias, "Electronic Devices and Circuits", 9th edition, Tata Mc-Graw Hill, 2012.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", 9th edition, Pearson/Prentice Hall, 2006.

REFERENCE BOOKS:

1. J. Taub and C.C. Halkias, "Electronic Circuits", 8th edition, Tata Mc-Graw Hill, 2015.
2. Salivahanan, Kumar and Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, 4th edition, 2008.
3. J. Millman and K Taub, "Electronic Circuits and Applications", 4th edition, Tata Mc-Graw Hill, 2011.
4. K Thomson, "Electronic Switching Circuits", 2nd edition, Oxford University Press, 2012.
5. K Satya Prasad, "Electronic Devices and Circuits", 2nd edition, VGS Publications, 2014.
6. K K Vara Prasad, "Electronic Devices and Applications", 2nd edition, Oxford University Press, 2014.

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	45	-	-	-	20	-	-

Course Description and Objectives:

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes:

The student will be able to :

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

ü *Prepare wooden and metal furniture.*

ü *Electrical wiring and power supply in residences.*

ü *Make funnels, trays, locker, steel almirahs etc.*

ü *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*

ü *CNC machines and various machining operations and processes.*

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin Smithy and Black smithy.
4. House wiring.
5. Foundry and Welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS :

1. S.K. Hazra Choudhury, “Elements of workshop Technology”, 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., “A first course on workshop practice: Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S., “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai, 1999.

II

YEAR

COMPUTER SCIENCE AND ENGINEERING

B.Tech.

I SEMESTER

4	16HS202	-	Probability and Statistics
4	16MS201	-	Management Science
4	16CS201	-	Database Management Systems
4	16CS202	-	Data Structures
4	16CS203	-	Digital Logic Design
4	16CS204	-	Discrete Mathematical Structures
4	16EL102	-	Soft Skills Laboratory
4		-	Employability and Life SkillsElective

II SEMESTER

4	16CS205	-	Computer Organization and Architecture
4	16CS206	-	Design and Analysis of Algorithms
4	16CS207	-	Formal Languagesand Automata Theory
4	16CS208	-	ObjectOriented Programming using JAVA
4	16EL102	-	Department Elective
4		-	Department / Open Elective
4		-	Employability and Life Skills Elective

COURSE CONTENTS

I SEM & II SEM

16HS202 PROBABILITY AND STATISTICS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

CS	WA/RA	SSH	SA	S	BS
-	10	45	-	-	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation, regression, and their applications, probability, theoritical distributions and testing of hypothesis. The objective of this course is to enable the student to understand and apply statitical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L- 12**

DESCRIPTIVE STATISTICS: Basic Definitions, Frequencies, Graphical Representation, Histogram, Ogive curves, Measures of Central tendency, Arithmetic mean, Median, Mode, Mean deviation, Standard Deviation, Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT - 2 **L- 12**

CURVE FITTING, CORRELATION AND REGRESSION: Least squares method, Curve fitting (straight line and parabola only),Covariance, Correlation, Types, Pearson's Coefficient of correlation, Rank correlation, Spearman's rank correlation, Regression, Regression lines.

UNIT - 3 **L- 12**

PROBABILITY: Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L- 12**

DISTRIBUTIONS: Random variables, Discrete and Continuous variables, Introduction to Distributions.

BINOMIAL DISTRIBUTION: Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION: Definition, Mean and Standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION: Definition, Normal curve, Mean and Standard deviation, Median, Mode, Normal Distribution applications.

UNIT - 5 **L- 12**

TESTING OF HYPOTHESIS: Population and Sampling, Parameters and Statistics, Types of sampling, Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion**,** t-distribution for small sample, Difference between means of small sample, Chi square test for goodness of fit, Chi-square test for test of independence.

TEXT BOOKS:

1. Miller and Freund, Probability and Statistics for engineers, 8th edition, Pearson publishers, 2013.
2. H. K. Dass and Er. Rajanish Verma, Higher Engineering Mathematics, S. Chand & Co., Third revised edition, 2014.

REFERENCE BOOK:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Co., New Delhi, 2005.

16MS201 MANAGEMENT SCIENCE

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	10	20	5	5	-	-

Course Description and Objectives:

This course provides an introduction to the evolution of management along with the framework of managerial functions related to organization structure, production, operations, marketing, human resource management, strategy etc. The objective of the course is to introduce the students and make them well versed with the operational functions of management.

Course Outcomes:

The student will be able to:

- understand the nature, importance and evolution of management.
- identify the significance of Operations Management.
- carry out production operations through work study.
- understand the markets, customers and competition.
- plan and control the HR function.

SKILLS :

ü *Analyze and improve productivity.*

ü *Analyze the customer needs, wants and demand.*

ü *Recognize the need of different types/qualities of Human Resources.*

ü *Analyze the reasons for the evolution of management.*

ü *Analyze the philosophies of different management thinkers.*

ACTIVITIES:

- *Solve a test case to identify the various operational functions of management .*
- *Solve a test case to know the importance of marketing.*
- *Solve a test case to know the importance of human resources.*
- *Solve a test case to know the importance and evolution of management discipline.*

UNIT - 1 **L-9**

INTRODUCTION TO MANAGEMENT: Concepts of management and organization, Nature, Importance and functions of management, Systems approach to management, Taylor's scientific management theory, Fayol's principles of management, Mayo's hawthorne experiments, Maslow's theory of human needs, Douglas McGregor's theory X and theory Y, Herzberg's two-factor theory of motivation, Leadership styles, Social responsibilities of management.

UNIT - 2 **L-9**

OPERATIONS MANAGEMENT: Principles and types of plant layout; Methods of production (Job, Batch and Mass Production), Work study - Basic procedure involved in method study and work measurement

UNIT - 3 **L-9**

MATERIALS MANAGEMENT: Objectives, Need for inventory control, EOQ, ABC analysis, Purchase procedure, Stores management and stores records; Statistical quality control - Control charts for variables and attributes (simple problems), Acceptance sampling

UNIT - 4 **L-9**

HUMAN RESOURCES MANAGEMENT (HRM): Concepts of HRM, Basic functions of HR manager; Manpower planning, Recruitment, Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfer, Separation, Performance appraisal, Grievance handling and welfare administration, Job evaluation and merit rating.

UNIT - 5 **L-9**

MARKETING MANAGEMENT: Evolution of marketing, Functions of marketing selling Vs marketing; 4 P's of marketing, Product mix, Product life cycle, Place mix, Channels of distribution, Price mix, Pricing methods, Promotion mix, Tools of promotions.

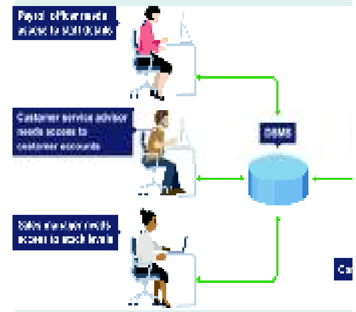
TEXT BOOKS:

1. P. Vijay Kumar, N. Appa Rao, Ashnab and Chnalill, "Introduction to Management Science", 6th edition, Cengage Learning India, 2012.
2. Stoner, Freeman and Gilbert, "Management", 6th edition, Pearson Education, New Delhi, 2004.

REFERENCE BOOKS:

1. Kotler Philip and Keller Kevin Lane, "Marketing Mangement", 12th edition, PHI, 2005.
2. Koontz and Weihrich, "Essentials of Management", 6th edition, TMH, 2005.

16CS201 DATABASE MANAGEMENT SYSTEMS



Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P	CS	WA/RA	SSH	SA	S	BS
45	15	30	5	5	40	8	5	2

Course Description and Objectives:

This course presents an introduction to database management systems with an emphasis on how to organize, maintain and retrieve data efficiently and effectively from a database. It concentrates on requirements gathering and conceptual, logical, physical database design. The objective of the course is to make the student to understand database management concepts such as database design, transaction processing and query optimization.

Course Outcomes:

The student will be able to:

- understand the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- design Entity Relationship(ER) models to represent simple database application scenarios.
- convert the ER-model to relational tables, populate relational database and formulate SQL queries.
- construct simple and complex queries using Structured Query Language (SQL).
- improve the database design by normalization.
- familiarise with basic database storage structures and access techniques.

SKILLS :

ü *Design a conceptual database using ER-Model.*

ü *Convert ER- Model to RDBMS.*

ü *Formulate database queries using* Structured Query Language (SQL).

ü *Build and run DDL and DML commands.*

ü Design and implement normalized databases.

ü Construct B+ Trees.

ACTIVITIES:

- *Design of ER diagram for the development of web applications.*
- *Transformation of ER diagram into a relational schema.*
- *Creation of relations with entity and referential integrity constraints for a given relational schema*
- *Representation of queries using Relational Algebra.*
- *Formulation of queries using SQL.*
- *Design of relational database using normalization techniques.*
- *Development of relational schema for enterprise level web applications.*

UNIT - 1 **L-09,T-03**

INTRODUCTION TO DATABASES: Characteristics of the Database Approach, People who work with databases, Advantages of using the DBMS approach, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs.

UNIT - 2 **L-09,T-03**

CONCEPTUAL DESIGN AND DATABASE DESIGN: High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the Company Database, ER Diagrams, Naming Conventions and Design Issues, Subclasses, Super classes and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization Hierarchies, Modeling of UNION Types Using Categories.

UNIT - 3 **L-09,T-03**

RELATIONAL DATA MODEL AND SQL: Relational Database Design Using ER-to-Relational Mapping, Mapping EER Model Constructs to Relations, Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations, SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE and UPDATE Statements in SQL, Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables) in SQL, Relational Algebra.

UNIT - 4 **L-09,T-03**

DATABASE DESIGN THEORY AND NORMALIZATION: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Properties of Relational Decompositions.

UNIT - 5 **L-09,T-03**

TRANSACTION PROCESSING, CONCURRENCY CONTROL AND RECOVERY: Transaction and System Concepts, Desirable Properties of Transactions, Two-Phase Locking Techniques, Timestamp Ordering, Recovery Concepts, The ARIES Recovery Algorithm, Recovery in Multi-database Systems, Primary File Organizations, Single level and Multilevel indexes, Dynamic Multilevel Indexes Using B+ Trees.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- understand, analyze, and apply common SQL Statements including DDL, DML and DCL statements to perform different operations.
- apply PL/SQL blocks using Cursors and Triggers.
- design and implement a database for a given problem.

List of experiments Total Hours 30

1. ER Design tool (ex. TOAD)
2. MYSQL RDBMS

3. Table Creation, Constraints, Insert, Select Commands, Update and Delete Commands.
4. Nested Queries and Join Queries.
5. Views.
6. Design and development of database using MYSQL.
7. High level programming language extensions (Control structures, Procedures and Functions).
8. Front end Tools.
9. Forms.
10. Triggers.
11. Menu Design.
12. Reports.

TEXT BOOK:

1. Ramez Elmasri and Shamkant B Navathe, "Fundamentals of Data base Systems", 6^{th} edition, Pearson Education, 2010.

REFERENCE BOOKS :

1. Raghu Rama Krishnan and Johannes Gehrke, "Database Management Systems", 3^{rd} edition, Tata McGraw Hill, 2013.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", 6^{th} edition, Tata McGraw Hill, 2010.
3. Peter Rob and Carlos Coronel, "Database System Design, Implementation and Management", 7^{th} edition, Cengage Learning, 2007.

16CS202 DATA STRUCTURES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

CS	WA/RA	SSH	SA	S	BS
-	5	40	8	5	-

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explain how to implement them. It begins with the basic concepts of data, data structures and then introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

Course Outcomes:

The student will be able to:

- apply advanced C programming techniques such as pointers, dynamic memory allocation, structures to develop solutions for particular problems.
- analyze characteristics of various data structures.
- differentiate between Graphs and Trees.
- derive the importance of sorting and applying it wherever useful.
- argue the usefulness of data structures in solving problems.

SKILLS:

- ü *Analyse the data structure required for various applications.*
- ü *Develop the sorting algorithm suitable for a given scenario.*
- ü *Implement array or linked list for a given problem.*
- ü *Describe Pros & Cons of each data structure.*
- ü *Usage of trees and graphs.*

UNIT - 1 **L- 9**

SORTING AND SEARCHING: Introduction - Data, Data type, Data Structure, Primitive and Non-primitive - Data type, Data Structure; Storage structures - Sequential and Linked storage representations; Applications of Structures, Hashing.

SORTING: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort.

SEARCHING: Binary Search and Linear Search.

UNIT - 2 **L- 9**

LINKED LISTS: Introduction, Types of Linked List - Singly Linked List, Doubly Linked List, Circular Linked List; Operations - Insertion, Deletion, Traverse forward/reverse order; Multi lists, Applications of Linked Lists.

UNIT - 3 **L- 9**

STACKS AND QUEUES: Stacks - Introduction, Array and Linked representations, Implementation and their applications; Queues - Introduction, Array and Linked representations, Implementation and their applications, Types - Linear, Circular and Doubly ended queues; Applications.

UNIT - 4 **L- 09**

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and Linked representations; Tree traversals and their Implementation, Expression trees, BST Definition and implementation; AVL Trees - Definition and Implementation.

UNIT - 5 **L-09**

GRAPHS: Introduction, Properties, Modeling problems as graphs representations - Adjacency matrix, Adjacency list; Traversals - Breath first search and Depth first search; Application of graphs.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to :

- understand the importance of structure, abstract data type and their basic usability in different applications through different programminglanguages.
- understand the linked implementation and its uses both in linear and non-linear data structure.
- understand various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
- decide a suitable data structure to solve a real world problem.

LIST OF EXPERIMENTS: Total hours: 30

1. Selection, Bubble, Insertion, Quick and Merge sorting algorithms.
2. Linear and Binary search algorithms.
3. Single linked list, doubly linked list, and circular linked list.
4. Stack using an array and linked list.
5. Queue using an array and linked list.
6. Tree using an array and linked list.
7. Check if given expression is fully parenthesis or not using stack.
8. Tree traversing techniques.
9. BST using an array and linked list.
10. Graph traversal techniques.

ACTIVITIES:

- *Design and Implement a School Management System.*
- *Design and Implement a Social Networking Site.*
- *Implement a project to find out the most common words in the articles.*
- *Design and Implement a Library Book Management System.*
- *Design and Implement a CricBuzz Application.*

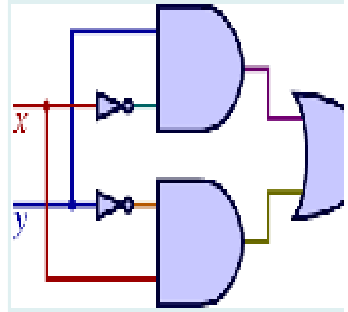
TEXT BOOK:

1. ReemaThareja, “Data Structures Using C”, 2nd edition, Oxford University Press, 2014.

REFERENCE BOOKS :

1. Richard F. Gilberg and Bhrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd edition, Cengage Learning, 2004.
2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd edition, Tata Mc-Graw Hill, 2004.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education, 2006..

16CS203 DIGITAL LOGIC DESIGN



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

CS	WA/RS	SSH	SA	S	BS
7	5	40	8	2	2

Course Description and Objectives:

This course introduces the topics such as number systems, analysis and design of combinational and sequential circuits, digital circuit design optimization methods using multiplexers, decoders, registers, counters and programmable logic arrays. The objective of this course is to offer the knowledge and skill of conversions between different number systems, design of logical gates, minimization of switching functions, effective memory utilization and design of synchronous and asynchronous counters.

Course Outcomes:

The student will be able to:

- determine philosophy of number systems and codes.
- minimize switching functions using Boolean algebra, Karnaugh maps and tabular method.
- design combinational and sequential logic circuits using conventional gates.
- gain knowledge of the ROM, RAM, PROM, PLD etc.

SKILLS :

ü *Perform number conversion.*

ü *Synthesize boolean algebra.*

ü *Construct combinational circuits like, decoders, encoders, multiplexers etc.*

ü *Analyze counters, shift registers etc.*

ü *Construction of PLA and PLD.*

ACTIVITIES:

- *Design of logical circuits using universal gates and basic gates.*
- *Reduction of Boolean function using K-maps.*
- *Construction of one stage ALU circuit.*
- *Design of the n-bit decoder and encoder.*
- *Design of combinational circuits using different types of flip-flops.*
- *Design of PLA for the given Boolean expression.*
- *Design of PLD for the given Bolean expression.*
- *Design of different types of counters.*

UNIT - 1 **L-09,T-03**

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Number system **-** Binary numbers, Number base conversions, Octal and hexadecimal numbers, Complements of numbers, Signed binary numbers, Binary codes, Binary logic. Boolean Algebra **-** Basic definitions, Basic theorems and properties of Boolean algebra.

UNIT - 2 **L-09,T-03**

LOGIC GATES AND GATE-LEVEL MINIMIZATION: Boolean functions, Canonical and standard forms, Digital logic gates, The map method, Four - variable k-map, Product-of-sums simplification, Don't-care conditions, NAND and NOR implementation, Other two-level implementations, Exclusive-or function.

UNIT -3 **L-09,T-03**

COMBINATIONAL LOGIC: Combinational circuits, Analysis and design procedure, Binary adder–subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers, De-mutliplexers.

UNIT - 4 **L-09,T-03**

SEQUENTIAL LOGIC: Sequential circuits, Storage Elements-Latches, Flip-flops, Analysis of clocked sequential circuits, Design procedure, Registers, Counters.

UNIT - 5 **L-09,T-03**

PROGRAMMABLE LOGIC DEVICES: Programmable logic, PLDs, ROM, Types of ROM, Combinational Programmable Devices, Programmable Logic Array, Programmable Read Only Memory.

TEXT BOOK:

1. M Morris Mano and Michael D. Ciletti, " Digital Design", 5th edition, Pearson Education, Inc, 2013.

REFERENCE BOOKS:

1. H Taub and D Schilling, "Digital Integrated Electronics", 2nd edition, TataMc Graw-Hill, 2004.
2. Z. Kohavi, "Switching and Finite Automata Theory", 2nd edition, Tata McGraw-Hill,2008.

16CS204 DISCRETE MATHEMATICAL STRUCTURES

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

CS	WA/RA	SSH	SA	S	BS
3	10	40	8	5	2

Course Description and Objectives:

This course deals with the analysis of computational processes using analytical and combinatorial methods such as propositional logic, predicate logic, set theory, relations, functions, recurrence relations and graph theory. The objective of this course is to make the students to familiarize with required mathematical foundations of Computer Science.

Course Outcomes:

The student will be able to:

- use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, recurrence relations and graph theory applications.
- evaluate elementary mathematical arguments, identify erroneous reasoning, combine induction hypotheses and simple induction proofs.
- prove elementary properties of modular arithmetic and explain their applications in Computer Science.

SKILLS:

ü *Design of logical gates using propositions.*

ü *Prove the basic mathematical theorems through direct or indirect proofs.*

ü *Solving various types of problems on sets & relations to understand some basic properties of trees, graphs and related discrete structures.*

ü *Solving a problem in recursive manner and estimation of time complexity.*

ACTIVITIES:

- *Construction of Logical circuits using Truth tables.*
- *Gates minimization using Normal forms.*
- *Finding shortest path in graphs using different algorithms.*
- *Study on Pigeonhole principle.*
- *Finding solutions to non homogeneous linear equations.*
- *Study on different tree traversals.*
- *Checking logical equivalences.*

UNIT - 1 **L- 09**

MATHEMATICAL LOGIC: Propositions, Negation, Disjunction and Conjunction, Well-formed formulas, Truth Tables, Tautology, Implication and Equivalence, Normal forms – DNF, CNF, PDNF, PCNF.

UNIT - 2 **L- 09**

PREDICATES AND QUANTIFIERS: Natural Deduction, Rules of Inference, Methods of proofs, Mathematical Induction.

UNIT - 3 **L- 09**

SET THEORY: Set, Properties, Relation, Properties of Binary Relations, Equivalence, Compatibility and partial ordering relations, Hasse diagram, Lattice and its Properties, Peano postulates, Pigeon hole principles and its application.

UNIT - 4 **L- 09**

RECURRENCE RELATION: Generating Functions, Function of Sequences, Calculating Coefficient of generating function, Recurrence relations, Recurrence relation by substitution and Generating functions, Characteristics, roots solution of Non-homogeneous recurrence relation.

UNIT - 5 **L- 09**

GRAPH THEORY: Introduction, Graphs, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers, Euler graph, Hamiltonian path, Trees, Tree traversals, Spanning trees, Minimal Spanning Trees.

TEXT BOOKS:

1. Trembly J.P. and Manohar, “Discrete Mathematical Structures with applications to computer science”, 6th edition, Tata Mc-Graw Hill, 2006.
2. Ralph and P.Grimaldi, “Discrete and Combinational Mathematics- an Applied Introduction”, 5th edition, Pearson Education, 2014.

REFERENCE BOOKS:

1. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, 7th edition, Tata Mc-Graw Hill, 2012.
2. Thomas Koshy, “Discrete Mathematics with Applications”, 1st edition, Elsevier, 2003.
3. Bernand Kolman, Roberty C. Busby and Sharn Cutter Ross, “Discrete Mathematical Structures”, 2nd edition, Pearson Education/Prentice Hall India, 2013.
4. Garry Haggard, “Discrete Mathematics for Computer science”, 1st edition, Thomson, 2007.
5. J.L. Mott, A. Kandel and T.P. Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, 2nd edition, Prentice Hall India, 2009.
6. Grass Man and Trembley, “ Logic and Discrete Mathematics”, 2nd edition, Pearson Education/Prentice Hall India, 2013.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	30	-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, Preparing Resume, Group Discussion, and Interview Skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to:

- formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs equip with requisite professional and inter-personal skills.
- they will possess the ability to think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- through identification and introspection on individual strengths and weaknesses.
- students will emerge with improved levels of self-awareness and self-worth, for greater efficacy at workplace.

SKILLS:

ü *Communicate and understand the difference between soft skills and hard skills,*

ü *Learn professionalism and Employability skills.*

ü *Plan Career by drawing their SWOT, Setting the Goal, learn the importance of Time and Stress Management.*

ü *Learn Vocabulary, Situational English, Group Discussion, Reading Comprehension and Listening Comprehension which are essential for all competitive examinations.*

ü *Prepare Resume and learn how to face interview.*

ü *Learn Gender sensitive language, Good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication...*
- *SWOT analysis,*
- *Stephen covey Time Management matrix*
- *Stress Management techniques*
- *Vocabulary flash cards*
- *Situational Dialogues*
- *Group Discussion*
- *Resume preparation*
- *Mock Interview.*
- *Reading comprehension activities*
- *Listening comprehension Activity by watching the American accent video*
- *Emotional intelligence, etiquette quiz*

UNIT - 1 **L-4, P-4**

A) COMMUNICATION: Need for effective communication - the process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal), Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, employability skills

C) CAREER PLANNING: Job vs. career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis; Setting a SMART goal using the provided grid, Writing a Statement of Purpose (SOP).

UNIT - 2 **L- 4, P- 4**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes & Suffixes, Synonyms & Antonyms, Collocations, One-word substitutes, Analogies, Idioms and Phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student) – Vocabulary exercises with hand-outs- Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention, Summarizing and conclusion, Voice modulation, Content generation, Key Word Approach (KWA), Social, Political, Economic, Legal and Technical Approach (SPELT), View Point of Affected Part (VAP), Language relevance, Fluency and Coherence.

ACTIVITY: Viewing a recorded video of GD & Mock sessions on different types of GD topics- controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **L- 2, P-2**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes,Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pe-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele- interviews, Video interviews, Frequently asked questions (FAQs) including Behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **L-2, P- 2**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas, (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and Writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in Group Discussion.

B) LISTENING COMPREHENSION:

Listening as a skill, Different types of listening, Active and Passive listening, Top-Down approach, Bottom-Up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), Listening comprehension exercises with audio and video excerpts.

UNIT - 5 **L-3, P- 3**

IMPACT OF LANGUAGE ON PERSONALITY:

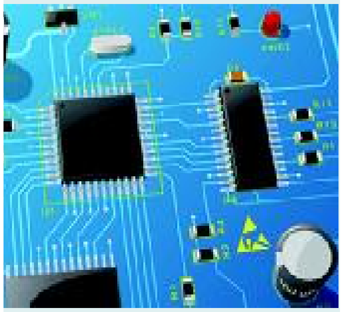
Gender sensitive language in MNCs, Cultural Sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression.

Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and Case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan & NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa & Co. 2004.



16CS205 COMPUTER ORGANIZATION AND ARCHITECTURE

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

CS	WA/RS	SSH	SA	S	BS
7	5	40	8	2	2

Course Description and Objectives:

This course introduces Register Transfer Language, Computer Arithmetic, Basic Computer Organization and Design, Pipeline processing, Memory and Input Output Organizations. Further it helps to understand and analyze the functions and organizations of modern digital computers. It also offers students learning experience in the design and development of solutions and applications for modern digital computer systems using assembly language. The objective of the course is to enable the students to understand the basic structure and operation of a digital computer and also to know in detail the operation of the arithmetic unit, logical unit, control unit, different ways of communicating with I/O devices and the hierarchical memory system.

Course Outcomes:

The student will be able to:

- demonstrate the understanding of the basic principles of organization and operations of digital computers using assembly language.
- evaluate the technical issues of digital computer systems including arithmetic logic unit, control unit, communication with peripheral devices and interrupt handling.
- develop solutions related to the organization of digital computer systems.
- recognize and identify the developmental nature of technology related to modern digital computers.

SKILLS:

- ü *Writing assembly language programs that make use of various hardware resources.*
- ü *Perform fixed and floating point arithmetic operations.*
- ü *Identifying the types of memories and their uses.*
- ü *Perform data transfer mechanism in digital computer.*

UNIT - 1 **L-9, T-2**

INTRODUCTION &RTL: Organization and architecture, Block diagram of digital computer, Structure and function. Register Transfer language – Register Transfer Bus and memory transfers.

UNIT - 2 **L-9, T-4**

COMPUTER ARITHMETIC: Arithmetic micro operations, Logic micro Operations, Shift micro operations and Arithmetic logic shift unit. Addition and subtraction, Multiplication Algorithms and Division Algorithms, Floating point representation and its operations.

UNIT - 3 **L-9, T-4**

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer Registers, Computer instructions, Instruction cycle, Memory–Reference Instructions, Register Reference instructions, Input-Output and Interrupt, Stack organization, Instruction formats, Addressing modes, Data Transfer and manipulation, Program control, Reduced Instruction set computer.

UNIT - 4 **L-9, T-3**

PIPELINE PROCESSING & MEMORY ORGANIZATION: Pipeline processing-Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline, RISC pipeline. The memory organization - Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory.

UNIT - 5 **L-9, T-2**

INPUT- OUTPUT ORGANIZATION: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access, Input-Output Processor (IOP), Serial communication.

TEXT BOOKS:

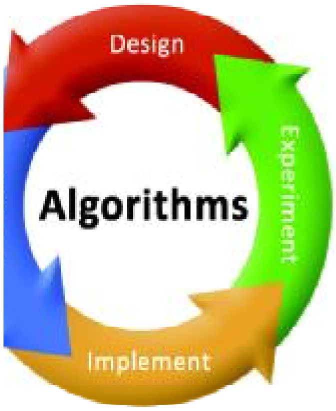
1. M.Moris Mano, “Computer Systems Architecture”, 3rd edition, Pearson/Prentice Hall India, 2007.
2. William Stallings, “Computer Organization and Architecture”, 7th edition, Pearson/Prentice Hall India , 2007.

REFERENCE BOOKS:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th edition, Tata McGraw Hill, 2007.
2. Vincent P. Heuring and Harry F Jordan, ”Computer Systems Design and Architecture”, 2nd edition, Pearson/Prentice Hall India, 2004.
3. David A Patterso and John L Hennessy, “Computer Organization and Design - The Hardware/ Software Interface, ARM edition”, 5th edition, Elsevier, 2009.

ACTIVITIES:

- *development of assembly language programs that levarage the underlying hardware resources efficiently.*



16CS206 DESIGN AND ANALYSIS OF ALGORITHMS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

CS	WA/RS	SSH	SA	S	BS
3	5	40	8	5	2

Course Description and Objectives:

This course offers insight into the time and space complexities of various algorithms, design of algorithms using divide and conquer, greedy, dynamic, branch and bound, and back tracking approches. The objective of this course is to design and analyze the algorithms for their time and space complexities and also to understand problems such as 0/1 knapsack, shortest path, minmum spanning tree, matrix multiplication, graph coloring, n-queens and travelling salesman problem.

Course Outcomes:

The student will be able to:

- argue the correctness of algorithms using inductive proofs and invariants.
- analyze worst case running times of algorithms using asymptotic analysis.
- derive and solve recurrences describing the performance of divide and conquer algorithms.
- design the greedy algorithms and analyze them.
- design dynamic programming algorithms and analyze them.
- analyze major graph algorithms.

SKILLS:

ü *Develop algorithms for solving problems using divide and conquer, greedy, dynamic programming and backtracking techniques.*

ü *Analyze the given algorithm with respect to space and time complexities and compare with other algorithms.*

ü *Application of existing algorithms to solve the real world problems.*

UNIT - 1 **L-09**

INTRODUCTION: Algorithm, Pseudo-code for expressing algorithms, Performance Analysis - Space and Time complexity; Asymptotic Notation - Big oh notation, Omega notation, Theta notation and Little oh notation; Randomized algorithms; Disjoint Sets - Disjoint set operations, Union and find algorithms, Connected components and Biconnected components.

UNIT - 2 **L-09**

DIVIDE AND CONQUER: General method, Applications - Binary search, Quick sort, Merge sort, and Stassen's matrix multiplication, Greedy method; Applications - Job sequencing with deadlines, Knapsack problem, Minimum cost spanning trees and Tree vertex splitting problem, Single Source Shortest Path.

UNIT - 3 **L-09**

DYNAMIC PROGRAMMING: General method, Applications - Multi stage graphs, Optimal binary search trees, Matrix chain multiplication, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem.

UNIT - 4 **L-09**

BACKTRACKING: General method, Applications – n-queen problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles.

UNIT - 5 **L-09**

BRANCH AND BOUND & COMPLETE PROBLEMS: General method, Applications - Traveling sales person problem, 0/1 knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, NP - Hard and NP - Basic concepts, Non deterministic algorithms, NP – Hard and NP Complete classes, Cook's theorem.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- analyze a problem & design the solution for the problem.
- derive solution must be optimum, i.e., time complexity & memory usage of the solution must be very low.
- learn and execute various problem solving mechanisms.

LIST OF EXPERIMENTS

Total Hours: 30

Language: C++

1. Implement the following:
   a) Prim's algorithm.
   b) Kruskal's algorithm.
2. Find optimal order of matrix multiplication using dynamic programming method.
3. Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Implements backtracking algorithm to solve the problem i.e. place eight non-attacking queens on the board.

ACTIVITIES:

- *Analysis of various algorithmic techniques to solve problems.*
- *Implementing robust set of algorithms to solve new problems efficiently.*
- *Design and implementation of solutions using dynamic programming methods.*
- *Design and implementation of various backtracking algorithms to solve the given problem.*
- *Compare the performance of different problem solving strategies for given applications.*

4. Implement the following:

   a. Optimal Binary Search Trees Using Dynamic Programming.

   b. Job Sequencing With Deadlines Using Greedy Approach.

   c. dynamic programming algorithm to solve all pairs shortest path problem.

   d. sum of subsets problem by using backtracking.

   e. 0/1 knapsack problem using Greedy algorithm.

   f. 0/1 knapsack problem using Dynamic programming algorithm.

   g. 0/1 knapsack problem using Branch and Bound.

TEXT BOOK:

1. Ellis Horowitz, Satraj Sahni and Rajasekharam, "Fundamentals of Computer Algorithms", 2nd edition, Galgotia publications, 2006.

REFERENCE BOOKS:

1. Thomas H.Coremen,Charles E.Leiserson and Ronald L.Rivest, " Introduction to Algorithm", 2nd edition, Clifford Stein, 2014.

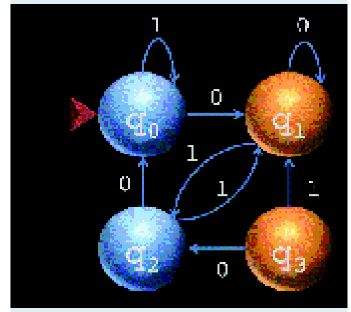
2. Anony Levitin, "Introduction to Design and Analysis of Algorithms", 3rd edition, Pearson Education, 2016.

3. Donald E.knuth, "The Art of Computer Programming", Volume 3, 2nd edition, Addison-wesley Longman Inc,1998.

4. Ronald L.Graham,Donald E.Knuth and Oren Patashnik, "Concrete Mathematics", 2nd edition, Addison-wesley Publishing Company,1998.

5. Jeffrey J.McConnell, "Analysis of Algorithms: An Active Learning Approach", 1st edition, Jones and Bartlett Publishers, 2001.

16CS207 FORMAL LANGUAGES AND AUTOMATA THEORY



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

CS	WA/RA	SSH	SA	S	BS
5	5	40	8	5	5

Course Description and Objectives:

This course focuses on the basic theory of Computer Science and formal methods of computation like automata theory, formal languages, grammars and Turing Machines. The objective of this course is to explore the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages.

Course Outcomes:

The student will be able to:

- understand the basic properties of formal languages and grammars.
- differentiate regular, context-free and recursively enumerable languages.
- make grammars to produce strings from a specific language.
- acquire concepts relating to the theory of computation and computational models including decidability and intractability.

SKILLS:

ü *Design automata, regular expressions and context free grammars for accepting or generating a certain language.*

ü *Describe the language accepted by an automata or generated by a regular expression or a context free grammar.*

ü *Transform between equivalent deterministic and non-deterministic finite automata, and regular expressions.*

ü *Minimize finite automata and grammars of context free languages.*

ACTIVITIES:

- *Conversion of NFA to DFA.*
- *Finding equivalence between finite automata and regular expressions.*
- *Convert regular grammar to finite automata and vice-versa.*
- *Simplification of grammar.*
- *Design a Turing machine for a particular language.*

UNIT - 1 **L-09,T-03**

INTRODUCTION: Alphabets, Strings and Languages, Automata and Grammars, Regular Languages, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation**,** State transition graph, Transition table, Language of DFA; Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem, FA with output - Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT - 2 **L-09,T-03**

REGULAR EXPRESSION (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages.

UNIT - 3 **L-09,T-03**

GRAMMAR FORMALISM: Regular grammars-Right linear and left linear grammars, Equivalence between regular linear grammar and FA; Context Free Grammar, Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs; Normal forms for CFGs - CNF and GNF, Closure properties of CFLs; Decision Properties of CFLs-Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT - 4 **L-09,T-03**

PUSH DOWN AUTOMATA (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT - 5 **L-09,T-03**

TURING MACHINES (TM): Basic model, Definition and representation, Instantaneous Description, Language acceptance by TM, Computable functions, Types of Turing machines, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs, Post correspondence problem (PCP), Modified PCP.

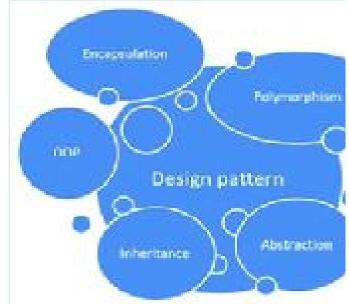
TEXT BOOK :

1. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", 2nd edition, Pearson/Prentice Hall India, 2007.

REFERENCE BOOKS

1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", 2nd edition, Pearson/Prentice Hall India, 2004.
2. Martin J. C., "Introduction to Languages and Theory of Computations", 2nd edition, Tata McGraw Hill, 2005.
3. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", 2nd edition, Pearson/Prentice Hall India, 2009.

16CS208 OBJECT ORIENTED PROGRAMMING THROUGH JAVA



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

CS	WA/RA	SSH	SA	S	BS
5	5	30	20	5	5

Course Description and objectives:

This course introduces the fundamentals of object-oriented programming concepts such as encapsulation, inheritance, polymorphism, data abstraction etc., and implementation of these concepts using JAVA . It also covers the concepts of AWT and Swings to create GUI based applications. The objective of this course is to enable the students to use the Java SDK environment to develop software applications.

Course Outcomes:

The student will be able to:

- understand OOP concepts and basics of java programming (Console and GUI based).
- apply OOP principles and Java programming to solve real-life problems.
- apply AWT and Swings concepts to develop GUI based applications.

SKILLS :

ü *Create, debug and run Java programs.*

ü *Develop multi threaded applications, remote applets.*

ü *Create web applications.*

ACTIVITIES:

- *Develop placement activity system for VU.*
- *Develop college Enrollment System for VU.*
- *Develop Department Library Management for CSE.*
- *Develop online attendance system for VU.*
- *Develop Student Project Allocation and Management for VU.*
- *Develop Result intimation System for VU.*
- *Design application for automated department timetable generation.*
- *Develop online feedback system for VU.*

UNIT - 1 **L-09**

INTRODUCTION, CLASSES AND OBJECTS: History of Java, Byte code, JVM, Java buzzwords, OOP Principles, Data types, Variables, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Concepts of classes and objects, Introducing methods, Method Overloading, Constructors, Constructor Overloading Usage of static with data and methods, Access control, this key word, Garbage collection, Recursion, String class.

UNIT - 2 **L-09**

INHERITANCE, PACKAGES AND INTERFACES: Inheritance Basics, Types of Inheritance, Member access rules, Usage of super key word, Method overriding, Usage of final, Abstract classes, Differences between abstract classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces, Defining, Creating and Accessing a Package, Importing packages, Access control in packages.

UNIT - 3 **L-09**

EXCEPTION HANDLING & MULTITHREADING: Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating User Defined Exception, Concepts of Multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads.

UNIT - 4 **L-09**

WINDOW PROGRAMMING: Applet Class, Applet Architecture, Applet Skeleton, Display Methods, repaint(), A simple banner Applet, Status Window, The HTML APPLET Tag, Passing parameters to Applets.

EVENT DRIVEN PROGRAMMING: Delegation Event Model, Event classes–ActionEvent, Adjustment Event, Component Event, Container Event, Item Event, Key Event and Mouse Event, Event Listeners, Handling mouse and Keyboard events, Adapter classes.

UNIT - 5 **L-09**

AWT & SWINGS: Frame, Font class, Color class and Graphics; AWT Controls - Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, and Layout Managers; Swings- JApplet, JFrame, Icons and Labels, Text fields, JButton, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS: Total Hours: 30

Write a Java program:

a) that prompts the user for an integer and then prints out all prime numbers up to that. Integer.

b) to check whether a given string is a palindrome or not.

c) to sort a given list of names in ascending order.

d) that reads a line of integers, and then displays each integer, and the sum of all the integers (use StringTokenizer class)

e) to display the number of characters, lines and words in a text file.

f) to create multiple threads

   i) Using Thread class.

   ii) Using Runnable interface.

g) to implement run time polymorphism.

h) to implement the following
   - i) Creation of simple package.
   - ii) Accessing a package.

i) to implement the following
   - i) Handling predefined exceptions.
   - ii) Handling user defined exceptions

j) to implement JAVA APPLETS of the following
   - i) Working with Frames and various controls.
   - ii) Working with Dialogs and Menus.
   - iii) Working with Panel and Layout.
   - iv) Incorporating Graphics.
   - v) Working with colors and fonts

TEXT BOOKS:

1. Herbert Schildt, “The Complete Reference Java J2SE”, 9th edition, Tata McGraw Hill, 2014.
2. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd edition, Tata McGraw Hill, 2009.

REFERENCE BOOKS:

1. Cay Horstmann, “Big Java”, 2nd edition, John Wiley and Sons, 2006.
2. Kathy Sierra and Bert Bats, “Head First JAVA”, 2nd edition, O’Reilly Media, 2005.
3. Herbert Schildt, “A Beginner’s Guide”, 6th edition, McGraw Hill Education, 2014.
4. Joshua Bloch, “Effective Java”, 2nd edition, Addison-Wesley, 2008.

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

The student will be able to:

- having gone through the course, students would be equipped to clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- this will equip them to stand out both in the professional setting as well as for further pursuits in the academic world.
- since this certification looks at LSRW (Listening, Speaking, Reading and Writing) components in great detail, we hope to equip students to confidently and successfully attempt all the 4 critical components.

SKILLS :

ü *Understand and use grammar rules in writing; sentences, paragraphs, paraphrasing,*

ü *Write business emails, memos, letters, reports and proposals*

ü *Comprehend business articles, and documents*

ü *Use expressions in Professional context, and acquire presentation skills like one minute talk and pair discussion in professional context*

ü *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT - 1 **L-3,P-3**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage).

ELEMENTS OF TECHNICAL WRITING: Sentence structure, Reducing verbosity, Arranging ideas logically, Building coherence, Paragraph level and document level, Topic sentence, Cohesive devices, Transitional words, Paraphrasing and précis-writing.

MECHANICS OF WRITING: Stylistic elements, The rapporteur, The purpose, The reader's viewpoint (audience), Elementary rules of grammar, Choice of diction, Elementary principles of composition, Matters of form, Punctuation, Conventions of business communication, Language and professional tone, Weak links in business correspondence, Ethical concerns in business writing, Code of conduct (Not sending illegal, Offensive, Disparaging personal remarks or comments), In written business communication.

UNIT - 2 **L-5,P-5**

BUSINESS CORRESPONDENCE: E-mail: Nature and scope, e-mail etiquette, Clear call for action, Common errors in composing e-mails, Office communication such as meeting agenda and minutes of the meeting, Notice, Circular and memo.

LETTER-WRITING: Formal and informal letters, Structure of formal letters, Expressions of salutations, Different types of letters [Such as sales letter, Complaint letter, Response to the complaint letter (dispute resolution), Letter of permission, Letter of enquiring, Claim letter – letter of apology etc], Introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, Types of reports such as factual reports, Feasibility reports and survey reports, Parts ofa report (Such as title page, Declaration, Acknowledgements, Table of contents, Abstract, Introduction, Findings, Conclusion and recommendations, Citations, References and appendices).

UNIT - 3 **L-2,P-6**

SPEAKING: Speaking in business context, Assertiveness, Politeness, Making requests, Queries and questions, Negotiations, Asking for information, Offering suggestions, Conflict resolution, Contacting clients, Initiating, Addressing delegates (in public), Features of a good power point presentation (making the PPT), Delivering the presentation effectively, Telephone etiquettes, Delivering seminar/proposal/report effectively, Team meeting etiquettes (face to face and conference call), Making effective one minute presentations.

UNIT - 4 **L-4,P-10**

READING: Reading and comprehending business documents, Learning business register, Regularizing the habit of reading business news, Suitable vocabulary, Skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **L-2, P-5**

LISTENING: Specific information in business context, Listening to telephonic conversations/ messages and understanding the correct intended meaning, Understanding the questions asked in interviews or in professional settings, Summarizing speaker's opinion or suggestion, Enable active listening.

ACTIVITIES:

- *Basic grammar practice, Framing paragraphs on topics allocated,*
- *Paraphrasing an article or a video in your own words Finding topic sentences in newspaper articles*
- *Finding out new words from a professional viewpoint Understanding the meaning and its usage*
- *Perusing samples of well prepared proposals and reports*
- *Draft different proposals/ reports on topics assigned.*
- *Watching videos/listening to audios of business presentations*
- *Classroom activities of team and individual presentations*
- *Using PPTs, mock exercises for BEC speaking.*

TEXT BOOKS:

1. Guy Brook Hart (2014): Cambridge English Business Bench Mark: Upper Intermediate, 2nd edition: CUP.
2. CUP (2002) Cambridge: BEC VANTAGE: Practice Tests, CUP.

REFERENCE BOOKS:

1. http:// www.cambridgeenglish.org/exams/business-certificates/business vantage/ preparation/
2. https:// www.youtube.com/watch?v=qxFtn9pGaTI.

VFSTR UNIVERSITY

III Year - B.Tech
SYLLABUS

I SEM & II SEM

III Year B.Tech. CSE	I - Semester	L	T	P	To	C
		4	-	-	4	4

CS234 WEB TECHNOLOGIES

Course Description and Objectives:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers. Students will be able to use a variety of strategies and tools to create websites and also integrate with IDE's for fast development of web applications.

Course Outcomes:

- *Students are able to develop a dynamic webpage by the use of java script and DHTML.*
- *Students will be able to write a well formed / valid XML document.*
- *Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.*
- *Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.*
- *Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.*

UNIT I - Tier Architecture & **HTML**

Client/Server Architecture**,** J2EE Multi Tier Architecture. HTML Common tags- Block Level and Inline Elements, Lists, Tables, Images, Forms, Frames; Cascading Style sheets, CSS Properties;

UNIT II - Java Script & XML

Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script.

The Need for XML, SGML and XML, Well-Formed XML, Valid XML, Displaying XML, XML Application Languages, Document type definition, XML Schema.

UNIT III - JDBC

Data Base, Database Schema, A Brief Overview Of The JDBC Process, JDBC Driver Types, JDBC Packages, Database Connection, Associating The JDBC-ODBC Bridge With Database, Creating, Inserting, Updating And Deleting Data In Database Tables, Result Set, Metadata.

UNIT IV - Web Servers and Servlets

Tomcat web server, Introduction to Servlets: Servlets, the Advantage of Servlets over "Traditional" CGI, Basic Servlet Structure, Simple Servlet Generating Plain Text, Compiling and Installing the Servlet, Invoking the Servlet, Lifecycle of a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Context Parameters, Handling Http Request & Responses, Using Cookies-Session Tracking, Servlet with JDBC.

UNIT V - JSP

The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods , Sharing Data Between JSP pages, Users Passing Control and Data between Pages, JSP application design with JDBC, JSP Application Design with MVC.

TEXT BOOKS:

1. Beginning Web Programming-Jon Duckett, WROX, 2008.
2. Core Servlets and Java Server pages Vol. 1: Core Technologies By Marty Hall and Larry Brown Pearson, 2006.

REFERENCE BOOKS:

1. Programming world wide web-Sebesta,Pearson, 2015.
2. Internet and World Wide Web – How to program by Dietel and Nieto PHI/ Pearson Education Asia, 2011.
3. Jakarta Struts Cookbook, Bill Siggelkow, S P D O'Reilly, 2015
4. Murach's beginning JAVA JDK 5, Murach, SPD, 2005.
5. An Introduction to web Design and Programming –Wang-Thomson, 2011.

III Year B.Tech. CSE I - Semester

L	T	P	To	C
4	-	-	4	4

CS313 COMPUTER NETWORKS

Course Description and Objectives:

This course will focus on imparting knowledge about the aspects of data communication and computer network systems with the required basic principles behind them. This course provides essential knowledge about the OSI model and TCP/IP model. It creates a good foundation covering the physical, data link, network, transport, and application layers.

Course Outcomes:

- *To understand the communication basics.*
- *To have the knowledge of different networks.*
- *To know about different protocols.*
- *To understand how to find the routes by using different routing algorithms.*
- *To understand the basics of Internet.*

UNIT I - Introduction

Use of computer networks, network hardware, network software, reference models, example networks.

UNIT II - Physical layer, Data link layer & MAC sublayer

Physical layer, Datalink layer and Medium access control sublayer, Guided Transmission Media.

Design issues, Error detection & correction, Elementary data link protocols, Sliding window protocols.

The channel allocation problem, multiple access protocols.

UNIT III - Network Layer

Design issues, Routing algorithms, Congestion control algorithms, Quality of Service (QOS), Internetworking, the network layer in the Internet.

UNIT IV - Transport layer

The transport service, elements of transport protocols, the internet transport protocols: UDP & TCP

UNIT V - Application Layer

DNS-Domain Name System. The World Wide Web, Multimedia.

TEXT BOOK:

1. Andrew S Tanenbaum, “Computer Networks”, 4th ed., Pearson Education, 2003.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, “Data communications and Networking”, 3rd ed.,TMH, 2003.
2. William Stallings, “Data and Computer Communications”, 7th ed., Pearson Education, 2004.
3. J.F. Kurose and K . W. Ross, “Computer Networking-A Top-Down Approach Featuring Internet,” 3rd ed., Perason Education, 2005.

III Year B.Tech. CSE	I - Semester	L	T	P	To	C
		4	-	-	4	4

CS315 OPERATING SYSTEMS

Course Description and Objectives:

In this course students should understand how the operating system effectively manages system resources.

Course Outcomes:

- *To understand the types of Operating systems and analyze the process scheduling Algorithms and Case study on processing Scheduling.*
- *To understand the resource sharing among the processes in the system.*
- *To understand how to manage the memory during the process execution (Memory Management) and File Management system.*

UNIT I - Introduction

What Operating System do, Operating System structure. Process Concept: Overview, Process scheduling, Operations on process, Inter process communication. Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Case Study: Process scheduling in Linux.

UNIT II - Process Synchronization

The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors, Classical problems of synchronization, Case Study : Process Synchronization in Linux.

.

UNIT III - Deadlocks

Deadlock Characterization, Methods of Handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock Detection and Recovery.

UNIT IV - Memory Management

Continuous memory allocation, paging, structure of the page table, segmentation, demand paging, page replacement algorithms.

UNIT V - File System

File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File-System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management.

Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, RAID Structure.

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Principles", 7th edition, John Wiley & Sons Inc, 2006.

REFERENCE BOOKS:

1. William Stallings, "Operating Systems – Operating System: Internals and Design Principles", 6th edition, , Prentice Hall, 2005.
2. Andrew S Tanenbaum ,"Modern Operating Systems", 3rd edition, , Prentice Hall, 2007.

III Year B.Tech. CSE I - Semester

L	T	P	To	C
4	-	-	4	4

CS317 COMPILER DESIGN

Course Description & Objectives:

To understand, design and implement a lexical analyzer , parser and code generation schemes. To understand optimization of codes and runtime environments.

Course Outcomes:

On completion of the course the student will:

- *Be able to prove an understanding of a program language structure and its translation to executable code by constructing and demonstrating a compiler for a language defined by a certain grammar.*
- *Prove knowledge of ongoing events when executing programs written in high level language. This is done by explaining and demonstrating these events while running a simple program translated by a personally designed compiler.*
- *Know how to design a compiler for a regular high level language.*

UNIT I - Introduction to Compiling

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens, data structures in compilation – LEX lexical analyzer generator

UNIT II - Syntax Analysis

Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing –Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser ,YACC – automatic parser generator.

UNIT III - Semantic analysis

Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Conversion of popular Programming languages language Constructs into Intermediate code forms, Declarations – Assignment Statements –Boolean Expressions.

UNIT IV - Code optimization and Run Time Environments

Introduction– Principal Sources of Optimization –Optimization of basic Blocks – Introduction to Global Data Flow Analysis - Basic blocks, Flow graphs, data flow equation, global optimization, data flow analysis for structured Programs.

UNIT V - Code Generation

Issues in the design of code generator – The target machine – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.

TEXT BOOK :

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and Tools”, 1st ed., Pearson Education Asia, 2003.

REFERENCE BOOKS :

1. Allen I. Holub “Compiler Design in C”, 1st ed., Prentice Hall of India, 2003.
2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, 1st ed., Benjamin Cummings, 2003.
3. J.P. Bennet, “Introduction to Compiler Techniques”, 2nd ed., Tata McGraw-Hill, 2003.
4. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, 3rd ed., PHI, 2001.
5. Kenneth C. Louden, “Compiler Construction: Principles and Practice”, 1st ed., Thompson Learning, 2003.

III Year B.Tech. CSE I - Semester

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CS319 OPEN SYSTEMS FOR WEB TECHNOLOGIES (ELECTIVE I)

Course Description & Objective:

It makes familiar of Open Source technologies like LINUX, MySQL, CGI, PHP, Webserver and various tools which are used to develop web programming.

Course Outcomes:

- Students can develop web pages using HTML
- Can write dynamic web pages
- Can write server programs handling database connection
- Can generate responses accordingly

UNIT I - Introduction & Open Source Operating System

Nature of Open sources –Maturity Model- Design Strategy-Support Models-Advantages – Application of Open Sources.

Open Source Operating System: General Overview - Case Study: Linux - Files and Directories - Intermediate File Management - Process Management-Memory Addressing - Process Scheduling - Signals – Virtual File System- Page Cache- Program Execution.

UNIT II - Open Source Database

General Overview- Case Study: MySQL -Introduction – MySQL Basic- Directory Structure-Creating Users and Super Users- Designing a Relational Database-Managing Databases, Tables and Indexes-Operators-functions-Transaction Management

UNIT III - Open Source Programming Languages

General Overview - Case Study: PHP -Introduction – Basics of PHP- functions-Error Handling- Interaction between PHP and MySQL Database using Forms-Using PHP to manipulate and Retrieve Data in MySQL.

UNIT IV -Open Source Web Server

General Overview of Web Server - Case Study: Apache Web server – Working with Web Server – Configuring and using Apache Web services-Case Study Apache Tomcat.

UNIT V - Open Source Tools and Technologies

Open Source IDE-Modeling Tools- Mozilla Firefox- Wikipedia- Eclipse

TEXT BOOKS:

1. Dan Woods and Gautam Guliani,"Open Source for the Enterprise: Managing Risks, Reaping Rewards", O'Reilly, Shroff Publishers and Distributors, 2005.

2.Daniel.P.Bovet and Marco Cesati," Understanding the Linux Kernel ", O, Reilly, 2007.

REFERENCE BOOKS:

1. Ivan Bayross and Sharanam Shah,"MySQL 5 for Professionals", Shroff Publishers and Distributors, 2007

2. Ivan Bayross and Sharanam Shah," PHP 5.1 for Beginners", Shroff Publishers and Distributors, 2006

3. Vivek Chopra, Sing Li, Jeff genender, "Professional Apache Tomcat 6", Wiley India, 2007

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CS321 COMPUTER GRAPHICS (ELECTIVE I)

Course Description & Objective:

To provide a comprehensive introduction to computer graphics leading to understand the contemporary terminology andalgorithms of computer graphics.To make the students learn the basic principles of visualization. To give an introduction to 2D and 3D modeling and animation.

Course Outcomes:

- Students will understand the working of various graphics systems along with the algorithms used for these devices for drawing.
- They will have an understanding of 2D graphics and algorithms including: line drawing, polygon filling, clipping, and transformations.
- They will understand the concepts of and techniques used in 3D computer graphics and basic about animation.

UNIT I - Overview of Graphics System

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives, Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

UNIT II - 2D geometric transformations and viewing

Basic transformation: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D Viewing, The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT III - 3D geometric transformations

3-D Object representation, Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier andB-spline surfaces, sweep representations, octrees BSP Trees, 3-D Geometric transformations, Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT IV - Visible surface detection methods

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods Illumination Models and Surface rendering Methods: Basic illumination models, polygon rendering methods

UNIT V - Computer animation

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Text Books:

1.Donald Hearn and M. Pauline Baker, Computer Graphics C version, Pearson education, Second Edition, 2008

2. Zhigang Xiang, Roy Plastock, Computer Graphics, Schaum's outlines, Second Edition, Tata McGraw Hill Edition, 2000

Reference Books:

1. Foley, VanDam, Feiner and Hughes, Computer Graphics Principles &Practice in C, Pearson Education.Second Edition, 1996
2. David F Rogers, Procedural elements for Computer Graphics, Tata McGraw Hill, 2nd edition., 1988
3. Neuman and Sproul, Principles of Interactive Computer Graphics, Tata McGraw Hill, 2nd edition., 1978
4. Shalini, Govil-Pai, Principles of Computer Graphics,Springer. First Edition, 2006
5. Steven Harrington, Computer Graphics, TMH, Second Edition, 1987

III Year B.Tech. CSE I - Semester

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CS323 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS (ELECTIVE I)

Course Description & Objective :

To impart the fundamental concepts of computer system performance evaluation.

Course Outcomes :

- Design of simulation models that represent the real-life computer systems
- Usage of simulation models as laboratory models for generating artificial history of the computer systems over time
- Design of experiments; and performance evaluation metrics computation and presentation

UNIT I - *Performance Evaluation*

A Systematic Approach to Performance Evaluation; Techniques for Performance Evaluation - Analytical Modelling, Simulation and Measurement; Performance Metrics - Selection and Utility Classification; Performance Requirements Specification; Types of Workloads; Art of Data Presentation; Ratio Games.

UNIT II - Probability Distributions

Key Characteristics of Commonly used Probability Distributions; Stochastic Processes, Markov Processes, Markov Chains and Markov Models.

UNIT III - Queuing Models

Introduction to Queuing Theory, Analysis of a single Queue, Queuing Networks, Operational laws, Mean Value Analysis, Convolution Algorithm and Hierarchical Decomposition of Large Queuing Networks.

Unit IV - Simulation

Introduction, Examples and Concepts in Discrete-Event Simulation; Random-Numbers - Properties and Techniques for Generating; Random-Variate generation techniques; Input Modelling. Simulation Models - Verification and validation;

Unit V - Design of Experiments

Introduction, 2^k Factorial Designs, 2^krFactorial Designs, 2^{k-p} FractionalFactorial Designs and Full Factorial Designs with k Factors.

Text Books

1. Raj Jain, The Art of Computer Systems Performance Analysis,Wiley India Pvt Ltd, Reprint 2010 (for Units I, III and V)

2. KishorShridharbhai Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications, 2nd Edition, Wiley 2001 (for Unit II)

References

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol and P Shahabudeen, Discrete-Event System Simulation, Fourth Edition, Pearson Prentice Hall, Second Impression 2008 (For Unit IV).
2. NPTEL Video Lectures on course topics

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CS325 OPERATIONS RESEARCH (ELECTIVE I)

Course Description & Objectives:

Operations Research uses mathematical, analytical and computational techniques to provide quantitative and qualitative information that will improve managerial decision making .This subject will provide students withability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively.

Course Outcomes:

Upon completion of the subject, students will be able to

- Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry;
- Formulate a managerial decision problem into a mathematical model;
- Understand Operations Research models and apply them to real-life problems; use computer tools to solve a mathematical model for a practical problem.

UNIT I - Introduction

Nature & Meaning of OR, Management applications of OR, Characteristics of operations research, Scope of operations research, Role of computers in Operations Research, Computational procedure of simplex method, Two phase method, Big-M Method, Methods to resolve degeneracy, solution of simultaneous equations by simplex method.

UNIT II - Transpotation problem

Introduction, Mathematical formulation of transportation problem, Types of transportation problem, Basic feasible solution by northwest corner method, least cost entry method, vogel's approximation method, U-V Method.

UNIT III

Assignment Problem, introduction, Zero one programming model for assignment problem, Types of assignment problem, Hungarian method, Branch and Bound technique for assignment problem

UNIT IV - Game Theory

Introduction, Characteristics of Game theory,Basic Definitions ,Minimax(Maximin) criterion and optimal strategy, saddle point,optimal strategies and value of the game, solution of games without saddle points, rectangular games with out saddle point, equivalence of rectangular game and linear programming, 2 ×2 games without saddle points, Arithmetic Methods for 2 ×2 games, Principle of dominance to reduce size of the game

Unit V - Network Techniques

Introduction, Shortest path model, Minimum spanning tree problem, Maximum flow problem

Text Books:

1.R.Panneer selvam , “ Operations Research “, Second edition Prentice-Hall of India Private Limited , 2006 by (II, III, V Units)

2. S.D.Sarma,” Operations Research Theory Methods &applications”, 13th Edition Kedarnath Ramnath & co, Meerut (I,IV Units)

Reference Books

1. J.C.Pant “Introduction to Operations Research “, (Jain Brothers, New Delhi)

2.Kanti Swarup, Man Mohan & P.K.Gupta “Introduction to Operations Research “ 5th Edition sultan Chand & sons

III Year B.Tech. CSE I - Semester

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CS236 WEB TECHNOLOGIES LAB

Course Description & Objective:

To createafullyfunctionalwebsite/web applicationwithMVC architecture.

Course Outcomes:

- *Students are able to develop a dynamic webpage by the use of java script and DHTML.*
- *Students will be able to write a well formed / valid XML document.*
- *Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.*
- *Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.*
- *Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.*

List of Experiments:

Lab Cycle – 1

1. Create an HTML page having Four frames named
   a. Top
   b. Center
   c. Bottom
   d. Left

   The Top frame should contain company logo and title. The bottom frame should contain copy right information. The Left frame should contain various links like Home, Products, Services, Branches, About us, etc. When we click on those links, the contents should come in to Center Frame.
2. Create a HTML document to demonstrate Form Elements that i ncludes Form, input-text, password, radio, checkbox, hidden, button, submit, reset, label, textarea, select, option, file upload.
3. Write a HTML program with at least two <h1>, two images, two buttons and appropriate CSS to display
   a. All <h1> with font-size 12pt, and bold in Verdana font using Inline CSS.
   b. All <img> with border color yellow, thickness 10px using Document Level CSS
   c. All <input type='button'>should change background color to red on mouse over them using External CSS.

4. Design an HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate javascript function should be called to display
    a. Factorial of that number
    b. Fibonacci series up to that number
    c. Prime numbers up to that number
    d. Is it palindrome or not
5. Write java script programs to demonstrate
    a. Math Object with at least five methods.
    b. String Object with at least five methods.
    c. Array Object with at least five methods.
    d. Date Object with at least five methods.
6. Write a java script program to display message on OnBlur and OnFocus events.
7. Create an XML document where CSEBooks is the root tag,it consists of 5 books named as(book1, book2, book3, book4, book5) whose copies of books are 10 and provide the child tag such as author,title,pages,price for all books.
8. For the above program, provide an associate DTD.
9. Create an XML document where automobiles is the root tag,it consists of 5 vehiclesnamed as (vehicle1,vehicle2,vehicle3, vehicle4, vehicle5) and use attributestype,model,engine no,color,cc.
10. For the above program, provide an associatedSchema.

Lab Cycle – 2

1. Write a java program to connect to a database server using JDBC and insert 10 students information of user choice in to student table.

2. Write a java program to display all records in the student table.

3. Develop a simple Servlet to display Welcome to Servlet.

4. Develop a Servlet to validate user name and passwordwith the data stored in Servlet configuration file. Display authorized user if she/he is authorized else display unauthorized user.

5. Demonstrate Life cycle of Servlet

6. Develop a Servlet to validate user name and password stored in database. Display authorized user is she/he is authorized else display unauthorized user.

7. Write a Servlet program to store student details sent from registration form in to database table.

8. Write JSP Program to store student information sent from registration page into database table.

9. Develop a program to validate username and password that are stored in Database table using JSP.

10. Write appropriate JSP pages to insert, update and delete data in student table in a single application with proper linking of JSP pages and session management.

TEXTBOOKS :

1. ChrisBates,”Webprogramming-BuildingInternet Applications”, 2nd ed.,WileyPublishers,2006.
2. DietelandNieto,”InternetandWorldWideWeb-Howtoprogram”, 4th ed., PHI/PearsonEducationAsia,2007.

REFERENCE BOOK:

1. HansBergsten,“JavaServerPages”, 1st ed., O’REILLYPublications, 2000.
2. Jennifer Niederst, Robbins, “Learning Web Design”, 3rd ed., SPD O’REILLY Publications, 10.
3. FiruzaAibara, “HTML for Beginners”, 2nd ed., SPD O’REILLY Publications, 2010.
4. Marty Hall, “Core Servlets and Java Server Pages”, 1st ed., Prentice Hall PTR, 2000.
5. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH

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CS329 COMPUTER NETWORKS LAB

Course Description & Objective:

Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

Course Outcomes:

- After completing the course, students will be able to:
- Understand the structure and organization of computer networks; including the division into network layers, role of each layer, and relationships between the layers.
- Understand the basic concepts of application layer protocol design; including client/server models, peer to peer models, and network naming.
- In depth understanding of transport layer concepts and protocol design; including connection oriented and connection-less models, techniques to provide reliable data delivery and algorithms for congestion control and flow control.

List of experiments:

1. Study of Network devices in detail
2. Connect the computers in Local Area Network
3. Implementation of Data Link Framing method - Character Count.
4. Implementation of Data link framing method - Bit stuffing and De stuffing.
5. Implementation of Error detection method - even and odd parity.
6. Implementation of Error detection method - CRC Polynomials.
7. Implementation of Data Link protocols - Unrestricted simplex protocol
8. Implementation of data link protocols - Stop and Wait protocol
9. Implementation of routing algorithms - Dijkstra's algorithm
10. Study of Network IP Addressing
11. Study of sockets in detail
12. Design TCP client and server application to transfer file
13. Design UDP client and server application to transfer file
14. Working on Network Protocol Analyzer Tool (Ethereal/Wireshark)
15. Working on NMAP Tool for Port scanning.

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CS331 OPERATING SYSTEMS LAB

Course Description & Objective:

To obtain the familiarity of Operating Systems tasks, simulation programs were designed using UNIX system calls.

Course Outcomes:

Student obtain practical exposure on

- Basic commands in UNIX
- Process scheduling algorithms simulation
- Inter Process Communication
- Memory management simulation

List of Programs

1. Write programs using the following system calls of UNIX operating system:
   fork, exec, getpid, exit, wait, close.
2. Write programs using the I/O System calls of UNIX operating system. (open, read, write, etc)
3. Write C programs to simulate UNIX commands like ls, grep, cp
4. Obtain the list of processes, their CPU burst times and arrival times through the keyboard. Display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
5. Obtain the list of processes, their CPU burst times and arrival times through the keyboard. Display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
6. Develop Application using Inter-Process-Communication (Using shared memory, pipes or message queues).
7. Implement the Producer-Consumer problem using semaphores (Using UNIX system calls)
8. Implement some Memory management schemes like Paging and Segmentation.

9. Implement some Memory management schemes like FIRST FIT, BEST FIT & WORST FIT.
10. Implement any file allocation techniques (Contiguous, Linked or Indexed)

TEXT BOOK:

1. Richard. Stevens, “Advanced Programming in the Unix Environment”, Addison-Wesley, 2nd edition, 1992

REFERENCE BOOK

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Principles”, 7th edition, John Wiley & Sons Inc, 2006.

III Year B.Tech. CSE II - Semester

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CS322 OBJECT ORIENTED ANALYSIS & DESIGN

Course Description & Objective:

This course explains how a software design may be represented as a set of interacting objects that manage their own state and operations. It describes the activities in the object - oriented design process and introduces various models that can be used to describe an object-oriented design.

Course Outcomes:

- To understand the fundamental principles of Object Oriented programming.
- To master key principles in Object Oriented analysis, design, and development.
- Be familiar with the application of the Unified Modelling Language (UML) towards analysis and design.
- To know common patterns in Object Oriented design and implement them.
- To be familiar with alternative development processes.
-

UNIT I - Introduction to UML

Importance of Modeling, Principles of Modeling, Object Oriented Modeling, Conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II - Basic Structural Modeling

Classes, Relationships, Common Mechanisms, and Diagrams.

Basic Behavioral Modeling, Use cases, Use case Diagrams, Interactions, Interaction Diagrams, Activity Diagrams.

UNIT III - Class & Object Diagrams

Terms, Concepts, Modeling Techniques for Class & Object Diagrams.

UNIT IV - Advanced Structural Modeling

Advanced Classes, Advanced Relationships, Interfaces, Types and Roles, Packages.

Advanced Behavioral Modeling, Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.

UNIT V - Architectural Modeling

Component, Deployment, Component Diagrams and Deployment Diagrams.

TEXT BOOK:

1. Booch G., Rumbaugh J. & Jacobsons I., “The Unified Modeling Language User Guide”, Addison Wesley, 2002.

REFERENCE BOOKS:

1. Meilir Page-Jones, “Fundamentals of Object Oriented Design in UML”, 4th ed., Pearson Education, 2008.
2. Pascal Roques, “Modeling Software Systems Using UML2”, 2nd ed., WILEY- Dreamtech India Pvt. Ltd, 2004.
3. Atul Kahate, “Object Oriented Analysis & Design”, 1st ed., The McGraw-Hill Companies, 2008.
4. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, “UML 2 Toolkit”, 1st ed., WILEYDreamtech India Pvt. Ltd., 2003.

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CS324 MIDDLEWARE TECHNOLOGIES

Course Description & Objective:

The main objective of this course is to get on awareness of a the various technologies which can help in the implementation of the various live project

Course Outcome:

Upon completion of the subject, students will be able to:

- Understand the basic structure of distributed systems;
- Understand the motivation of using middleware;
- Understand the basic concepts underlying the ASP.net and C#.net;
- Learn to make judgment in choosing a suitable middleware for application problems;
- Understand the basic concepts of Web Services and EJB.

UNIT I- Emergence of Middleware

Introduction,Objects, Web Services,Middleware Elements,Vendor Architecture,interoperability,Middleware in distributed applications, Types of Middleware,RMI, JDBC,Client/Server CORBA Style.

UNIT II - ASP.NET

Introduction,Lifecycle,ServerControls,Basic Controls,Directives,Validators, Database Access,ADO.Net,File Uploading, Data Sources, Data Binding,Custom Controls,Security,Data Caching,Multithreading, Deployment.

UNIT III - Fundamentals of C#& .NET platform

Comprehensive .NET Assemblies.OOPs with C#,Attributes, Reflection, Properties,Indexers ,Delegates ,Events,Collections, Generics, Anonymous Methods, Unsafe Codes and Multithreading

UNIT IV - Web Services

Introduction,Architecture, Components,Security,XML Web Service Standards,Creating Web Services,Extending Web Services, Messaging Protocol,describing,discovering,securing

UNIT V - EJB

Java Bean Component Model,EJB Architecture,Session Bean,Java Message Service,Message Driven Bean,Entity Bean

TEXT BOOKS:

1. WortgangEmmerichJohn,"Engineering Distributed Objects", Wiley, 2000.
2. Mesbah Ahmed, Chris Garrett, Jeremy Faircloth, Chris Payne, DotThatCom.com, "ASP.net web developer guide",Wei Meng Lee (Series Editor),Jonothon Ortiz (Technical Editor),Syngress Publications, 2001.

REFERENCE BOOKS:

1. Andrew Troelsen, "C# and the .NET Platform",Apress Wiley-dreamtech, India Pvt.Ltd, 2011.
2. ".NET Web Services-Architecture and Implementation", Keith Ballinger, Pearson Education, 2002.

III Year B.Tech. CSE II - Semester

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CS326 MICROPROCESSORS AND INTERFACING

Course Description &objectives :

This course introduces basic architecture and operation of microprocessor and microcontroller to the student. The course objective is to study the architecture and addressing modes of 8086/8051 and to know the importance of different peripheral devices.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- Impart knowledge on the architecture and software aspects of microprocessor 8086
- Write assembly language program in 8086 for various application.
- Create the memory and IO interfacing techniques with 8086 and 8051
- Give an overview on the architecture and basic concepts of microcontroller

UNIT I - Introduction to microprocessors

Evaluation of microprocessors, 8086 microprocessor, architecture, register model, physical address generation, instruction set classification, addressing modes, I/O addressing. Assembly language programs for arithmetic operations, logical operations, CALL-RET operations, Intra and inter segment calls, sorting and string operations. Interrupts of 8086, Interrupt vector table, explanation of interrupts.

UNIT II - Hardware features of 8086

Pin diagram of 8086, multiplexed ADD/DATA and ADD/STATUS buses, control bus, minimum and maximum modes, Memory READ/WRITE and I/O READ/WRITE machine cycles, machine cycle with WAIT states. Physical Memory organization & memory interfacing to 8086.

UNIT – III

I/O Interfacing - I, 8255-PPI: Architecture, Modes of operation and Interfacing to 8086, A/D and D/A converter interfacing. 8259 - PIC: Architecture, working.

UNIT IV - I/O Interfacing - II

Direct Memory Access (DMA): Architecture, Working, Serial Data Communication **:** Fundamentals of Serial Data Communication, 8251 USART, Architecture, working.

UNIT V - Introduction to Microcontroller

Differences between microprocessor and microcontrollers, 8051 architecture,Internal & External memory organization, Pin diagram, addressing modes, Instruction set and assembly language programming.

TEXT BOOKS :

1. Douglas V.Hall, “Microprocessors & Interfacing” , 2nd ed., TMH, 2003.
2. AK Ray and KM Bhurchandi, “Advanced Microprocessors & Peripherals”, 2nd ed., TMH, 2006.

REFERENCE BOOKS :

1. Kenneth J. Ayala, “8086 Microprocessor Programming and Interfacing the PC”, 2nd ed., Cengage Learning, 2008.
2. Barry B. Brey, “The Intel Microprocessors”, 6th ed., Pearson Education, 2003.
3. Kenneth J. Ayala, “8051 Microcontrollers”, 1st ed., Cengage Learning, 2008.

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CS328 MOBILE COMPUTING

Course Description & Objective:

Introducing the mobile and wireless data communication to the student. Describing the main characteristics of WLAN, Blue tooth, mobile IP. Illustrating how the data is routed using mobile IP, using Home Agent & Foreign Agent. Describing the current areas of emerging interest in wireless and mobile computing.

Course outcomes:

- Able to understand how communication is established when mobile node is moved from one location to another location.
- Able to think and develop new mobile applications.
- Able to develop new ad hoc network applications and/or algorithms/ protocols.
- Able to understand & develop any existing or new protocol related to mobile environment

UNIT I - Introduction

Wireless Communication Fundamentals Introduction, Wireless transmission, Frequencies for radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread spectrum, Medium Access Control - SDMA, FDMA, TDMA, CDMA, Cellular Systems.

UNIT II - GSM

Mobile Telecommunications Systems Introduction to 1G,2G,3G systems, GSM – System Architecture, Protocols, Connection Establishment, Frequency Allocation, Routing, Handover, Security, GPRS,UMTS.

UNIT III - Categories of Wireless Networks

Wireless Local Area Networks Infrared Vs. Radio LANs, IEEE 802.11 Standards, Architecture, Physical Layer, MAC Layer, versions of 802.11, Blue Tooth - Introduction, Networking, Pico net, Scatter net, Protocol Architecture and Layers.

UNIT IV - Routing in Wireless Networks

Network Layer Mobile IP, Dynamic Host Configuration Protocol, Routing, Destination Sequence Distance Vector Routing, Dynamic Source Routing, Ad hoc On Demand Distance Vector Routing, Mobile Adhoc Networks, Wireless Sensor Networks - MAC protocols, Routing protocols, Applications of sensor networks.

UNIT V - Protocols and Tools

Transport and Application Layers TCP over Wireless Networks, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit / Fast Recovery, Transmission/ Timeout Freezing, Selective Retransmission, Transaction Oriented TCP, Wireless Application Protocol –WAP Architecture, Wireless Datagram Protocol, Warless Transport Layer Protocol, Wireless Transaction Protocol, Wireless Security Protocol, Wireless Markup Language,WML Script, Wireless Application Environment.

TEXT BOOKS :

1. Jochen Schiller, “Mobile Communications “, 2nd ed., Pearson Education, 2003.
2. William Stallings, “Wireless Communications and Networks “,2nd ed., Prentice Hall of India / Pearson Education, 2007.

REFERENCE BOOKS :

1. Uwe Hansmann, Lothar Merk, Martin S.Nicklons and Thomas Stober, “ Principles of Mobile Computing, 2nd ed., Springer International, 2007.
2. Raj Kamal “Mobile Computing” , Oxford University Press 3. http://www.zigbee.org/
3. Dharma P.Agarwal, Carlos Cordeiro “Adhoc and Sensor Networks - Theory and Applications”, 1st ed., World Scientific Publications, 2007.
4. C.Siva Ram Murthy, “ Adhoc Wireless Networks Architecture and Protocols”, 2nd ed., Prentice Hall PTR, 2008.

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CS330 NETWORK PROGRAMMING (ELECTIVE II)

Course Description & Objective:

The main objectives of this course is to provide hands on experience on the usage of the multiprocessing systems like UNIX for basic communication needs among processes and further, how the basic communication between two computers can be enabled using socket programming.

Course Outcomes:

- demonstrate advanced knowledge of networking
- make use of various solutions to perform inter-process communications
- demonstrate knowledge of protocols and languages used in Web and multimedia delivery
- demonstrate advanced knowledge of programming for network communications
- describe major technologies used in network communications

UNIT I - Introduction to Network Programming

OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services.

Inter Process Communication: Pipes, FIFOs

UNIT II - Elementary Sockets

Address structures, value – result arguments, Byte ordering and manipulation function and related functions.

Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT III - TCP client server

Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination.

UNIT IV - I/O Multiplexing and socket options

I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server. Socket Options getsockopt and setsockopt functions. Socket states, Generic socket option.

UNIT V - UDP sockets

Introduction UDP Echo server function, lost datagram.
Elementary name and Address conversions,DNS-Resource Records, Resolver and name servers.

TEXT BOOK :

1. W.Richard Stevens,"UNIX Network Programming Sockets API", Vol. I, 3rd ed., PHI, 2011.

REFERNCE BOOKS :

1. T CHAN ,"UNIX Systems Programming Using C++",1st ed., PHI, 2005.
2. GRAHAM GLASS, KING ABLES ,"UNIX for programmers and Users", 3rd ed., Pearson Education,2008.
3. M J Rochkind, "Advanced UNIX programming", 2nd ed., Pearson education, 2007.
4. W.Richard Stevens, "UNIX Network Programming",1st ed., PHI, 2005.

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CS332 ARTIFICIAL INTELLIGENCE (ELECTIVE II)

Course Description & Objectives:

Provide knowledge of ideas and techniques underlying the design of intelligent computer systems. Develop problem solving skills in students. Provide knowledge of the tools and applications of AI. Lay the foundation for research areas like Natural language Processing(NLP) and Machine learning(ML).

Course Outcomes:

- Basic knowledge of AI principles, techniques, Expert Systems
- Applications of basic AI techniques for problem solving.
- Knowledge representation and new knowledge deduction in intelligent systems.
- A brief idea of NLP, and Machine learning techniques.

UNIT I - Intelligent Systems

Introduction- What is AI? Examples of AI systems, Brief history of AI. Intelligent Agent- Agents and environments, The concept of rationality, The nature of environments, Structure of agents, stimulus-response agents (simple reflex agents), Model based agents, Goal based agents, Utility based agents, Learning agents.

UNIT II - Problem Solving

Searching, Solving problems by searching, A* algorithm, AO* algorithm, Heuristic functions, Hill climbing. Searching game trees (Adversarial search): Games, Optimal decisions in games, Minimax procedure, Alpha-beta pruning.

UNIT III - Knowledge Representation

Propositional logic, Logical agents, reasoning patterns in propositional logic, Inference in propositional logic i.e. Resolution, Forward chaining, Backward chaining. First order logic, Reasoning patterns in First order logic, Inference in First order logic i.e. Resolution, Forward chaining, Backward chaining.

UNIT IV - Planning

The planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, analysis with planning approaches.

UNIT V - Learning

Forms of learning, Inductive learning, Learning Decision Trees, Ensemble Learning, Why learning works. Natural Language Processing(NLP): Introduction, Understanding, Perception, Machine learning.

Text Book:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence”, Second Edition, Pearson Education, 2003.

Reference Books:

1. G.Luger, W.A. Stubblefield, “Artificial Intelligence”, Third Edition, Addison-Wesley Longman, 1998.
2. N.J. Nilsson, “Principles of Artificial Intelligence”, Narosa Publishing House, 1980.

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CS334 PRINCIPLES OF PROGRAMMING LANGUAGES (ELECTIVE II)

Course Description & Objective:

After the completion of this course Student should be able to understand how to design a new Programming Language. Know the differences between Structured and unstructured programming constructs.

Course Outcomes:

On completion of the course the student will:

- Understand the concepts in programming languages
- The way of using those constructs in different programming languages.
- Familiar with the design of a new programming language.

UNIT I - Syntax and Semantic

Reasons for studying concepts of programming languages, Programming domains, Language Evaluation Criteria, Von Neuman Architecture, Language categories, Implementation Methods, Programming environments, General Problem of describing Syntax – Language. Recognizers and Language Generators, Formal methods of describing syntax – BNF, EBNF , Attribute grammars, Dynamic Semantics – Axiomatic , Operational and Denotational semantics.

UNIT II - Variables and Data Types

Names, Variables, Concept of binding, Type checking, Strong typing, Type compatibility, Named constants, Variable initialization, Data types – Primitive, Character, User defined, Array, Associative Arrays, Record, Union, Pointer and Reference types, Design and implementation uses related to these data types.

UNIT III - Expressions and Statements

Arithmetic, Relational and Boolean expressions, Short circuit evaluation, Mixed mode assignment, Assignment Statements, Statement-Level Control structures – Introduction, Selection and Iteration statements, Unconditional branching, Guarded commands.

UNIT IV - Language Features

Fundamentals of sub-programs, Static and Dynamic, Scope and lifetime of variable, Design issues of subprograms, Local referencing environments, Parameter passing methods, Overloaded sub-programs, Generic sub-programs, Parameters that are sub-program names, Design issues for functions, User defined overloaded operators, Co routines.

UNIT V - Concurrency and Exception Handling

Subprogram level concurrency, Introduction to Exception Handling, Exception Handling in Ada, C++ and Java, Functional Programming languages-Haskell, LISP

TEXT BOOKS :

1. Robert .W. Sebesta,"Concepts of Programming Languages", 8th ed., Pearson Education, 2009.
2. Ellis Horowitz, "Fundamentals of Programming Languages", 2nd ed., Computer Science Press, 2003.

REFERENCE BOOKS

1. Pratt and Zelkowitz," Programming Languages Design and Implementation" , 4th ed., PHI/Pearson Education,2002.
2. Watt, "Programming Languages", 4th ed., Wiley Dreamtech, 2002.
3. H.M.Dietel and P.J.Dietel, "Java How to Program", 6th ed., Pearson Education/PH

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CS336 SIMULATION AND MODELING (ELECTIVE II)

Course Description and Objectives:

The objective of this course is to teach students methods for modeling of systems using discrete event simulation. Emphasis of the course will be on modeling and on the use of simulation software. The students are expected to understand the importance of simulation in IT sector, manufacturing, telecommunication, and service industries etc. By the end of the course students will be able to formulate simulation model for a given problem, implement the model in software and perform simulation analysis of the system.

Course outcomes:

1. Students will be enable to understand the types of system models.
2. Students will be able to generate random variables and random numbers.
3. Students can verify and validate simulation models.

UNIT I - Introduction to Simulation

static physical models,dynamic physical models,static mathematical models,dynamic mathematical models,principles used in modeling.
System studies, a corporate model:Environment segment,production segment,management segment. Types of system study.

UNIT II - Mathematical and Statistical Models

Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers.

UNIT III - Language for simulation

Input modeling:data collection,identifying the distribution with data,parameter estimation,goodness of fit test,fitting a non stationary Poisson process,selecting input models with out data,multivariate and time series input models.

Verification and validation of simulation models, model building,verification and validation ,verification of simulation models,calibration and validation of models.

UNIT IV - Experiments

Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques.

UNIT V - Case Study

Manufacturing and material handling simulation,goals and performance measures,issues in manufacturing and material handling simulations,case studies of the simulation of manufacturing and material handling systems. Manufacturing example, a job shop analysis,simualtion of computer systems:simulation tools,model input,high level computer system simulation,memory simulation.

Text Books:

1. Geoffrey Gordon, “System Simulation”, Second edition, Prentice Hall, India, 2002[unit I]

2. Jerry Banks and John S.Carson, Barry L.Nelson, David M.Nicol, “Discrete Event System Simulation”, fourth edition, Prentice Hall, India, 2002[unit II,III,IV,V]

Reference Books:

1. Robert E.Shannon, “System Simulation The art and science”, Prentice Hall, New Jersey, 1995.

2. D.S. Hira, “System Simulation”, S.Chand and company Ltd, New Delhi, 2000

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CS338 OBJECT ORIENTED ANALYSIS AND DESIGN LAB

Course Description & Objective:

The analysis, design, coding, documentation, database design of mini project which will be carried out in 4th year can be done in object-oriented approach using UML and by using appropriate software which supportsUML.

Course Outcomes:

After completing this course the student must demonstrate the knowledge and ability to:

- Show the importance of systems analysis and design in solving complex problems.
- Show how the object-oriented approach differs from the traditional approach to systems analysis and design.
- Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, statechart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation.
- Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.
- Show the role and function of each UML model in developing object-oriented software.

Mini-Project - I :

A Point-of-Sale (POS) System :A POS system is a computerized application used to record sales andhandle payments; it is typically used in a retail store, it includes hardware components such as a computerand bar code scanner, and software to run the system. It interfaces to various service applications, such asa third-party tax calculator and inventory control. These systems must be relatively fault tolerant; that is,even if remote services are temporarily unavailable they must still be of capturing sales and handling at leastcash payments. A POS system must support multiple and varied client-side terminals and interfaces such asbrowser, PDAs, touch-screens.

Mini-Project - II :

Online Bookshop Example : Following the model of amazon.com or bn.com, design and implement anonline bookstore.

Mini-Project - III :

A Simulated Company : Simulate a small manufacturing company. The resulting application will enable the user to take out a loan, purchase a machine, and over a series of monthly production runs, follow theperformance of their company.

Mini-Project - IV :

A Multi-Threaded Airport Simulation : Simulate the operations in an airport. Your application shouldsupport multiple aircrafts using several runways and gates avoiding collisions/conflicts.

Landing: an aircraft uses the runway, lands, and then taxis over to the terminal. Take-Off: an aircraft taxiesto the runway and then takes off.

Mini-Project - V :

An Automated Community Portal : Business in the 21st Century is above all BUSY. Distractions areeverywhere. The current crop of “enterprise intranet portals” is often high noise and low value, despite thelarge capital expenditures it takes to stand them up. Email takes up 30 - 70% of an employee’s time. Chatand Instant Messaging are either in the enterprise or just around the corner. Meanwhile, management istasked with unforeseen and unfunded leadership and change-agent roles as well as leadership developmentand succession management. What is needed is a simplified, repeatable process that enhancescommunications within an enterprise, while allowing management and peers to self-select future leaders andeasily recognize high performance team members in a dynamic way. Additionally, the system shouldfunction as a general-purpose content management, business intelligence and peer-review application.Glasscode’s goal is to build that system. The software is released under a proprietary license, and will havethe following features: Remote, unattended moderation of discussions However, it will have powerfuldiscovery and business intelligence features, and be infinitely extendable, owing to a powerful API andadherence to Java platform standards. Encourages peer review and indicates for management potentialleaders, strong team players and reinforces enterprise and team goals seamlessly and with zeroadministration.

Mini-Project - VI :

A Content Management System : The goal is to enable non-technical end users to easily publish, access,and share information over the web, while giving administrators and managers complete control over thepresentation, style, security, and permissions.

Features:

- Robust Permissions System
- Templates for easy custom site designs
- Total control over the content
- Search engine friendly URL's
- Role based publishing system
- Versioning control
- Visitor profiling

Mini-Project - VII :

An Auction Application : Several commerce models exist and are the basis for a number of companies like eBay.com, pricellne.com etc. Design and implement an auction application that provides auctioningservices. It should clearly model the various auctioneers, the bidding process, auctioning etc.

Mini-Project - VIII :

A Notes and File Management System : In the course of one's student years and professional career oneproduces a 1 lot of personal notes, documents. All these documents are usually kept 1 on papers orindividual files on the computer. Either way the bulk of the information is often erased corrupted andeventually lost. The goal of this 1 project is to build a distributed software application that addresses this "|problem. The system will provide an interface to create, organize and manage I personal notes through theInternet for multiple users. The system will also allow users to collaborate by assigning permissions formultiple users to view and edit notes.

Mini-Project - IX :

Library Management System(LMS): The goal is to enable students and librarians to easily access and manage the library and run it smoothly. Each physical library item - book, tape cassette, CD, DVD, etc. could have its own item number. To support it, the items may be barcoded. The purpose of barcoding is to provide a unique and scannable identifier that links the barcoded physical item to the electronic record in the catalog.

Barcode must be physically attached to the item, and barcode number is entered into the corresponding field in the electronic item record. Barcodes on library items could be replaced by RFID tags. The RFID tag can contain item's identifier, title, material type, etc. It is read by an RFID reader, without the need to open a book cover or CD/DVD case to scan it with barcode reader.

Mini-Project - X

Hospital Management System: Simulate to show and explain hospital structure, staff, and relationships with patients, and patient treatment terminology

TEXT BOOK :

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process", 2nd ed., Pearson Education Asia, 2002.

REFERENCE BOOKS:

1. Simon Sennet, Steve McRobb, and Ray Farmer, "Object Oriented Systems Analysis and Design using UML", 2nd ed., McGraw Hill, 2002.
2. Andrew Haigh, "Object-Oriented Analysis & Design," 1st ed., Tata McGraw-Hill, 2001.

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CS340 MOBILE COMPUTING LAB

Course Description & Objective:

After performing the below experiments, the students can simulate various network topologies with different routing algorithms and they can analyze how each routing algorithm is performing its job. The students will also be able to design, develop and deploy mobile applications in different different platforms.

1) Installing NS2 or NS3.
2) Create a TCL Script for the following network.

   N2 —— 1MB, 10ms, DropTail —— N1

   Create FTP traffic over TCP. Find out the throughput using GREP command.
3) Create a TCL Script for the following network.

   N2 —— 1MB, 10ms, DropTail —— N1

   Create CBR traffic over UDP. Find out the throughput using GREP command.
4) Simulate the Distance Vector Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc
5) Simulate the Link State Routing Algorithm and Analyze the performance metrics such as throughput, packet drop rate etc
6) Develop a simple mobile application for swapping images by using either Android or IBM Worklight.
7) Develop a mobile calculator application that performs addition, subtraction, multiplication, division, modulus operations on mobile by using either Android or IBM Worklight.
8) Design and develop a mobile application to validate user name and password by using either Android or IBM worklight.
9) Design and develop a College Information system by using either Android or IBM worklight.

10) Simulate the mobile chatting application by using either Android or IBM Worklight.

Text Books

1. Ian G Clifton, “Android User Interface Design , “Turning Ideas and Sketches into beautifully designed Apps” , Kindle Edition.
2. Teerawat Issari Yakul, Ekram Hossain, “ Introduction to Network Simulator NS2”, 2nd Edition, Springer.
3. Mohammad Siaf Uddin, Talha Haroon “ , IBM Worklight Mobile Application Development Essentials”, Kindle Edition.

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CS342 MINI PROJECT

Course Description & Objective:

The main objective of this course is that the student has to employ all the skills acquired so far to develop a working model or software or project. Student has to take up a live project or come up with a new idea or propose an alternative solution to an existing problem that is related to computer science. Student has to develop a software solution to the problem identified or proposed.

Course Outcome:

- Student should know all the phases of SDLC
- How requirements are gathered
- How gathered requirements are analyzed.
- Proposing an design model for the requirements
- Writing the appropriate modules using any of the programming languages
- Testing the developed software

Mini project and its report shall be evaluated along with labs at the end of the semester. Mini project shall be submitted in report form and should be presented before the committee, which shall evaluate for 50 Marks. The committee consists of an external examiner, HOD, supervisor of the mini project and a senior faculty member of the department. There shall be 50 internal marks for mini project and its evaluation on continuous basis.

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CS425 DATA WAREHOUSING & DATA MINING

Course Description & Objective:

This course is about knowing of how to make use of historical data so that high end business decision can be taken for the growth of an organization. The main objective of this course is to designing the intelligent machines which can take risk business decisions behalf of humans using the datamining techniques like classification, clustering, outlier detection, association rule mining.

Course Outcomes:

Students are able to

- Learn the basic concepts of Database Technology Evaluation steps and also understood the need of data mining and its functionalities
- Explore the efficient and effective maintenance of Data Warehouses.
- Apply the data mining functionalities like Clustering, Classification, Association Analysis to real world data.
- Discover interesting patterns and association rules from huge volume of data used to do classifications and predictions.
- Gain knowledge on developing areas like Web Mining, Text Mining, and Spatial Mining.

UNIT I - Introduction Data Warehousing and Mining

Why Data Mining, What is Data Mining, Kinds of Data, Kinds of Patterns, and Technologies used, Kinds of applications adopted, Major issues in Data Mining.

Data Warehousing and Online Analytical Processing, Basic Concepts, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction

UNIT II - About Data & Data Preprocessing

Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity Data Preprocessing, An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT III - Mining Concepts

Preliminary Concepts, Data Cube Computation Methods, Processing Advanced Kinds of Queries by Exploring Cube Technology, Multidimensional Data Analysis in Cube Space

Mining Frequent Patterns, Associations, and Correlations, Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods

Advanced Pattern Mining, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining

UNIT IV - Classification

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy

Advanced Classification, Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Classification Using Frequent Patterns, Lazy Learners, Other Classification Methods

UNIT V - Cluster Analysis

Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering

Advanced Cluster Analysis, Probabilistic Model-Based Clustering, Clustering High-Dimensional Data

TEXT BOOK:

1. Jiawei Han Micheline Kamber – “Data Mining Concepts & Techniques”, Third Edition, Morgan Kaufmann Publishers, 2012.

REFERENCE BOOKS :

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, First Edition,2012.
2. Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit”, first edition John Wiley and Sons Inc., 2002.

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CS427 CRYPTOGRAPHY AND NETWORK SECURITY

Course Description & Objective:

This Course focuses towards the introduction of network security using various cryptographic algorithms and understanding network security applications. It also focuses on the practical applications that have been implemented and are in use to provide email and web security.

Course Outcomes:

On successful completion of this course, the students

- Will have knowledge and understanding of: Classical encryption techniques, Block ciphers and the Data Encryption Standard, Basics of finite fields, Advanced Encryption Standard, Contemporary symmetric ciphers, Confidentiality using symmetric encryption, Basics of number theory, Key management, Public key cryptosystems, Message authentication, Hash functions and algorithms, Digital signatures and authentication protocols, Network security practice, Applications, E-Mail, IP and web security, System security, Intruders, Malicious software, Firewalls.
- Will develop their skills in: the programming of symmetric and/or asymmetric ciphers and their use in the networks.
- Will learn protocols used in Web Security and Transport layer Security

UNIT I - Network Security Introduction

Security attacks – Security services – Security Mechanisms – A Model for Network Security Model Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography

UNIT II - Block Ciphers and Data Encryption Standard

Block Cipher Principles – Data Encryption Standard – Strength of DES – Differential and Linear Cryptanalysis - Block Cipher Design Principles.-

Advanced Encryption Standard – Evaluation Criteria of AES – AES Cipher – More on Symmetric Ciphers – Multiple encryption and Triple DES – Block Cipher Modes of Operation – RC4.

UNIT III - Public-Key Encryption and Hash Functions

Principles of Public –Key Cryptosystems – RSA Algorithm – Key Management – Message Authentication and Hash Functions – Authentication Requirements – Authentication Functions – Message Authentication – Hash Functions – Security of Hash Functions and MACs- Digital Signatures - Authentication Protocols – Digital Signature Standard.

UNIT IV - Network Security Applications

Kerberos – X.509 Authentication Service – Public Key Infrastructure – Pretty Good Privacy – S/MIME- IP Security Overview – IP Security architecture-Authentication Header – Encapsulating Security Payload – Combining Security associations – Key Management

UNIT V - Web Security

Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction. SYSTEM SECURITY Intruders – Intrusion Detection – Password Management – Malicious Software - Firewalls – Trusted Systems.

TEXT BOOKS :

1. William Stallings, "Cryptography and Network security", 4th ed., Pearson Education, 2010.
2. William Stallings "Network Security Essentials Applications and Standards", 2nd ed.,Pearson Education, 2009.

REFERENCE BOOKS :

1. Eric Malwald, "Fundamentals of Network Security ", 4th ed., Pearson Education, 2010.
2. Charlie Kaufman, "Radis Perlman and Mike Speciner ,Network Security – Private Communication in a Public World", 1st ed., Pearson Education,2009 .
3. Buchmann, Springer ,"Introduction to Cryptography", 2nd ed., Pearson Education, 2009.

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CS429 DISTRIBUTED COMPONENT OBJECT TECHNOLOGIES (J2EE/.NET)

Course Description & Objective:

To understand the development of enterprise applications using 'java 2 Platform, enterprise Edition (J2EE) and .NET'.ADO.NET provides consistent access to data sources such as Microsoft SQL Server, as well as data sources exposed through OLE DB and XML.

Course Outcomes:

After completing this course a student is capable of:

- Gain knowledge on J2EE architecture
- Distributive systems introduction
- EJB implementation
- ASP.net introduction
- Developing web controls

UNIT I - Introduction To J2EE

J2EE Overview, Why J2EE?,J2EE Architecture,The Birth Of J2EE,Distributive Systems,The Tier,J2EE Multitier Architecture,Client Tier Architecture, Web Tier Implementation,EJB Tier Implementation,Enterprise Information Systems Tier Implementation,Myths Of Using Inheritance,Maintainable Classes.

UNIT II - JDBC and Embedded SQL

Model Programs,Tables,Indexing,Inserting Data Into Tables,Selecting Data From A Table,Metadata,Updating Tables,Deleting Data From A Table,Joining Tables,CalculatingData,Grouping And Bordering Data,Subqueries,View. Struts Framework:What Is Struts?,Struts Architecture.

UNIT III - Introduction to ASP and ASP.Net Server Controls

Introduction to asp, net FrameWork,asp.net, visual studio 2005-the Document window –views in the Document Window, the Tag Navigator, Page tabs, code change Status Notifications, Error Notifications and Assistance, the tool box, Solution Explorer, Server Explorer, Properties Window, Asp.net server Controls and Client- Side Scripts: Asp.Net Server Controls- Types of server Controls

Building With Server Controls. working with Server Control Event, Applying Styles to Server Controls –Examining the Controls Common properties.Html Server Controls- Html Control Base Class.

UNIT IV - Web Server Controls

Label Server Control, Leteral Server Control, Text Box Server Controlfocus(), AutoPostBack, Auto Complete Type,. Button Server Control- Causes Validation Property ,command Name Property, Asp.net Web Server Controls Bulleted List Server Controls, File Upload Server Control-Uploading Files Using the File Upload Control, Giving Asp.net Proper Permissions to Upload Files

UNIT V - Data Binding in ASP.NET

Data Source Controls - Sql Data Source Control, Xml Data Source Control, Object Data Source Control Site Map Data Source Control,. Configuring Data Source Control Caching, Storing Connection Information, Using Bound List Controls with Data Source Controls, GridView Editing, inserting, and Updating, and Deleting Data Using DetailsView, FormView, AD Rotator. Menu.

TEXT-BOOKS :

1. Jim Keogh “The complete reference J2EE”, 2nd ed., Tata McGraw Hill publishers, 2007.
2. Bill Evjen, Scott Hanselman, Farhan Muhammad, Srinivasa Sivakumar, Devin Rader, “ProfessionalASP.NET 2.0”, 1st ed., WROX Publishers; 2005.

REFERENCE BOOKS :

1. Herebertschildt “ Java 2 complete reference” 5th ed., TMH, 2008.
2. Black “ Java server programming” J2EE, 1st ed., Dream Tech Publishers, 2008.
3. Kathy walrath “ The J2EE tutorial” , 1st ed., Addison Wesley Publishers, 2005.
4. Kathleen Kalata, “Introduction to ASP NET 2.0”, 3rd ed., Cengage Learning; 2007.
5. Jesse Liberty, Dan Hurwitz, “Programming ASP.NET” , 3rd ed., OReilly; 2005.

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CS431 CLOUD COMPUTING (ELECTIVE III)

Course Description & Objective:

Cloud computing has evolved as a very important computing model, which enables information, software, and shared resources to be provisioned over the network as services in an on-demand manner. This course provides an insight into what is cloud computing and the various services cloudis capable.

Course Outcomes:

- Understanding the key dimensions of the challenge of Cloud Computing
- Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas

UNIT I - Systems Modeling, Clustering and Virtualization

Distributed System Models and EnablingTechnologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualizationof Clusters and Data centers.

UNIT II - Foundations

Introduction to Cloud Computing, Migrating into a Cloud, Enriching the Integration as aService' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

UNIT III - Infrastructure as a Service (IAAS)

Virtualmachines provisioning and Migration services, On the Management of Virtual machines for CloudInfrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, SecureDistributed Data Storage in Cloud Computing.Aneka, Comet Cloud, T-Systems,

Workflow Engine for Clouds, Understanding Scientific Applicationsfor Cloud Environments.

UNIT IV - Monitoring, Management and Applications

An Architecture for Federated Cloud Computing, SLAManagement in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices inArchitecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds,Resource Cloud Mashups.

UNIT V - Governance and Case Studies

Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readinessfor Cloud Services.

TEXT BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and AndrzejM. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier,2012.

REFERENCE BOOKS:

1. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinghouse, James F.Ransome, CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

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CS433 EMBEDDED SYSTEMS (ELECTIVE III)

Course Description & Objective:

Emphasis on Comprehensive treatment of Embedded Hardware and Real Time Operating systems along with case studies in tune with the requirements of Industry. The example-driven approach will put students on a fast track to understanding embedded-system programming and applying what they learn to their projects.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Understand what is a embedded system and microcontroller.
- Understand different components of a microcontroller and their interactions.
- Become familiar with programming environment used to develop embedded systems
- Understand key concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices

UNIT I - Introduction to Embedded Systems

Definition, Applications of ES, Examples of Embedded Systems, Embedded Hardware Units and Devices, Embedded Software, Design Metrics in ES, Challenges in ES Design.

UNIT II - Architecture of 8051

8051 Micro Controller Hardware, Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT III - Programming Model of 8051

Data Transfer and Logical Instructions , Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, Further Details on Interrupts.

UNIT IV - Real Time Operating Systems

Introduction, Tasks and Task States, Tasks and Data, Reentrancy, Semaphores and Shared Data, Basic Design Principles, Inter Process Communication: Message Queues, Mailboxes and Pipes.

UNIT V - Embedded Software Development

Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment, Host and Target Machines, Linker/Locator for Embedded Software, getting Embedded Software into the Target System.

TEXT BOOKS:

1. Raj Kamal, "Embedded Systems", 2nd ed., TMH, 2009.
2. Kenneth J. Ayala, Thomson, "The 8051 Microcontroller", 3rd ed., 2008.

REFERENCE BOOKS :

1. David E. Simon, "An Embedded Software Primer", 1st ed., Pearson Education, 2008
2. Wayne Wolf, "Computers as Components-principles of Embedded Computer system Design", 1st ed.,Elseveir, 2009.
3. Labrosse "Embedding system building blocks", 2nd ed., CMP Publishers, 2007.
4. Ajay V Deshmukhi," Micro Controllers", 1st ed., TMH, 2008.
5. Frank Vahid, Tony Givargis, John Wiley, "Embedded System Design", Microcontrollers, 3rd ed.,Pearson Education, 2008.

IV Year B.Tech. CSE I - Semester

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CS435 SOFTWARE TESTING METHODOLOGIES (ELECTIVE III)

Course Description & Objective:

Software testing is a subject where the student will learn and apply basic skills needed to create and automate the test plan of a software project.It aims to describe principles and strategies for generating system test cases and to understand the essential characteristics of tools used for test automation.

Course Outcomes:

Students who have completed this course would have learned

- *Various test processes and continuous quality improvement*
- *Types of errors and fault models*
- *Methods of test generation from requirements*
- *Behavior modeling using UML: Finite state machines (FSM)*
- *Test adequacy assessment using: control flow, data flow, and program mutations*

UNIT I - Introduction

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II - Transaction Flow & Domain Testing

Transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Domain Testing, domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT III - Path products and expressions

Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

UNIT IV - Logic Based Testing

Overview, decision tables, path expressions, kv charts, specifications.
State, State Graphs and Transition testing, State graphs, good & bad state graphs, state testing, Testability tips.

UNIT V - Graph Matrices and Application

Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Winrunner tools for functional / Regression testing (Ref Text book2).

TEXT BOOKS:

1. Boris Beizer, "Software Testing Techniques", 2nd ed., Dreamtech, 2006.
2. Dr.K.V.K.K.Prasad, "Software Testing Tools", 1st ed., Dreamtech. 2008. (Unit - 5)

REFERENCES BOOKS:

1. Brian Marick, "The craft of software testing", 2nd ed., Pearson Education, 2007.
2. Edward Kit, "Software Testing in the Real World ", 2nd ed., Pearson Education, 2008.

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CS437 FUNDAMENTALS OF IMAGE PROCESSING (ELECTIVE III)

Course Description & Objective:

To introduce to students the analytical tools and methods, which are currently used in digital image processing as applied to image information for human viewing. Students will learn to apply these tools in the laboratory in image restoration, enhancement, compression and segmentation.

Course Outcomes:

- Understand image formation and the role human visual system plays in perception of gray and color image data.
- Get broad exposure to and understanding of various applications of image processing in industry, medicine and defences.
- Learn the signal processing algorithms and techniques in image enhancement and image restoration.
- Acquire an appreciation for the image processing issues and techniques and be able to a IV Year IV Yearpply these techniques to real world problems.
- Be able to conduct independent study and analysis of image processing problems and techniques.

UNIT I - Digital Image Fundamentals

Fundamental steps in Digital Image Processing, Components of an Image Processing systems, Elements of visual perception, Image sensing and acquisition, Image sampling and quantization, basic relationship between pixels, basic geometric transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform.

UNIT II - Image Enhancement

Spatial Domain methods, Basic grey level transformation, Histogram equalization, Image subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters: Smoothing, Sharpening filters, Homomorphic filtering.

UNIT II - Image Restoration

Model of Image Degradation/restoration process, Noise models, Inverse filtering, Least mean square filtering, Constrained least square filtering, Blind image restoration, Pseudo inverse, Singular value decomposition.

UNIT IV - Image Segmentation

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V - Image Compression

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TEXTBOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing, Pearson', Second Edition, 2004.
2. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

REFERENCES:

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2004.
3. D,E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing, Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, Digital Image Processing , John Wiley, New York, 2002
5. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson 2002.

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CS439SOFTWARE PROJECT MANAGEMENT (ELECTIVE IV)

Course Description & Objective:

Students will be introduced to the following aspects of project management related to managing small software development and To describe activities of SPM highlights and train in the planning and implementation of project management. It brings a specific project to complete on time and on budget.

Course Outcomes:

- identify and describe the impact different project contexts will have upon all aspects of a software development project, including an understanding of the role professional ethics plays in the conduct of successful software development
- identify and describe the key phases of project management and the key skills associated with each
- determine an appropriate project management approach through an evaluation of the business context and project scope and knowledge of agile and traditional project management approaches
- demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule; governance including progress reporting, risk and quality management
- as part of a small team research and produce a concise piece of writing suitable for presentation to senior management demonstrate an ability to present their ideas both formally and informally to a group of their peers.

UNIT I - Software Management & Software Economics

The waterfall model, conventional software Management performance. Evolution of Software Economics : Software Economics, pragmatic software cost estimation.

Improving Software Economics , Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II - The old way and the new & Life Cycle Phases

The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life cycle phases : Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT III - Artifacts of the process

The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

Model based software architectures : A Management perspective and technical perspective.

UNIT IV - Project Organization and Planning

Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities, Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation : Automation Building blocks, The Project Environment.

UNIT V - Project Control and Process instrumentation

The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Future Software Project Management, Modern Project Profiles, Next generation Software economics, modern process transitions.

TEXT BOOK :

1. Walker Royce ,"Software Project Management", 1st ed., Pearson Education, 2005.

REFERENCES BOOKS :

1. Bob Hughes and Mike Cotterell, "Software Project Management", 3rd ed.,Tata McGraw - Hill Edition, 2005.

2. Joel Henry, "Software Project Management", 1st ed., Pearson Education, 2006.

3. Pankaj Jalote, "Software Project Management in practice", 1st ed., Pearson Education, 2005.

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CS441 BUSINESS INTELLIGENCE (ELECTIVE IV)

Course Description & Objective:

The study of Web technologies course is fundamental to Computer Science and Engineering. This course enables students to understand web page site planning, management and maintenance. The main objective behind introduction of this course is also to develop web sites which are secure and dynamic in nature and writing scripts which get executed on server as well.

Course outcomes:

On successful completion of this course students should be able to obtain:

- Understand the principles of business intelligence
- Understand the data warehousing principles
- Understand reporting and visualisation techniques
- Understand data mining techniques

UNIT I - Introduction to Business Intelligence

Introduction to digital data and its types – structured, semistructuredand unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions &Concepts, BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BIProcess, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices.

UNIT II - Basics of Data Integration

Concepts of data integration, needs and advantages of using data integration,introduction to common data integration approaches, Meta data - types and sources.

UNIT III - Extraction Transformation Loading

Introduction to data quality, data profiling conceptsand applications, introduction to ETL using Pentaho data Integration (formerly Kettle).

UNIT IV - Multi-Dimensional Data Modeling

Introduction to data and dimension modeling,multidimensional data model, ER Modeling vs multi dimensional modeling, concepts of dimensions, facts,cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creatingcubes using Microsoft Excel.

UNIT V - Basics of Enterprise Reporting

A typical enterprise, Malcolm Baldrige - quality performance framework,balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise dashboard, enterprisereporting using MS Access / MS Excel, best practices in the design of enterprise dashboards

TEXT BOOK :

1. Mike Biere, “Business Intelligence for the Enterprise”, 1st ed., IBM Press, 2009.

REFERENCE BOOKS :

1. Larissa Terpeluk Moss, Shaku Atre, “Business intelligence roadmap”, 2nd ed., Addison-Wesley Longman Publishing Co., Inc. Boston, 2003.
2. Swain Scheps, “Business Intelligence For Dummies”, 2nd ed.,Wiley Publishing inc, 2004.
3. Chuck Ballard, Daniel M.Farrell, Amith Gupta, Carlos Mazuela, Stanislav Vohnik, “Dimensional Modelling in a Business Intelligence Environment”, 2nd ed., OREILLY Publications, 2006.

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CS443 BIG DATA ANALYTICS (ELECTIVE IV)

Course Description & Objectives:

The main objectives of this course is to enable the students with basic data analytic skills like regression analysis, classification techniques, clustering techniques, association rule mining. Further, this course also enables the students how to scale the above algorithms with different data environments like massive amount of data, streaming data, distributed data and provides hands on experience on real world problems using above theoretical background.

Course Outcomes

- Necessary theory background for processing analytics.
- Processing analytics on small scale data.
- Mining from massive datasets.
- Mining from distributed datasets.

UNIT I - Introduction To Big Data

Introduction to BigData Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II - Data Analysis

Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning

UNIT III - Advanced Learning and treaming

Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data – Fuzzy c-Means- Stochastic Search Methods. Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams

UNIT IV - Frequent Itemsets And Clustering

Mining Frequent Itemsets - Market Based Model – Apriori Algorithm, FP-Growth, Dynamic Item set Algorithm – Clustering Techniques – Hierarchical – K-Means, K-medoid, CURE- Clustering High Dimensional Data – CLIQUE– Clustering in Non-Euclidean Space – Clustering for Streams and Parallelism.

UNIT V - Frameworks And Visualization

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications.

TEXT BOOKS:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.

2. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

Reference:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.

2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007

3. Pete Warden, “Big Data Glossary”, O’Reilly, 2011.

4. Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

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CS445 INTERNET OF THINGS (ELECTIVE IV)

Course Description & Objectives:

Explore the interconnection and integration of the physical world and the cyber space. Able to Design & Develop IOT Devices.

Course Outcomes:

- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics.

UNIT I - Introduction & Concepts

Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

UNIT II - Domain Specific IOTs

Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

UNIT III - M2M & System Management with NETCONF-YANG

M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

UNIT IV - Developing Internet of Things & Logical Design using Python

Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages

UNIT IV - IOT Physical Devices & Endpoints

What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

Text Book:

Vijay Madisetti , Arshdeep Bahga," Internet of Things A Hands-On-Approach",ISBN:978 0996025515,2014

Reference Books:

1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, first edition 2013.
2. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things", Kindle edition 2013.

IV Year B.Tech. CSE I - Semester

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MS310 MANAGERIAL ECONOMICS (ELECTIVE IV)

Course Description and Objective:

To make the student familiar with the basic concepts and principles of Business Economics. The course aims to develop student's capacity to analyze the economic environment in which business entities operate and understand how managerial decisions can vary under different constraints that each economic environment places on a manager's pursuit of it's goals, focusing on analyzing the functioning of markets and the economic behavior of firms and other economic agents.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

- Understand nature and scope of managerial economics and its application in managerial decision making
- Demand determinants, elasticity of demand and demand forecasting methods for marketing planning.
- Theory of production, law of variable proportions and returns to scale
- Cost analysis and cost output relationship
- Types of markets and price determination

UNIT I - Nature & Scope of Managerial Economics

Basic tools and techniques of Business Economics, Macro Economic Environment and Managerial decisions.

UNIT II - Demand Analysis

Types of Demand, Demand determination Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT III - Theory of Production

Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors,Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT IV - Cost Analysis

Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis.

UNIT V - Markets and price determination

Features and types of different competitive situations – Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

Text Books:

1. Gupta: Managerial Economics, 1/e TMH, 2005
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010

Reference Books:

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004

IV Year B.Tech. CSE I - Semester

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CS447 DATA WAREHOUSING AND DATA MINING LAB

Course Description & Objectives:

The main objective of this lab is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. At the end to compare and contrast different conceptions of data mining.

Course Outcomes:

Students can able

- To evaluate the different models of OLAP and data preprocessing.
- To enlist various algorithms used in information analysis of Data Mining Techniques.
- To demonstrate the knowledge retrieved through solving problems

List of Experiments

1. Explore various commands given in PL/SQL in Oracle 8.0
2. Execute multi-dimensional data model using SQL queries.
3. Implement various OLAP operations such as slice, dice, roll up, drill up, pivot etc.
4. Implementation of Text Mining on the data warehouse
5. Explore the correlation-ship analysis between the data set
6. Evaluate attribute relevance analysis on a weather data warehouse
7. Evaluate Information Gain of an attribute in the student database
8. Experiment to predict the class using the Bayesian classification
9. Find out a weight & bias updating using the Back Propagation Neural Network
10. To perform various data mining algorithms on the give data base using WEKA

Text Book:

Jiawei Han, Micheline Kamber " Data Mining: Concepts and Techniques" 3rd edition ,Morgan Kaufmann, 2012

References:

1. Ramesh Sharda, Dursun Delen, David King Business Intelligence, 2/E; Efraim Publisher Turban,pearson Education, 2011

2. Berry, Gordon S. Linoff, "Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management", John Wiley & Sons Inc publishers, 3rd Edition, 2011.

IV Year B.Tech. CSE I - Semester

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CS449 CRYPTOGRAPHY AND NETWORK SECURITY LAB

Course Description & Objective:

After the success full completion of this course the student is enable towards learning and overcome security attacks in future.

Course Outcomes:

- Understand computer security principles and discuss ethical issues for theft of information. Identify threat models and common computer network security goals
- Explain various encryption algorithms, hashing functions, one-way authentication and public key cryptology
- Analyze firewalls, DOS attacks and defense types. Dramatize example scenarios in DNS and IPSec applications

Programming:

1. Write program for Ceaser cipher encryption and decryption
2. Write program for Mono alphabetic cipher encryption and decryption
3. Implementation of Play Fair cipher
4. Implementation of Vigenere cipher (Polyalphabetic substitution)
5. Implementation of Hill cipher
6. Implementation of Rail Fence cipher
7. Implementation of S-DES algorithm for data encryption
8. Implement RSA asymmetric (public key and private key)-Encryption
9. Implement Euclidean and Extended Euclidean algorithm for calculating the GCD
10. Working with PGP

Text Books:

1. Cryptography and Network security by William Stallings, Pearson Education, Fourth Edition

2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education, Second Edition

Reference Books:

1. Fundamentals of Network Security by Eric Malwald (Dreamtech press)

2. Network Security – Private Communication in a Public World by Charlie Kaufman, Radis Perlman and Mike Speciner,Pearson Education

3. Introduction to Cryptography Buchmann, Springer

4. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

5. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.

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CS451 DISTRIBUTED COMPONENT OBJECT TECHNOLOGIES LAB

Course Description & Objective:

To understand the development of enterprise applications using ‘java 2 Platform, enterprise Edition (J2EE) and .NET’.ADO.NET provides consistent access to data sources such as Microsoft SQL Server, as well as data sources exposed through OLE DB and XML.

Course Outcomes:

After completing this course a student is capable of:

- Gain knowledge on J2EE architecture
- Distributive systems introduction
- EJB implementation
- ASP.net introduction
- Developing web controls

PART-1

1. Create a database ‘VIGNAN’ and three tables with specific constraints.
2. Insert the information in all the three tables using JDBC application.
3. Update and delete the specific information of any one table by specifying the condition by using ‘where’ clause.
4. List the entire content of any one table.
5. Create an HTML file named insertEmployee.html and then create a servlet EmployeeServlet.java to insert employee information into ‘Employee’ table.
6. Create an HTML file named employee.html and a servlet named GetServlet1.java. With the help of employee.html, we send the ‘ID’ of an employee to the GetServlet1 program.
7. Then, we use it to retrieve his/her information from ‘Employee’ table and display it on to the browser.
8. Create an HTML file AddCookies.html which contains four text boxes

. When user enters the values in these text boxes and press the submit button, the values will be sent to AddCookies.java servlet and get saved in cookies.

9. Create an HTML form login.html that accepts the username and password and submits to login.java servlet. Verify credentials and on success, set the username in the HTTP Session and show a “Welcome <username>” message. (Use the request.getSession().setAttribute() method)
10. Design a registrationform.jsp page with all user registration information and after filling all the details, transfer all the filled information to registrationsuccess.jsp page.(use Implicit objects)
11. Create connection.jsp which contains database connection settings and include this file in registrationsuccess.jsp page to save ‘registration’ details into registration table.
12. Design a StudentBean class with getter/setters for the Student details like firstname,lastname and age; Access the above bean class in JSP. You can use <jsp:getProperty/> action to access get methods and <jsp:setProperty/> action to access set methods
13. Write a program to accept citizen name,address& age in struts.If age is greate than 18 then allow the person for voting
14. Demonstrate a program in struts that uses Action Class
15. Demonstrate a database application in struts.

PART-2

1. Create a Project using Visual Studio to display “Hello World” message on the browser screen.
2. Design a registration page using ASP.NET form controls.
3. Demonstrate the use of HTML Server controls using ASP.NET.
4. Demonstrate the use of Server Controls in ASP.NET.
5. Create a Data Source for SQL Database Server in Visual Studio.
6. Create a dropdown server control using ASP.NET and bind the data source created earlier to this control.
7. Create a Grid View for the table that was created using SQL Server and write appropriate code for handling updations to that table through grid view.

TEXT-BOOKS :

1. Jim Keogh “The complete reference J2EE”, 2nd ed., Tata McGraw Hill publishers, 2007.
2. Bill Evjen, Scott Hanselman, Farhan Muhammad, Srinivasa Sivakumar, Devin Rader, “ProfessionalASP.NET 2.0”, 1st ed., WROX Publishers; 2005.

REFERENCE BOOKS :

1. Herebertschildt “ Java 2 complete reference” 5th ed., TMH, 2008.
2. Black “ Java server programming” J2EE, 1st ed., Dream Tech Publishers, 2008.
3. Kathy walrath “ The J2EE tutorial” , 1st ed., Addison Wesley Publishers, 2005.
4. Kathleen Kalata, “Introduction to ASP NET 2.0”, 3rd ed., Cengage Learning; 2007.
5. Jesse Liberty, Dan Hurwitz, “Programming ASP.NET” , 3rd ed., OReilly; 2005.

IV Year B.Tech. CSE II - Semester

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CS420 MOBILE AD-HOC NETWORKS (ELECTIVE V)

CCourse description and objectives:

This course is introduced to learn the fundamental concepts and design issues of Ad Hoc Wireless Networks, architectures and protocols of Ad Hoc Wireless Networks. To Study state of art research developments in Ad Hoc Wireless Networking.

Course Outcomes

- Students will be able to describe the unique issues in ad-hoc wireless networks.
- Students will be able to describe current technology trends for the implementation and deployment of ad hoc wireless networks..
- Students will be able to discuss the challenges in designing MAC, routing and transport protocols for ad hoc wireless networks.
- Students will be able to discuss the issues in designing Security Protocols for ad hoc wireless networks.
- Students will be able to discuss about the issues in QoS solutions and Energy Management Schemes in ad hoc Wireless Networks.

UNIT I - Introduction to Ad-hoc netowrks

Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad hoc mobility models: - indoor and outdoor models.

UNIT II - Medium Access Protocols

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas.

IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III: Network Protocols

Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.

UNIT IV - End-End Delivery and Security

Transport layer: Issues in designing- Transport layer classification, ad hoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT V - Cross Layer Design

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad hoc with Mobile IP networks.

TEXT BOOKS:

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education. 2007

2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

REFERENCES:

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobilead hocnetworking, Wiley-IEEE press, 2004.

2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.

3. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network

4. Research," Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.

5. A survey of integrating IP mobility protocols and Mobile Ad hoc networks, Fekri M.bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, v no.12007

IV Year B.Tech. CSE I - Semester

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CS422 E-COMMERCE (ELECTIVE V)

Course Description & Objectives:

The advent of e-commerce has posed many new issues in the development of business information systems, including Accounting Information Systems.The purpose of this course is to introduce e-commerce, its impacts keys issues in the development of web-based business information systems and applications.

Course Outcomes:

- Comprehend the underlying economic mechanisms and driving forces of E-Commerce.
- Understand the critical building blocks of E-Commerce and different types of prevailing business models employed by leading industrial leaders.
- Appraise the opportunities and potential to apply and synthesize a variety of E-Commerce concepts and solutions to create business value for organizations, customers, and business partners.
- Formulate E-Commerce strategies that lever firms' core competencies, facilitate organizational transformation, and foster innovation.

UNIT I - Introduction

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications. Consumer Oriented Electronic commerce - Mercantile Process models.

UNIT II - Electronic payment systems

Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.Inter Organizational Commerce - EDI, EDI Implementation, Value added networks.

UNIT III - Intra Organizational Commerce

work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT IV - Corporate Digital Library

Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT V - Consumer Search and Resource Discovery

Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

TEXT BOOK:

1. Ravi Kalakota,Andrew B. Whinston- “Frontiers of electronic commerce” pearson education 2010.

REFERENCE BOOKS:

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang- “E-Commerce fundamentals and applications”- John Wiley 2001.

2. S.Jaiswal -”Doing Business on the Internet E-Commerce”-GALGOTIA PUBLICATIONS

3. Efrain Turbon, Jae Lee, David King, H.Michael Chang -”E-Commerce”.Printice Hall 2/e 2002.

4. Gary P.Schneider,James T. Perry-”Electronic Commerce”,Course Technology 2 edition (February 26, 2001)

5. Kenneth C. Laudon, Carol Traver- “E-Commerce 2014” Global Edition, 10/e.

IV Year B.Tech. CSE II - Semester	L	T	P	To	C
	4	-	-	4	4

CS424 PATTERN RECOGNITIION (ELECTIVE V)

Course Description & Objectives:

This course will introduce the fundamentals of pattern recognition. First, we will focus on Introduction, decision and distance functions. Next, we will focus on probability and statistical decision making. Later concentrated on decision making and feature selection. It also covered the syntactic pattern recognition.

Course Outcomes:

Upon successful completion of the course, students will

- Understand the vision technology in conjunction with real world applications.
- Learn the principles and commonly used paradigms and techniques of computer vision.
- Be able to identify the limitations of vision systems.
- Be able to demonstrate successful applications to process and analyze images, and to make automatic decisions based on extracted feature information.

UNIT I - Introduction to Decision and Distance Functions

Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

UNIT II - Probability & Statistical Decision Making

Probability of events, Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples. **G -** Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.

UNIT III - Non Parametric Decision Making

Introduction, histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

Clustering and Partitioning - Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.

UNIT IV - PATTERN PREPROCESSING AND FEATURE SELECTION

Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V - SYNTACTIC PATTERN RECOGNITION

Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon, Finger prints, etc.,

TEXT BOOKS:

1. Gose. Johnsonbaugh. Jost. " Pattern recognition and Image Analysis", PHI.

2. Tou. Rafael. Gonzalez. "Pattern Recognition Principle", Pearson Education

REFERENCES:

1. Richard duda, Hart., David Strok, "Pattern Classification", John Wiley.

IV Year B.Tech. CSE II - Semester	**L**	**T**	**P**	**To**	**C**
	4	-	-	4	4

CS426 HUMAN COMPUTER INTERACTION (ELECTIVE V)

Course Description & Objectives:

The student will learn how interaction with computers takes place at user interface, which comprises both hardware and software. To facilitate communication between students of psychology, design, and computer science on user interface development projects. To facilitate communication between students of psychology, design, and computer science on user interface development projects.

Course Outcomes

- The student will learn, The importance of User Interface and interaction with computers using a Graphical User Interface and Keyboard and function keys along with video drivers
- To provide the future user interface designer with concepts and strategies for making design decisions.
- To expose the future user interface designer to tools, techniques, and ideas for interface design.
- To introduce the student to the literature of human-computer interaction.

UNIT I - Introduction

Importance of user Interface - definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface - popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user - Interface popularity, characteristics- Principles of user interface.

UNIT II - Design process

Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.

UNIT III - Screen Designing

Design goals - Screen planning and purpose, organizing screen elements, ordering of screen data and content - screen navigation and flow - Visually pleasing composition - amount of information - focus and emphasis - presentation information simply and meaningfully – information Screen Designing:- Design goals - Screen planning and purpose, organizing screen elements, ordering of screen data and content - screen navigation and flow - Visually pleasing composition - amount of information - focus and emphasis - presentation information simply and meaningfully - information retrieval on web - statistical graphics - Technological consideration in interface design.

UNIT IV - Windows

New and Navigation schemes selection of window, selection of devices based and screen based controls. Components - text and messages, Icons and increases - Multimedia, colors, uses problems, choosing colors.

UNIT V - Software tools

Specification methods, interface - Building Tools. Interaction Devices - Keyboard and function keys - pointing devices - speech recognition digitization and generation - image and video displays - drivers.

TEXT BOOKS:

1. Wilbert O Galitz “The essential guide to user interface design”, Wiley Computer publishing 2nd edition.

2. Ben Shneidermann,Catherina Plaisant “Designing the user interface”, Pearson Education Asia. 3rd Edition 2007,

REFERENCE BOOKS:

1. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg “Human - Computer Interaction” Pearson Education

2. Rogers, Sharps “Interaction Design Prece”, Wiley Dreamtech,

IV Year B.Tech. CSE II - Semester

L	T	P	To	C
4	-	-	4	4

CS428 NEURAL NETWORKS (ELECTIVE VI)

Course Description & Objective

Understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling. Provide knowledge of supervised learning in neural networks. ? Provide knowledge of computation and dynamical systems using neural networks. ? Provide knowledge of reinforcement learning using neural networks.

Course outcomes

- The role of neural networks in engineering, artificial intelligence, and cognitive modeling.
- Have an understanding of the concepts and techniques of neural networks through the study of the most important neural network models.
- Have a knowledge of sufficient theoretical background to be able to reason about the behavior of neural networks.
- To be able to evaluate whether neural networks are appropriate to a particular application.

UNIT – I Introduction to Artificial Neural Networks

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT – II Fundamental Models of Artificial Neural Networks

McCulloch-Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square(LMS) Rule, Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net. Perceptron Networks : Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks. Adaline and Madaline Networks : Introduction, Adaline, Madaline.

UNIT – III Associative Memory Networks

Introduction, Algorithms for Pattern Association, Hetero Associative Memory, Neural Networks, Auto Associative Memory Network, Bi-directional Associative Memory.

UNIT- IV Feedback & Feed Forward Networks

Feedback Networks : Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets. Feed Forward Networks : Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT – V Self Organizing Neural Architectures

Self Organizing Feature Map: Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ), Max Net, Maxican Hat, Hamming Net. Applications of Neural Networks: Applications in Bioinformatics, Knowledge extraction, Image processing, forecasting, Medical domain.

TEXT BOOK :

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL; 2005.

REFERENCES BOOKS :

1. Simon Hhaykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.

2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.

3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

IV Year B.Tech. CSE II - Semester	L	T	P	To	C
	4	-	-	4	4

CS430 BIO METRICS (ELECTIVE V)

Course Description & Objectives:

In this course students should understand how biometrics provides authentication, identification and security.

Course Outcomes:

- To understand the state-of-the-art in biometric technologies
- To survey the currently available biometric systems
- To learn and implement some of the biometrics authentication

UNIT I Introduction

Biometric Systems, Biometric Functionalities, Biometric System Errors, The Design Cycle of Biometric Systems, Applications of Biometric Systems.

UNIT II - Finger Print Recognition

Introduction, Friction Ridge Pattern, Fingerprint Acquisition, Feature Extraction, Matching, Fingerprint Indexing, Fingerprint Synthesis, Palmprint.

UNIT III - Face Recognition

Introduction, Image Acquisition, Face Detection, Feature Extraction and Matching, Advanced Topics: Handling Pose, Illumination and Expression variation, Homogenous Face Recognition, Face Modeling.

UNIT IV - Iris Recognition

Introduction, Design of Iris Recognition System, Iris Segmentation, Iris Normalization, Iris Encoding and Matching, Iris Quality, Performance Evaluation.

UNIT V Multi-Biometrics

Introduction, Sources of Multiple Evidence, Acquisition and Processing Architecture, Fusion Levels.

TEXT BOOK:

1. Anil K. Jain, Arun A. Ross, Karthik Nandakumar, Introduction to Biometrics, Springer .

REFERENCE BOOKS:

1. Samir Nanavati, Michael Thieme, Raj Nanavati,Biometrics – Identity Verification in a Networked World –WILEY

2. Paul Reid , Biometrics for Network Security-, 1/e, Pearson Education.

3. John D. Woodward, Biometrics- The Ultimate Reference- Wiley

IV Year B.Tech. CSE II - Semester	L	T	P	To	C
	4	-	-	4	4

CS432 GENETIC ALGORITHMS (ELECTIVE VI)

Course Description & Objectives:

To explore applications & algorithms with Genetics and to understand optimization techniques of Genetic Algorithms

Course Outcomes:

- Able to develop classifier systems with Genetic Algorithms
- Able to optimize the coding and understand functions of Genetic Algorithms

UNIT I - Introduction to Genetic Algorithms

What are Genetic Algorithms, Traditional Optimization and Search Methods, Goals of Optimization, Difference methods Genetic Algorithms & Traditional Methods, Simple Genetic Algorithm.

UNIT II - Mathematical Foundations

Fundamental Theorem, Schema Processing, Two armed & K armed Bandit Problem, Building Blocks Hypothesis, Minimal Deceptive Problem

UNIT III - Implementation of Genetic Algorithm

Data Structures, Reproduction, Crossover and Mutation, Fitness Scaling, Coding, Mapped and Fixed Point Coding, Discretization, Constraints, De Jong and Function Optimization, Improvements & Application of Genetic Algorithms.

UNIT IV - Advanced Operators & Techniques

Dominance, Diploidy, Inversion and Re ordering Techniques, Niche and Speciation, Multi objective Optimization, Knowledge based Techniques, Genetic Algorithms & Parallel Processors.

UNIT V - Introduction to Genetics Based Machine Learning

Classifier, Rule and Message System, Simple classifier system and Applications of Genetics based Machine Learning.

Text Books:

David E Goldberg, “Genetic Algorithms in Search, Optimization & Machine Learning”, Pearson Edition, 2009

Reference Books:

1. David A Coley, “An Introduction to Genetic Algorithms for Scientists and Engineers” World Scientific Publishers
2. M Mitchell, “An Introduction to Genetic Algorithms”, MIT Press

V Year B.Tech. CSE II - Semester

L	T	P	To	C
4	-	-	4	4

CS434 MULTIMEDIA SYSTEMS (ELECTIVE VI)

Course Description & Objectives:

Understand the characteristics of multimedia systems and how to address issues Be aware of the differences among multimedia authoring systems. Be familiar with the software development process as practiced in a multimedia development environment Be able to design, write, document, debug and evaluate a non trivial multimedia system. Appreciate and understand the legal and ethical issues associated with developing multimedia systems, particularly in regard to use of media clips developed by others.

Course Outcomes:

- Write action script for a particular problem.
- Design and Draw customized GUI components.
- Apply Transformations on Components.
- To make use of fundamental concepts and formulate best practices

UNIT I - Introduction

Introduction to Multimedia, Media and Data Streams, Sound/Audio, Images and Graphics, Video and Animation.

UNIT II - Comporession Techniques

Data Compression, Optical Storage Media; Computer Technology, Multimedia Operating Systems.

UNIT III - Networking

Networking Systems, Multimedia Communication Systems; Database Systems.

UNIT IV - Multimedia Architecture

Multimedia Architecture; Multimedia Documents, Hypertext and MHEG.

UNIT V - Application Development

User Interfaces, Synchronization, Abstractions for Programming; Multimedia Application Development; Virtual Reality; Future Directions.

Text Books:

1. Ralf Steinmetz, Klara Nahrstedt "Multimedia: Computing Communications & Applications" Pearson Education (2004)
2. Parekh Ranjan "Principles of Multimedia" Tata McGraw-Hill (2007)

Reference Books:

1. John E Koegal, Buford "Multimedia Systems" IIBK. (1994)
2. John Vince "Virtual Reality Systems" ACM Press (1995)

I

YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech.

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16CS202 - Data Structures
- 16ME103 - Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Recognise and solve different types of first and 2^{nd} order ordinary differential equations.

CO2: Understand the process of evaluation ODE numerically.

CO3: Illustrate the Application of partial differentiation.

CO4: Classify and solve the linear and non-linear partial differential equations.

CO5: Apply software tools to obtain and verify the solutions.

SKILLS:

- ✓ *Solve given differential equation by suitable method.*
- ✓ *Compute numerical solutions of differential equation by apt method.*
- ✓ *Compute maxima/minima of given function.*
- ✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L- 9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L- 9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.
11. Solving first order O.D.E.
12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Recognize the relevant applications of Ultrasonic waves by the grasp over their production and properties.

CO2: Analyze the characteristics of Laser for suitable applications in the field of industry, medicine and communication and to foster the knowledge on optical fibers to realize fiber optic communication and fiber optic sensors.

CO3: Apply the principles of quantum mechanics to learn the dynamics of free electrons in metals.

CO4: Evaluate efficiency of Solar cell and to understand the functioning of Photonic devices.

CO5: Demonstrate the knowledge on fabrication and applications of Nano-materials and latest advanced materials.

SKILLS:

- ✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*
- ✓ *Study the wavelengths of light sources and lasers.*
- ✓ *Estimate the efficiency of a given solar cell.*
- ✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*
- ✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non- linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand and apply the rules of grammar to speak in technical context.

CO2: Strengthen reading and listening comprehension skills to follow academic discussions in the engineering context.

CO3: Develop appropriate vocabulary for carrying out academic writing tasks.

CO4: Attain adequate proficiency to participate in the classroom discussions and make simple presentations.

CO5: Understand and apply the mechanics of writing to produce simple texts for academic purpose.

SKILLS:

- ✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*
- ✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*
- ✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*
- ✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*
- ✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**
  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory Practice : Introduction to phonetics
  (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role - Plays
  (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs

  Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions (from Energy Unit)
  Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**
  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 *“Mindscapes* - English for Technologists and Engineers”, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, “A Textbook of English Phonetics for Indian Students”, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. “Spoken English: A Self-Learning Guide to Conversation Practice”, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine Your English”, 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, “Effective Technical Communication”, Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Demonstrate the disassembling and assembling of a personal computer system.

CO2: Install the operating system and other software required in a personal computer system.

CO3: Analyze and visualize the data using various operations in Excel.

CO4: Identify the various threats to users and data.

CO5: Understand the concept of cyber security.

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools.
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, “Introduction to Computers”, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understanding of how to write simple, but complete C programs.

CO2: Identification of suitable data types for operands and design of expressions having right precedence.

CO3: Application of decision making and iterative features of C Programming language effectively.

CO4: Design and development of problem specific data structures and accessing methods to build large modular programs.

CO5: Development of C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L- 10,T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L- 9,T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L- 9,T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L- 9,T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L- 8,T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of 'n' numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.

ACTIVITIES:

- o *Implement matrix operations.*
- o *Implement malloc and calloc functions.*
- o *Copy the content of one file into the other.*
- o *Implement string manipulations functions.*

9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1^{st} edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2^{nd} edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4^{th} edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4^{th} edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Describe the working principle of Refrigeration and Air conditioning systems.

CO2: Gain awareness on choosing appropriate construction materials.

CO3: Operate and maintenance of basic electrical engineering appliances.

CO4: Analyze the different lighting sources and it's features.

CO5: Understand working of the basic electronics engineering appliances.

SKILLS:

- ✓ *Identify UPS requirements for a given load.*
- ✓ *Provide a Lighting scheme for specific working environment.*
- ✓ *Design a composition of Heating element for a particular application.*
- ✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*
- ✓ *Provide an earthing for Domestic Outlet.*
- ✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L- 9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L- 10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks, Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-08**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

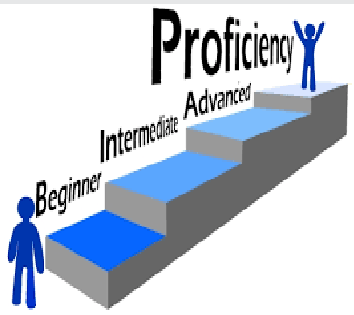
LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, "Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, "Electrical engineering - Electrical machines and Appliances Theory", 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, "How Stuff Works", 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, "Basic Mechanical Engineering", 1 st edition, Pearson Publishers, 2013.



16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Can understand routine information and factual articles in the news papers and understand general instructions, notifications, announcements, monologues and conversations. (Understand)

CO2: Use functional English to speak and express themselves in everyday social contexts. (Apply & Create)

CO3: Applying sentence structures and word collocations to produce simple and accurate sentences and create short compositions.

CO4: Analyse complex reading and listening materials and draw inferences to evaluate the intentions of the writers and speakers.

CO5: Creating concise and precise communication by analysing the relevance of the context and applying suitable formats.

SKIL LS:

- ✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*
- ✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*
- ✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*
- ✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

Listening – Following long conversations / Interviews

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

PRACTICE: Objective PET Units 25 – 30

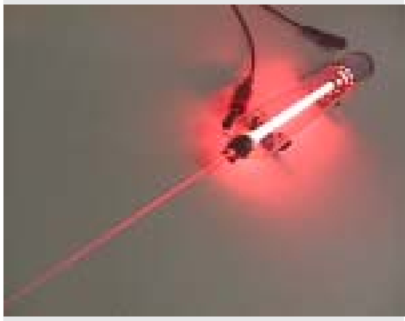
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, "Introduction to PET", Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

CO1: Realize the concept of resonance by conducting the experiments of AC sonometer and Melde'sexperiment.

CO2: Acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments,

CO3: Understand Magnetic field along the axis of a circular coil and thermal conductivity of bad conductor through experiments.

CO4: Understand the concepts of light by conducting the experiments of determination of wavelength,

CO5: Understand the numerical aperture of an optical fibre and also from V–I characteristics of Solar celland LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.

16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Determine rank of a matrix and solution of a system of linear equations, Eigen values and Eigen vectors.

CO2: Apply Cayley-Hamilton theorem for finding inverse and power of a matrix.

CO3: Illustrate the use of multiple integrals.

CO4: Understand the concepts of vector differentiation and integration.

CO5: Apply software tools to obtain and verify the solutions.

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9,T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L-9,T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L-9,T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L-9,T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L-9,T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Analyze the quality of the water and design a suitable water purification mechanism.

CO2: Apply the principle of electrochemistry for designing various batteries and fuel cells.

CO3: Analyze various factors effecting corrosion and apply proper corrosion control and prevention methods.

CO4: Familiarize the preparation, properties and applications of various polymers.

CO5: Apply the electromagnetic radiation to the spectroscopic methods for the analysis of engineering materials.

SKILLS:

- ✓ *Analyse the total hardness of water sample.*
- ✓ *Understand the basic principles involved in various batteries.*
- ✓ *Understand the mechanisms of corrosion and various controlling methods.*
- ✓ *Synthesize various polymers.*
- ✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Communicate the ideas and thoughts to other in the form of pictures.

CO2: Develop the drawing skills while drawing engineering objects.

CO3: Implement the concept of quadrant system in drawing practice.

CO4: Construct different engineering objects using drawing tools.

CO5: Sketch simple objects and their pictorial views using AutoCAD.

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT – 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT – 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT – 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT – 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT – 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

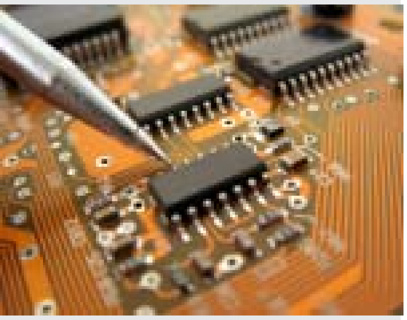
1. N.D.Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal, C.M.Agrawal "Engineering Drawing" , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Analyze the resistive circuits and solution of resistive circuits with independent sources.

CO2: Solve the AC (single and three phase) and DC circuits using different methods.

CO3: Familiarize the concepts of electro magnetism and it's applications.

CO4: Explain the types of electrical equipment, machines and its applications.

CO5: Acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.

ACTIVITIES:

- o *Decoding the value of resistors.*
- o *Design and fabricate a simple loop permanent magnet generator.*
- o *Design and fabricate a simple air cored transformer.*
- o *Fabricate full and half wave rectifiers using PN junction diodes.*
- o *Fabricate a voltage regulator using Zener diode.*

6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, “Basic Electrical and Electronics Engineering”, 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, “Electrical Technology”, Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, “Basic Electrical Engineering”, 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Analyse the quality of the water by volumetric methods.

CO2: Apply the principle of electrochemistry to determine the relative strength of oxidizing/reducing agents for the sample analysis.

CO3: Analyse various factors effecting the rate of corrosion by using weight loss method

CO4: Synthesize and analyse various polymers useful for engineering applications.

CO5: Apply instrumentation methods for chemical analysis.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.

2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Observation and integration of diverse information from variable sources outside of the classroom and helps students to think critically, creatively, resourcefully, and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness.

CO2: Collaborating across diverse disciplines and practices to identify and create solutions that conserve and help manage biodiversity for the long term.

CO3: Analyze the sources of pollutants and their effects on atmosphere and Adapting eco-friendly technologies and maintain hygienic conditions.

CO4: Identify the evidence of Global warming, Ozone depletion and acid rain.

CO5: Recognize safe receiving storing and handling of raw and prepared food and maintain hygienic conditions.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES: Environmental studies - Definition scope and its importance, Need for public awareness; Natural resources - Forest resources, Deforestation, Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources, Land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY: Ecosystem - Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems; Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forest community, Bio-villages; Green technology for sustainable development; Life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental protection act; Environmental Impact Asssssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation - Food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions; Role of youth in the development, Promoting activities, Youth as initiators, Field work/environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment, Common plants, Insects, Birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik and CP Kaushik, "Perspectives in Environmental Studies", 5th edition, 2016
2. Benny Joseph, "Environmental studies", 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, "A Text book of Environmental Studies", HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, "A Text book of environmental science and Technology", B S Publications, 2008.
3. Dr. K. Mukkanti, "A Text book of Environmental Studies", S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, "Text book of Municipal and Rural Sanitation", M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, "Environmental Pollution Control Engineering", New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, "Introduction to Remote Sensing", B S Publications, 2004.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

16CS202 DATA STRUCTURES

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explaining how to implement them. It begins with the basic concepts of data and data structures and introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply advanced C programming techniques such as pointers, dynamic memoryallocation, structures to develop solutions for particular problems.

CO2: Analyze characteristics of various data structures.

CO3: Differentiate between Graphs and Trees.

CO4: Derive the importance of sorting and applying it wherever useful.

CO5: Argue the usefulness of data structures in solving problems.

SKILLS:

- ✓ *Identify the required data structures for various applications.*
- ✓ *Identify the sorting algorithm suitable for a given scenario.*
- ✓ *Implement array or linked list for a given problem.*
- ✓ *Analyse Pros & Cons of each of the data structure.*
- ✓ *Usage of trees and graphs.*

UNIT - 1 **L-9**

SORTING AND SEARCHING: Introduction - Data, Data type, Data structure, Primitive and Non-primitive - Data type, Data structure; Storage structures - Sequential and linked storage representations; Applications of structures, Hashing.

SORTING: Selection sort, Bubble sort, Insertion sort, Quick sort, Merge sort.

SEARCHING: Binary search and linear search.

UNIT - 2 **L-9**

LINKED LISTS: Introduction, Types of linked list - Singly linked list, Doubly linked list, Circular linked List; Operations - Insertion, Deletion, Traverse forward/reverse order; Multi lists, Applications of linked lists.

UNIT - 3 **L-9**

STACKS AND QUEUES: Stacks - Introduction, Array and linked representations, Implementation and their applications; Queues - Introduction, Array and linked representations, Implementation and their applications, Types - Linear, Circular and doubly ended queues; Applications.

UNIT - 4 **L-9**

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and linked representations; Tree traversals and their Implementation, Expression trees, BST definition and implementation; AVL Trees - Definition and implementation.

UNIT - 5 **L-9**

GRAPHS: Introduction, Properties, Modeling problems as graphs representations - Adjacency matrix, Adjacency list; Traversals - Breath first search and depth first search; Application of graphs.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- understand the importance of structure, abstract data type and their basic usability in different applications through different programminglanguages.
- understand the linked implementation and its uses both in linear and non-linear data structure.
- understand various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
- decide a suitable data structure to solve a real world problem.

LIST OF EXPERIMENTS Total hours-30

1. Selection, Bubble, Insertion, Quick and Merge sorting algorithms.
2. Linear and Binary search algorithms.
3. Single linked list, doubly linked list, and circular linked list.
4. Stack using an array and linked list.
5. Queue using an array and linked list.
6. Tree using an array and linked list.
7. Check if given expression is fully parenthesis or not using stack.
8. Tree traversing techniques.

ACTIVITIES:

- o *Design and Implement a School Management System.*
- o *Design and Implement a Social Networking Site.*
- o *Implement a project to find out the most common words in the articles.*
- o *Design and Implement a Library Book Management System.*
- o *Design and Implement a CricBuzz Application.*

9. BST using an array and linked list.
10. Graph traversal techniques.

TEXT BOOK:

1. ReemaThareja, “Data Structures Using C”, 2nd edition, Oxford University Press, 2014.

REFERENCE BOOKS :

1. Richard F. Gilberg and Bhrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd edition, Cengage Learning, 2004.
2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd edition, Tata Mc-Graw Hill, 2004.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education, 2006..

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Course Description and Objectives :

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes :

Upon successful completion of this course, students should be able to:

CO1: Identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy,Blacksmithy and House wiring.

CO2: Understand Fabrication of wooden joints.

CO3: Understand joining of metals.

CO4: Make metal joints and sheet metal work.

CO5: Make metal tools like knives, needles, swords, arrows etc.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs etc.*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*
- ✓ *CNC machines and various machining operations and processes.*

ACTIVITIES:

- o *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- o *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- o *Trials on electrical circuit connections.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin smithy and Black smithy.
4. House wiring.
5. Foundry and welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS:

1. S.K. Hazra Choudhury, "Elements of workshop Technology", 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice: Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S, "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

II

YEAR

ELECTRONICS AND COMMUNICATION ENGINEERING

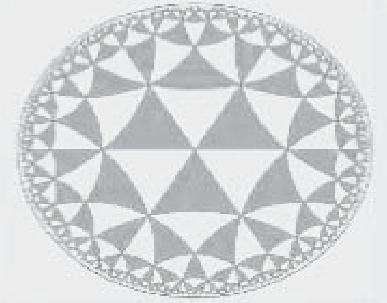
B.Tech.

I SEMESTER	16HS201	-	Complex Variables and Transformations
	16EC201	-	Materials for Electonics Engineering
	16EC202	-	Electronic Devices and Circuits
	16EC203	-	Network Theory
	16EC204	-	Signals and Systems
	16EC205	-	Digital Electronics
		-	Employability and Life Skills Elective
II SEMESTER	16EC206	-	Probability Theory and Stochastic Processes
	16EC207	-	Electronic Circuit Analysis
	16EC208	-	Analog Communications
	16EC209	-	Linear Control Systems
	16EL102	-	Soft Skills Laboratory
		-	Department Elective
		-	Department / Open Elective
		-	Employability and Life Skills Elective

COURSE CONTENTS

I SEM & II SEM

16HS201 COMPLEX VARIABLES AND TRANSFORMATIONS



Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

In this course students will learn complex numbers, complex functions, analytic functions, complex integration and theory of residues. Laplace transformations and Z-transformations will be dealt with including applications. The objective of this course is to offer theory of complex functions, Laplace transformations, their inverses, Z-transformations and their applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply the concept of Laplace transforms and solve differential equations.

CO2: Apply the concept of Z- transforms and evaluate the difference equations.

CO3: Understanding the concept of Analytical function and to construct the harmonic conjugate of the function.

CO4: Understand the concept of elementary function and evaluate complex integral using Cauchy's theorem and formula.

CO5: Evaluating Integral by using the concept of Residues.

CO6: Applications of Residue Theorem.

UNIT - 1 **L-9,T-3**

LAPLACE TRANSFORMATIONS: Introduction, Properties, Standard transformations, Change of scale property, Shifting properties, Laplace transformation of derivative and integral, Multiplication and division by *t*, Initial and final value theorems, Convolution theorem, Inverse Laplace transformations, Properties, Partial fractions method, Convolution, Applications, Solving ordinary differential equations using Laplace transformations.

UNIT - 2 **L-9,T-3**

Z – TRANSFORMATIONS: Introduction, Definition, Standard Z-transformations, Linear property, Damping rule, Shifting rules, Multiplication and division by *n*, Initial and final value theorems, Inverse Z-transformations, Convolution theorem, Applications to difference equations.

UNIT - 3 **L-9,T-3**

ANALYTICAL FUNCTIONS: Complex numbers, Properties including roots of a complex number, (Brief discussion), Functions of complex variables, Limit and continuity, Differentiability, Analytic functions, Cauchy-Riemann equations (without proof), Cauchy-Riemann equations in polar form (without proof), Orthogonal curve, Harmonic functions, Conjugate harmonic functions, Construction of conjugate harmonic function, Milne Thomson method.

UNIT - 4 **L-9,T-3**

ELEMENTARY FUNCTIONS AND COMPLEX INTEGRATION: Complex trigonometric functions, Hyperbolic functions, Relation between trigonometric and hyperbolic functions, Separation of real and imaginary parts of trigonometric and hyperbolic functions, Logarithmic function, Inverse functions, Line integral, Properties of contour integrals, Cauchy's integral theorem, Cauchy integral formula and its generalization, Evaluation of integrals.

UNIT - 5 **L-9,T-3**

RESIDUES: Convergence of series of complex terms, Power series, Region and radius of convergence, Taylor series, Maclaurin series and laurent series, Singularity, Classification of singularities, Pole at infinity, Zeros of analytic function, Residue of a pole, Residue at infinity, Residue theorem, Method of finding residues, Residue integrals.

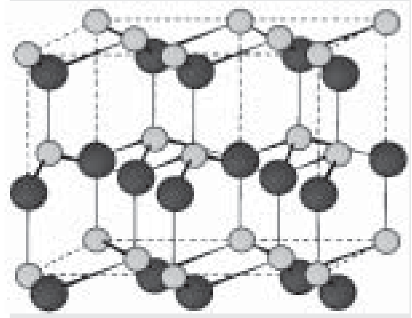
TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.
2. B. S. Grawel, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.

REFERENCE BOOKS:

1. Srimanta Pal, Subodh C and Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B.V. Ramana, "Higher Engineering Mathematics", 3rd edition, Tata McGraw-Hill Publishing Co, 2008.
3. R K Jain, S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2006.

16EC201 MATERIALS FOR ELECTRONICS ENGINEERING



Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

This course deals with the different materials used for electnoic device fabrication and their properties. The objective of the course is to introduce the students to structure and properties of materials, that are required for the design and construction of solid state devices. In addition, it provides introduction to the interrelations of the structure, properties and processing of materials.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Classification of materials and Understand the crystal structure.

CO2: Understand the fundamentals of the physical, mechanical, thermal and electronic properties of materials.

CO3: Apply all the electronic Properties of the material into the core electronic devices.

CO4: Applications of materials in the development of various electronic devices.

CO5: Apply electric and dielectric properties in the area of electromagnetic waves.

CO6: Understand the fundamentals of optical properties and appl ications of nano materials.

UNIT - 1 **L-9**

BONDING AND CRYSTALLOGRAPHY: Bonding forces and energies, Primary inter-atomic bonds, Secondary bonding or van der waals bonding, Fundamental concepts of crystallography, Unit cells, Metallic crystal structures, Polymorphism and allotropy, Crystal systems, Packing densities, Point coordinates, Crystallographic directions, Crystallographic planes, Linear and planar densities, Close-packed crystal structures.

UNIT - 2 **L-9**

SOLID STATE DIFFUSION AND MECHANICAL PROPERTIES: Introduction to diffusion, Diffusion mechanisms, Steady-state diffusion, Nonsteady-state diffusion, Factors that influence diffusion, Diffusion in semiconducting materials, Materials of importance - Aluminum for integrated circuit interconnects introduction to mechanical properties; Concepts of stress and strain, Stress-strain behavior of materials.

UNIT - 3 **L-9**

ELECTRICAL AND DIELECTRIC PROPERTIES: Introduction, Ohm's Law, Electrical conductivity, Electronic and ionic conduction, Energy band structures in solids, Conduction in terms of band and atomic bonding models, Electron mobility, Electrical resistivity of metals, Electrical characteristics of commercial alloys, Intrinsic semiconduction, Extrinsic semiconduction, The temperature dependence of carrier concentration, Factors that affect carrier mobility, The hall effect, Semiconductor devices, Conduction in Ionic materials, Electrical properties of polymers capacitance, Field vectors and types of polarization, Frequency dependence of the dielectric constant, Dielectric strength, Dielectric materials, Ferroelectricity, Piezoelectricity.

UNIT - 4 **L-9**

MAGNETIC PROPERTIES: Introduction to magnetic properties, Basic concepts, Diamagnetism and paramagnetism, Ferromagnetism, Anti-ferromagnetism and ferrimagnetism, The influence of temperature on magnetic behavior, Domains and hysteresis, Magnetic anisotropy, Soft magnetic materials, Materials of importance - An Iron-silicon alloy that is used in transformer cores, Hard magnetic materials, Magnetic storage, Superconductivity.

UNIT - 5 **L-9**

OPTICAL PROPERTIES: Introduction to optical properties, Electromagnetic radiation, Light interactions with solids, Atomic and electronic interactions, Optical properties of metals, Optical properties of nonmetals, Refraction, Reflection, Absorption, Transmission, Color, Opacity and translucency in iInsulators, Luminescence, Materials of importance - Light-emitting diodes, Photoconductivity, Lasers, Optical fibers in communications, Nano materials.

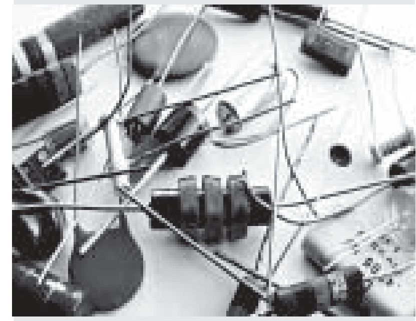
TEXT BOOK:

1. W.D. Callister, "Materials Science and Engineering: an Introduction", 8^{th} edition, Wiley, 2010.

REFERENCE BOOKS:

1. W. F. Smith, "Foundations of Materials Science and Engineering", 5^{th} edition, McGraw Hill, 2015.
2. V. Raghavan, "Materials Science and Engineering", 5^{th} edition, PHI, 2012.

16EC202 ELECTRONIC DEVICES AND CIRCUITS



Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course is aimed at offering fundamental concepts of semiconductor devices and circuits. The objective of the course is to introduce the student to Junction Diode, Transistor, FET and other basic devices that are designed with semiconductor materials. As a first-level course in electronics, it forms the basis for the understanding of advanced electronic courses that are offered in subsequent semesters.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the semiconductor devices with the help of V-I characteristics.

CO2: Investigate the characteristics of Amplifier Circuits employing BJT and FET devices.

CO3: Design half wave and full wave rectifiers with and without filters.

CO4: Analyze the working of BJTs and FETs under various biasing conditions.

CO5: Compare CB, CE, CC configurations of BJT and CG,CD,CS configurations of FET.

CO6: Apply the concepts of basic electronic devices to design various circuits.(Lab &MP)

SKILLS :

- ✓ *Identify a Semiconductor Diode for a specific application and power handling capacity.*
- ✓ *Identify the transistor type for a given application (switch/amplifier).*
- ✓ *Recognize the required specifications of the transistor.*
- ✓ *Identify the amplification factor of the given transistor.*
- ✓ *Test the working condition of the transistor.*

ACTIVITIES:

- *Choose a diode for a Cell-phone/ Laptop/ Tablet adapter/ for various ratings.*
- *Design voltage regulator using zener diode.*
- *Design three types of biasing circuits and determine the stability factors in each case.*
- *Transistor as an amplifier for the given specifications.*
- *Design a wideband amplifier with FET.*

UNIT - 1 **L-9**

P-N JUNCTION DIODE: Formation of P-N junction, Energy band diagram of open circuited P-N junction, Operation of forward and reverse biased P-N junction diode, Volt-Ampere characteristics, Temperature dependence on V–I characteristic, Diode resistances and capacitances, Diode equation, Special diodes-Breakdown Mechanisms in a Semi Conductor Diode, Zener diode, V-I characteristics and zener diode as voltage regulator, Tunnel diode, Varactor diode, SCR, LED and photodiode.

UNIT - 2 **L-9**

DIODE APPLICATIONS: The P-N junction diode as a rectifier - Half wave rectifier, Full wave rectifier and bridge rectifier, Harmonic components in a rectifier circuit; Filters - Analysis and comparison of various filters, Inductor filter, Capacitor filter, L- section filter and ð-section filter in terms of ripple factor, A simple regulated power supply circuit; Clipping and clamping circuits - Elementary diode clippers and clamping circuits.

UNIT - 3 **L-9**

TRANSISTOR: Bipolar junction transistor (BJT) - Construction, Principle of operation of PNP and NPN transistors, Characteristics of transistor in common emitter, Common base and common collector configurations; Field effect transistor (FET)-Construction, Symbol and principle of operation of JFET, Pinch-off voltage, JFET characteristics, Comparison of BJT and FET; MOSFET - Construction, working and V-I characteristics of enhancement and depletion MOSFET.

UNIT - 4 **L-8**

BJT and FET BIASING: Transistor biasing and thermal stabilization, DC and AC load lines, Operating point, types of BJT biasing, Thermal runaway and thermal stability, Stabilization against variations in V_{BE}, â and I_{co} , Stability factors, Bias compensation using diodes and transistors **,** Biasing of FET.

UNIT - 5 **L-10**

SINGLE STAGE BJT AND FET AMPLIFIERS: Transistor as an amplifier, Two port network representation and h parameter model of a transistor, Exact and approximate analysis of CE small signal low frequency transistor model, Expressions for voltage gain, Current gain, Input impedance and output impedance using h-parameters, Comparison of transistor amplifier configurations in terms of A_i, R_i, A_v, R_o; FET amplifiers - FET small signal model, Analysis of FET amplifiers (CS, CD and CG configurations) at low frequencies, Expressions for voltage gain, Input impedance and output impedance.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

1. Understand the V-I characteristics of P-N junction diode and hence determine the diode forward, reverse currents, static and dynamic resistances.
2. Analyze the V-I characteristics of zener diode under reverse biased condition and observe the application as voltage regulator.
3. Calculate the efficiency and ripple factor of all rectifiers and analyze their performance with and without filter.
4. Understand the input and o/p characteristics of all BJT configurations in active region and determine its current amplification factors.
5. Understand the drain and transfer characteristics of FET and determine its amplification factor.
6. Understand the diode application as a clipper.

LIST OF EXPERIMENTS Total hours-30

1. P-N Junction diode characteristics.
2. Zener diode characteristics and Zener diode as Voltage regulator.
3. To determine the ripple factor and efficiency of Half wave Rectifier with and without filter.
4. To determine the ripple factor and efficiency of Center tapped Full wave Rectifier with and without filter.
5. To determine the ripple factor and efficiency of Bridge Rectifier with and without filter.
6. Construction of various diode clipping circuits.
7. Transistor CB characteristics (Input and Output).
8. Transistor CE characteristics (Input and Output).
9. Transistor CC characteristics (Input and Output).
10. FET characteristics.

TEXT BOOKS:

1. J. Millman and C.C.Halkias, "Electronic Devices and Circuits", 9th edition, Tata Mc-Graw Hill, 2012.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", 9th edition, Pearson/ Prentice Hall, 2006.

REFERENCE BOOKS:

1. J. Taub and C.C. Halkias, "Electronic Circuits", 8th edition, Tata Mc-Graw Hill, 2015.
2. Salivahanan, Kumar and Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, 4th edition, 2008.
3. J. Millman and K Taub, "Electronic Circuits and Applications", 4th edition, Tata Mc-Graw Hill, 2011.
4. K Thomson, "Electronic Switching Circuits", 2nd edition, Oxford University Press, 2012.
5. K Satya Prasad, "Electronic Devices and Circuits", 2nd edition, VGS Publications, 2014.
6. K K Vara Prasad, "Electronic Devices and Applications", 2nd edition, Oxford University Press, 2014.

16EC203 NETWORK THEORY

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course enables the students to learn advanced concepts in circuit analysis which are applicable in solving electronic circuits. The aim of this course to introduce the student to the derivation of transient responses of RC, RL and RLC circuits, steady state response of circuits to sinusoidal excitation in time domain, application of phasors to circuit analysis and introduction to graph theory to analyze circuits.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply KVL, KCL, source transformation, star-delta transformation, voltage and current division rules on Electrical networks.

CO2: Investigate series and parallel circuits with AC excitation and resonant circuits.

CO3: Analyze the transient response of RL, RC and RLC circuits for DC and AC excitations.

CO4: Understand the concepts of various network theorems and applying to the linear circuits.

CO5: Analyze the two port network parameters, Interconnect, Represent and analyze two port networks.

CO6: Determine branch currents and voltages using Tieset and cutest.

SKILLS:

- ✓ *Determine currents and voltages of all elements of any electrical system network.*
- ✓ *Analysis of simple house wiring diagram.*
- ✓ *Analysis of simple circuits by using theorems.*
- ✓ *Calculate power, current and voltage in any AC and DC circuits.*
- ✓ *Design of suitable Battery for small applications.*
- ✓ *Application of two- port network parameters to analyze transmission lines and filters.*

UNIT - 1 **L-9, T-3**

INTRODUCTION OF CIRCUIT ELEMENTS: Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and current division, V-I characteristics of passive elements and their series / parallel combination, Energy stored in Inductors and capacitors, Kirchhoff's voltage law and Kirchhoff's current law, Mesh and nodal analysis, Star and delta conversions.

UNIT - 2 **L-9, T-3**

SINUSOIDAL STEADY STATE ANALYSIS AND RESONANCE: Instantaneous, Peak, Average ,RMS values, Crest factor and form factor of periodic waveforms, Notation and concept of phasors, Response of R, L, C series and parallel combination circuits to sinusoidal excitation, Calculation of active and reactive powers, Resonance - Series and parallel resonance circuits, concept of bandwidth and Q factor.

UNIT - 3 **L-9, T-3**

NETWORK TRANSIENT ANALYSIS: Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C and sinusoidal excitations, Initial conditions, Time domain and laplace transform methods of solutions.

UNIT - 4 **L-9, T-3**

NETWORK THEOREMS: Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Millman theorem, Application of theorems to DC and AC circuits.

UNIT - 5 **L-9, T-3**

TWO PORT NETWORK PARAMETERS: Introduction to Two port networks, Open circuit impedance and short circuit admittance (Y), Transmission and inverse transmission, Hybrid and inverse hybrid parameters, Relation between parameter sets, Interconnection of two port networks, Graph theory - Definitions, Graph, Tree, Basic tie-set and basic cut set matrices for planar networks, Loop and nodal methods of analysis of networks with independent and dependent voltage and current sources, Duality and dual networks.

TEXT BOOKS:

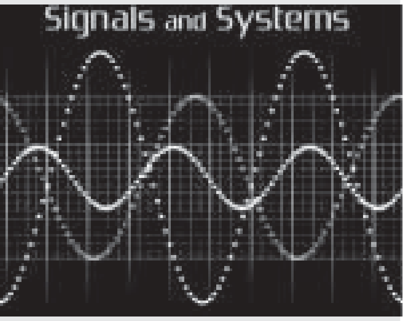
1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 7th edition,Tata McGraw-Hill, 2007.
2. A Sudhakar and Shyammohan S Palli, "Circuits & Networks: Analysis and Synthesis", 5th edition Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1. Syed A. Nasar, "Electric Circuits", Tata McGraw-Hill, Schaum's Series, 1988.
2. Franklin F.Kuo, "Network Analysis and Synthesis", 2nd Edition, John Wiley and Sons, 2003.
3. Mahmood Nahvi and Joseph Edminister, "Electric Circuits", 4th edition, Schaum's Outline series, Tata McGraw-Hill, 2004.

ACTIVITIES:

- *Measure the Resistance of any resistive Electrical Appliance like water heater, incandescent bulb.*
- *Design of small size house wiring system.*
- *Design circuits with suitable load to get maximum power from source.*
- *Determination of RLC values for given resonant frequency connected series/parallel combination.*
- *Design resonant circuit for oscillator and filter applications.*
- *Design of Power bank for mobile charger circuit.*
- *Determination of Voltage and current characteristics of given Black box.*
- *Verify duality for a given Network.*



16EC204 SIGNALS AND SYSTEMS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course deals with varoius signals, systems and their analysis along with their applications. The objective of this course is to enable the student to understand the continous time signals, systems and thier properties, analysis of signals using transforms, to analize and predict the behaviour of linear systems.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand basic signals andanalyze the representation using Fourier series.

CO2: Analyze continuous time signals by using appropriate mathematical tools like Fourier Transform and Laplace Transform.

CO3: Analyze the response of a LTI System to any arbitrary inputs and learn about signal transmission through linear systems.

CO4: Apply the concepts of convolution and correlation for continuous time signals.

CO5: Understand the fundamentals of sampling including the implications of sampling theorem.

CO6: Work in a team to analyze and demonstrate the applications of signals and systems.

SKILLS:

- ✓ *Design and test a stable system.*
- ✓ *Choose the various transforms and their applications in the analysis of signals and systems.*
- ✓ *Apply transformation to real-world problems involving bio-signals such as EEG, ECG and EMG.*
- ✓ *Analyze the abnormalities present in the physiological systems.*
- ✓ *Choose the desired sampling frequency for a given application.*

UNIT - 1 **L-10**

FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS: Introduction to signals and systems, Basic signals, Classification, Operations, Vectors vs Signals, Orthogonal functions, Representation of signals using orthogonal functions, Mean square error, Representation of fourier series, Continuous time periodic signals, Properties of fourier series, Dirichlet's conditions, Trigonometric fourier series and exponential fourier series, Complex fourier spectrum.

UNIT - 2 **L-10**

FOURIER TRANSFORMS AND LAPLACE TRANSFORMS: Fourier transforms - Deriving fourier transform from fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, Properties of fourier transforms, Fourier transforms involving impulse function and signum function, Introduction to hilbert transform; Laplace transforms- Review of laplace transforms, Partial fraction expansion, Inverse laplace transform, Concept of region of convergence (ROC) for laplace transforms, Constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T and F.T of a signal, Laplace transform of certain signals using waveform synthesis.

UNIT - 3 **L-9**

LTI SYSTEMS AND ANALYSIS: Classification of systems, Linear time invariant (LTI) system, Impulse response, Step response, Response of a LTI system to arbitrary inputs, Transfer function of LTI system, Filter characteristics of linear systems, Distortion less transmission, Signal bandwidth, System bandwidth, Ideal LPF, HPF, BPF, BRF characteristics, Causality and paley-wiener criterion for physical realization, Relationship between bandwidth and rise time.

UNIT - 4 **L-9**

CONVOLUTION AND CORRELATION OF SIGNALS: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of fourier transforms, Cross correlation and auto correlation of functions, Properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and power spectral density, Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT - 5 **L-7**

SAMPLING: Sampling theorem, Graphical and analytical proof for band limited signals, Impulse sampling, Natural and flat top sampling, Reconstruction of signal from its samples, Effect of under sampling - Aliasing; Introduction to band pass sampling.

ACTIVITIES:

- o *Recording of various signals like Speech, Noise, Audio signals and analysis using Matlab and spectrum analyzer*

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- analyze signals in order to calculate their frequency spectra
- analyze the different types of systems and their properties.

LIST OF EXPERIMENTS Total hours-30

1. Generation and plotting of trigonometric and exponential functions.
2. Standard signal teneration (Impulse, Step, Ramp & Sinc).
3. Operations on signals (Folding, Shifting and Scaling).
4. Periodic and Non-periodic signal generation.
5. Analysis of periodic signals.
6. Analysis of Non-periodic signals.
7. Analysis of transfer function.
8. System analysis by using poles and zeros.
9. Sampling theorem verification.
10. System response.
11. Convolution of continuous time signals.
12. Correlation of continuous time signals.
13. Generation of random signals.

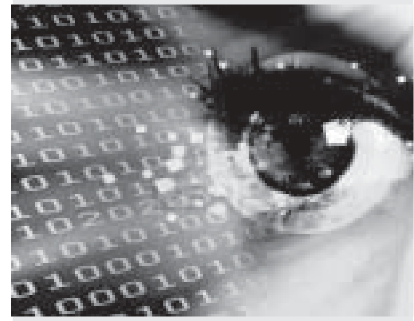
TEXT BOOKS:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd edition, Prentice Hall of India, 1997.
2. B.P.Lathi, "Linear Systems and Signals", 2nd edition, Oxford University Press, 2009.

REFERENCE BOOKS:

1. B.P. Lathi, "Signals,Systems and Communications", John Wiley, 2005.
2. Simon Haykin and Van Veen, "An Introduction to Signals and Systems", 2nd edition, Wiley, 2002.
3. John Alan Stuller, "An Introduction to Signals and Systems" Thomson, Indian edition, 2007.
4. H P Hsu, "Signals and Systems", 2nd edition, Tata McGraw-Hill Schaum's Outlines, 1995.
5. Tarun Kumar Rawat, "Signals and Systems", 1st edition, Oxford, 2010.

16EC205 DIGITAL ELECTRONICS



Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

Digital Electronics deals with fundamentals of number systems, Boolean expressions that are used to realize combinational and sequential circuits. Its objective is to minimize the logical expressions using Boolean postulates, to design various combinational and sequential circuits and to provide with sufficient number of applications to demonstrate the techniques and mathematics used.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand number systems and its conversion; simplify Boolean expressions by different methods and implementation using logic gates.

CO2: Apply the Boolean algebra knowledge of mathematics to analyze combinational and sequential digital electronic circuits using K-map and QM technique.

CO3: Design combinational and sequential circuits for the given specifications/constraints.

CO4: Synthesize the state diagram, state table, state equation for Finite state machine.

CO5: Compare the characteristics of logic families for implementing combinational & sequential circuits.

CO6: Demonstrate applications of digital circuits (lab + minor Project)

SKILLS:

✓ *Perform conversions between numbers of different radices.*

✓ *Identify the different gates and their properties.*

✓ *Minimize Boolean expression.*

✓ *Design combinational circuits for a given application.*

✓ *Develop sequential circuits for a given application.*

✓ *Verify the functionality of digital circuits.*

✓ *Design memories for a given specification.*

ACTIVITIES:

- *Choose a Gate for digital circuit.*
- *Design digital circuits using universal gates.*
- *Implement Combinational circuits like adder encoder, decoder.*
- *Design Sequential circuits like flip flops, counters.*
- *Develop Finite state machines like Mealy and Moore machines.*

UNIT - 1 **L-9**

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Review of number systems- Conversions, Arithmetic operations, Binary codes,Parity code, Hamming code; Fundamental concepts of boolean algebra- Basic theorems and properties, Canonical and standard forms; Logic gates, Algebraic simplification and realization with basic gates and universal gates.

UNIT - 2 **L-9**

MINIMIZATION OF SWITCHING FUNCTIONS: Minimization of switching functions - K-map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular method, Prime implicant chart.

UNIT - 3 **L-9**

COMBINATIONAL LOGIC DESIGN: Design using conventional logic gates - Decoder, Encoder, Multiplexer, Demultiplexer, Parity bit generator, code converters (Designing with IC's); Basic PLDs - PAL, PLA, ROM, PROM.

UNIT - 4 **L-10**

SEQUENTIAL LOGIC DESIGN: Classification of sequential circuits, Latches, Flip-Flops - SR, JK, D, T, triggering and Excitation tables; Design of sequential circuits - Shift registers, Counters, FSM, Sequence detectors.

UNIT - 5 **L-8**

LOGIC FAMILIES: Introduction to logic families, CMOS logic, Bipolar logic, Transistor logic, TTL families, CMOS/TTL Interfacing.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to design different:

- digital circuits.
- combinational circuits.
- sequential circuits.
- FSM for completely specified and incompletely specified sequential machines.
- memories.

LIST OF EXPERIMENTS Total hours-30

Design and Implementation of

1 Basic Logic Gates.
2 Adders.
3 Subtractor.
4 Decoder.
5 Encoder.
6 Multiplexer.
7 De-Multiplexer.
8 Parity Circuits.
9 Comparator.
10 Flip Flops.
11 Registers.

12 Shift Registers.

13 Counters.

14 Finite State Machines (FSM).

TEXT BOOKS :

1. Morris Mano, “Digital Logic and Computer Design”, 1st edition, Pearson, 2013.

2. John F walkerly, “Digital Design Principles and Practices”, 3rd edition, PHI/Pearson Education, 2015.

REFERENCE BOOKS :

1. John M. Yarbrough, “Digital Logic Applications and Design”, 1st edition, Thomson Publications, 2010.

2. Fletcher, “An Engineering Approach To Digital Design”, 1st edition, Prentice Hall of India, 2009.

3. R.P.Jain, “Modern Digital Electronics”, 3rd edition, Tata McGraw–Hill, 2010.

16EC206 PROBABILITY THEORY AND STOCHASTIC PROCESSES

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course deals with the quantifying of randomly varying parameters that are prevalent in real life situations. The objective of the course is to enable the student to learn probability theory and random variables, gain knowledge of multiple random variables, conditional expectation, independence of random variables, analysis of random processes and applications in the communication systems.

Course outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understands the basics of probability, sample space, events, statistics and apply them to real life problems.

CO2: Distinguish probability density and distribution functions for single and multiple random variables.

CO3: Calculate the statistical parameters for random variables.

CO4: Analyze the concept of random process along with its parameters.

CO5: Estimate the correlation, covariance and PSD for random processes.

CO6: Analyze the response of linear systems to random inputs.

SKILLS:

- ✓ *Formulate, analyze and validate models applicable to practical problems.*
- ✓ *Use the probability, moment generating functions and characteristic functions.*
- ✓ *Know the multivariate normal law and how to operate jointly with Gaussian random variables.*
- ✓ *Identify the different modes of convergence of sequences of random variables as well as the precise meaning of the laws of large numbers and the central limit theorem.*
- ✓ *Identify probability models based on the theoretical results presented in the course.*

UNIT - 1 **L-9,T-3**

PROBABILITY THEORY AND PROBABILITY STATISTICS: Mean, Median, Mode and Standard deviation, Correlation and regression analysis, Introduction to probability, Joint probability, Conditional probability, Total probability, Bayes' theorem, Bernoulli trails and independent events.

UNIT - 2 **L-9,T-3**

THE RANDOM VARIABLE AND OPERATIONS ON RANDOM VARIABLES: Definition of a random variable, Conditions for a function to be a random variable, Classifications of random variables, Density and distribution functions, Properties of random variables, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional distribution, Methods of defining conditioning event, Conditional density and distribution functions, Properties, Operations on Random variables - Introduction, Expected value of a random variable, Function of a random variable, Moments about the origin, Central moments, Variance, Chebychev's inequality, Characteristic function, Moment generating function, Monotonic transformations for a continuous and discrete random variables.

UNIT - 3 **L-8,T-3**

MULTIPLE RANDOM VARIABLES : Vector random variables, Joint distribution function and its properties, Marginal distribution functions, Conditional distribution and density, Statistical independence, Sum of two Random variables, Central limit theorem.

UNIT - 4 **L-8,T-3**

RANDOM PROCESSES: Temporal characteristics, Random process concept, Classification of processes, Distribution and density functions, Concept of stationary and statistical independence, Wide sense stationary, Time averages and ergodicity, Autocorrelation function and its properties, Cross correlation function and its properties, Gaussian random processes, Poisson random process, Relation between power spectral density and autocorrelation.

UNIT - 5 **L-11,T-3**

LINEAR SYSTEMS WITH RANDOM INPUTS: Random signal response of linear systems, System response – Convolution, Mean and Mean square value, Autocorrelation function; Cross-correlation functions of input and output, Spectral characteristics of system response, Power density spectrum of response, Cross-power density spectrums of input and output, Modeling of noise sources - Resistive (thermal) noise source, Arbitrary noise sources, Effective noise temperature, Average noise figures, Average noise figure of cascaded networks.

TEXT BOOKS:

1. Peyton Z. Peebles, "Probability, Random Variables and Random Signal Principles", 4th edition, Tata McGraw-Hill, 2001.
2. Athanasios Papoulis and S. Unnikrishnan Pillai, "Probability, Random Variables and Stochastic Processes", 4th edition, PHI, 2002.

REFERENCE BOOKS:

1. R.P. Singh and S.D. Sapre, "Communication Systems Analog and Digital", 2nd edition, Tata McGraw Hill, 2009.
2. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing", 3rd edition, Pearson Education, 2009.
3. S.P. Eugene Xavier, "Statistical Theory of Communication",1st edition, New Age Publications, 2003.
4. George R. Cooper and Clave D. MC Gillem, "Probability Methods of Signal and System analysis" 3rd edition, Oxford, 1999.
5. Y.Mallikarjuna Reddy, "Probability Theory and Stochastic Process" 4th edition, Universities press, 2015.

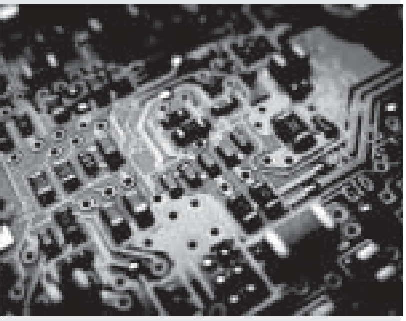
ACTIVITIES:

- *Verify that sum of two random variables is Gaussian.*
- *Write MATLAB code for finding total probability.*
- *Find Expectation, variance and standard deviation with the help of MATLAB for*

  (a) any random data.

  (b) any continuous random variables.

  (c) any discrete random variables.
- *Find Auto Correlation Function and Cross Correlation function for any two random variables.*
- *Plot density and distribution function for any random data.*



16EC207 ELECTRONIC CIRCUIT ANALYSIS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

The course provides an overview of the principles, operations and applications of the analog building blocks like diodes, BJT, FET etc for performing various functions. The objective of the course is to apply this knowledge to do the analysis and design of basic electronic circuits.

Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Analyze and demonstrate negative feedback amplifier circuits and positive feedback oscillators.

CO2: Understand the working of tuned amplifiers.

CO3: Understand and analyze the different multistage amplifiers.

CO4: Investigate the frequency response of amplifiers.

CO5: Analyze the efficiency of power amplifiers like class-A, B, C, AB.

CO6: Design and verify some common electronic circuits. (Lab and MP)

SKILLS:

- ✓ *Design an amplifier for Public address system.*
- ✓ *Construct an oscillator at audio and Radio frequency applications.*
- ✓ *Design and construct a tuned amplifier in radio receiver.*

UNIT - 1 **L-12**

FEEDBACK AMPLIFIERS AND OSCILLATORS: Concept and types of feedback, Effects of negative feedback, Different topologies with their parameter analysis, Oscillators - Barkhausen's crieterion for oscillations, Frequency of oscillations for Hartley, Colpitts, RC phase shift, Wein bridge and crystal oscillators.

UNIT - 2 **L-10**

MULTI STAGE AMPLIFIERS: Methods of inter stage coupling, N-stage cascaded amplifier, Miller's theorem, Frequency effects, Multistage amplifier analysis - Cascade, Cascode, CE-CC amplifiers, Two stage RC coupled JFET amplifier (CS), High input impedance transistor circuits.

UNIT - 3 **L-8**

FREQUENCY RESPONSE OF AN AMPLIFIER: Transistor at high frequencies, Hybrid-Pi common emitter transistor model, Determination of Hybrid- Pi conductances and capacitances in terms of low frequency h-parameters, Frequency response of BJT amplifiers and FET amplifiers.

UNIT - 4 **L-8**

POWER AMPLIFIERS: Classification of power amplifiers, Operation and efficiency of class A, Class B, Class C and class D amplifiers.

UNIT - 5 **L-7**

TUNED AMPLIFIERS: Concept and types of tuned amplifiers, Single tuned capacitive coupled amplifier, Double tuned amplifier, Stagger tuning, Application of tuned amplifiers, Stability considerations.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the knowledge to the analysis and design of basic circuits.
- identify, formulate and solve hardware engineering problems.
- analyze a circuit and compare its theoretical performance to actual performance.

LIST OF EXPERIMENTS Total hours-30

1. Verify negative feedback effects by using voltage shunt feedback topologies.
2. Design Colpitts Oscillator.
3. Verify the cascading Effects on amplifier.
4. Find the frequency response of CE and CS amplifiers.
5. Find the power efficiency of Class-A, B, AB and C amplifiers.
6. Design Single Tuned Amplifier.

TEXT BOOKS:

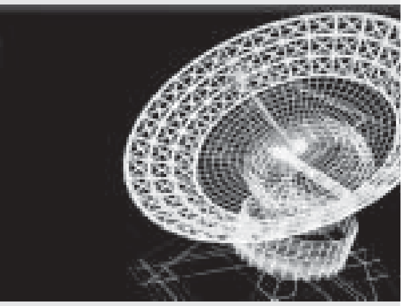
1. J. Millman and C.C. Halkias, "Integrated Electronics", 1st edition, Tata McGraw-Hill, 2009.
2. Donald A. Neaman, "Electronic Circuit Analysis and Design", 3rd edition, Tata McGraw-Hill, 2009.

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 9th edition, Pearson/Prentice Hall, 2006.
2. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", 5th edition, Oxford University Press, 2006.
3. M.H. Rashid, "Micro Electronic Circuits: Analysis and Design", 1st edition, Thomson PWS Publ, 1999.

ACTIVITIES:

- *Bandwidth improvement using negative feedback.*
- *Designing 1 Hz frequency oscillator for digital clock.*
- *calculating overall gain in multi stage amplifier.*
- *Design Music Operated Dancing LEDs.*
- *To determine overall bandwidth of multistage amplifiers.*
- *Design Microphone amplifier.*
- *To observe the crossover distortion and its elimination.*
- *Designing Water Tank Overflow alarm circuit using Darlington pair.*
- *Designing Rain Detector and Alarm Circuit using Darlington pair.*
- *Designing 25W audio power amplifier.*



16EC208 ANALOG COMMUNICATIONS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course deals with the fundamentals of analog communications - amplitude modulation and demodulation, frequency modulation and demodulation, phase modulation and demodulation. The objective of this course is to enable the students to understand the basic mathematical concepts of communications in both time domain and frequency domain.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the concepts of modulation, demodulation and learn the basic amplitude modulation techniques.

CO2: Analysis of DSB-SC, SSB-SC and VSB-SC modulation and demodulation techniques.

CO3: Analyze the performance of different types of Angle Modulation Techniques for a given set of parameters.

CO4: Identify the transmitter and receiver types required for a given application.

CO5: Understand the calculation of SNR in different modulation techniques.

CO6: Experiment on different types of Analog communication subsystems using hardware and simulations.

SKILLS:

- ✓ *Identify the need for modulation and choice of modulation.*
- ✓ *Choose the choice of frequency bands of AM/FM/T.V/Mobile/Satellite.*
- ✓ *Select base band signal, carrier and modulated signals in a given application.*
- ✓ *Determine the frequency deviation/guard band for FM receiver.*
- ✓ *Identify the Tx/Rx type required for a given application.*
- ✓ *Select the detector/discriminator required in FM.*
- ✓ *Identify inherent or interference noise and classify.*

UNIT - 1 **L-9**

INTRODUCTION TO COMMUNICATION SYSTEM: Introduction to communication system, Need for modulation, Frequency division multiplexing, Amplitude modulation- Definition, Time domain and frequency domain description, Single tone modulation, Power relations in AM waves; Generation of AM waves - Square law modulator, Switching modulator; Detection of AM waves- Square law detector, Envelope detector.

UNIT - 2 **L-10**

DSB-SC, SSB-SC AND VSB-SC MODULATION AND DETECTION: DSBSC modulation, Time domain and frequency domain description, Generation of DSBSC waves - Balanced modulators, Ring modulator; Detection of DSBSC waves - Coherent detection, COSTAS loop; SSB modulation,Time domain description, Frequency domain description, Generation of SSB Waves -Frequency discrimination method, Phase discrimination method; Demodulation of SSB Waves, VSB modulation, Frequency description, Time domain description, Generation of VSB modulated wave, Envelope detection of a VSB wave plus carrier, Comparison of AM techniques, Applications of different AM systems.

UNIT - 3 **L-10**

ANGLE MODULATION SYSTEMS: Angle modulation - Phase and frequency modulation and their relationships, Phase and frequency deviation, Spectrum envelope of FM signal, Narrow band FM and wide band FM, Transmission bandwidth; Generations of FM waves, Indirect and direct methods, Detection of FM waves - Balanced frequency discriminator, Foster seely discriminator, PLL demodulator.

UNIT - 4 **L-8**

RADIO TRANSMITTERS AND RECEIVERS: Radio transmitters - Classification of radio transmitters, AM transmitters and FM transmitters, Variable reactance type and phase modulated type; Radio receivers - Radio receiver types, TRF receiver, Super heterodyne receivers, FM receivers; Comparison of AM and FM receivers.

UNIT - 5 **L-8**

NOISE: Noise in analog communication system, Noise in DSB and SSB system, Noise in AM system, Noise in angle modulation system, Threshold effect in angle modulation system, Pre-emphasis and de-emphasis.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- identify and describe different analog modulation techniques.
- analyze AM radio transmitter and receiver.
- use AM techniques in MATLAB simulink.

LIST OF EXPERIMENTS Total hours-30

1. Amplitude Modulation and Demodulation.*
2. DSB-SC Modulation and Demodulation.*
3. SSB-SC Modulation and Demodulation.*
4. Frequency Modulation and Demodulation.
5. Pre-Emphasis and De-Emphasis.
6. Verification of Sampling Theorem.

ACTIVITIES:

- o *Choose the modulation scheme for the given Audio signal with minimum bandwidth.*
- o *Choose the modulation scheme for the given voice signal with very good quality.*
- o *Design simple AM modulator using discrete components.*
- o *Design a VCO (NE 566) to generate FM signal for a given application.*
- o *Design the scheme for demonstrating the capturing effect of FM receiver.*

7. Phase Locked Loop.
8. Design of Mixer.
9. AGC Characteristics.
10. Frequency Division Multiplexing.

** To be performed both in hardware and software (Simulink).*

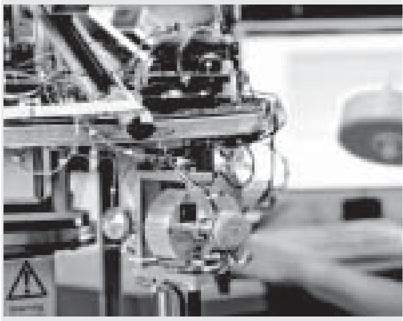
TEXT BOOKS:

1. H Taub, D.L. Schilling and Goutam Saha, “Principles of Communication Systems”, 3rd edition, TMH, 2008.
2. G.K. Mithal, “Radio Engineering Principles of Communication systems”, 20th edition, Khanna Publishers, 2008.

REFERENCE BOOKS:

1. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd edition, Oxford University Press, 2007.
2. B.Sklar, “Digital Communications Fundamentals and Applications”, 2nd edition, Pearson Education, 2007.
3. H P Hsu, “Analog and Digital Communications”, Schaum Outline Series, TMH, 2006.
4. Leon W. Couch, “Digital and Analog Communication Systems”, 8th edition, Pearson, 2013.

16EC209 LINEAR CONTROL SYSTEMS



Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

This course enables applications of mathematical modeling of physical systems (electrical, mechanical, chemical, thermal and pneumatic systems) and presents different methods of analysis and design. The aim of this course is to provide the knowledge in various time and frequency domains, tools for analysis and design of linear control systems and compensators.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Calculate the transfer function of different control systems.

CO2: Apply mathematical modeling to the physical systems/electrical systems.

CO3: Understand and analyze the characteristics of feedback systems.

CO4: Analyze the response of the open and closed loop systems with time domain and state space analysis. CO5: Design lag, lead and lead-lag compensators and PID controllers.

CO6: Investigate the stability of a given control system by using RH, Root locus, Bode plot and Nyquist plot.

SKILLS:

- ✓ *Model any physical system (Electrical, Mechanical, Electro-mechanical).*
- ✓ *Determine overall transfer function of a system using block diagram reduction technique and SFG method.*
- ✓ *Analyze first and second order systems in time domain.*
- ✓ *Determine design specifications like rise time, settling time, steady state error.*
- ✓ *Analysis of stability using R-H Criterion.*
- ✓ *Determine open loop gain variation in a stable system using root locus method.*
- ✓ *Stability analysis of any system in the frequency domain.*
- ✓ *Design of lag, lead compensators using R, L and C for any linear time invariant system.*

ACTIVITIES:

- *Realize the Lag, Lead Compensators using R,L and C for any specifications.*
- *Analyze time response of second order system using MATLAB.*
- *Analyze LTI system for stability using MATLAB.*
- *Design PID controller.*

UNIT - 1 **L-11**

INTRODUCTION TO CONTROL SYSTEMS: Introduction, Concept of control systems, Open loop versus closed loop control systems, Different examples of control systems, Classification of control systems, Mathematical Models of Physical Systems, Differential equations, Transfer function and block diagram representation of systems considering electrical systems as examples, Block diagram algebra, Signal flow graph representation, Reduction using Mason's gain formula, Translational and rotational mechanical systems.

UNIT - 2 **L-6**

FEED-BACK CHARACTERISTICS AND CONTROL COMPONENTS: Feedback, Effects of feedback, Control over system dynamics by the use of feedback, Elements of control systems, Transfer function derivation of DC Servo motor, AC servo motor, Synchro transmitter and receiver.

UNIT - 3 **L-9**

TIME RESPONSE ANALYSIS AND STABILITY: Time response analysis, Standard test signals, Time response of first order systems, Characteristic equation of feedback control systems, Transient response of second order systems, Time domain specifications, Steady state response, Steady state errors and error constants, Stability - The concept of stability, Routh stability criterion.

UNIT - 4 **L-10**

RL TECHNIQUE AND FREQUENCY RESPONSE ANALYSIS: Root locus technique - The root locus concept, Construction of root loci; Frequency response analysis - Introduction, Frequency domain specifications, Bode diagrams, Determination of frequency domain specifications from the Bode diagram, Phase margin and gain margin, Stability analysis from Bode plots, Polar plots, Nyquist plots and Nyquist stability criterion.

UNIT - 5 **L-9**

DESIGN AND MODERN CONTROL SYSTEMS: The design problem, Preliminary design considerations, Realization of basic compensators - Lead, Lag and Lead-lag; PID controllers, State space analysis of continuous systems - Concepts of state, State variables and state model, Derivation of state models from block diagrams, Solving the time invariant state equations, State transition matrix, Controllability and observability.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", 2nd edition, New Age International (P) Limited, 2009.
2. Katsuhiko Ogata, "Modern Control Engineering" 5th edition, Prentice Hall of India Private Ltd, New Delhi, 2011.

REFERENCE BOOKS:

1. M. Gopal, "Control Systems: Principles and Design", 3rd edition, McGraw Hill, 2008.
2. Benjamin C Kuo and Farid Golnaraghi, "Automatic Control systems", 9th edition, Prentice Hall of India PrivateLtd, New Delhi, 2009.
3. Richerd C. Dorf and Robert H. Bishop, "Modern Control Systems", 12th edition, Prentice, Hall, 2010.
4. S.Salivahanan, R.Rengaraj and G.R. Venkata Krishnan, "Control Systems Engineering", 1st edition, Pearson, 2015.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Have the ability to introspect on individual strengths and weaknesses, and emerge as a balanced personality with improved self-awareness and self-worth.

CO2: Be able to prepare a resume and gain the confidence to face an interview.

CO3: Develop interpersonal skills to participate himself/herself effectively in everyday professional and social contexts.

CO4: Be able to implement professionalism into his/her daily activities.

CO5: Adapt gender sensitive language and workplace etiquette in his/her professional life.

SKILLS:

- ✓ *Communicate and understand the difference between soft skills and hard skills.*
- ✓ *Professionalism and employability skills.*
- ✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*
- ✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*
- ✓ *Prepare resumé and learn how to face interview.*
- ✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan and NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa and Co, 2004.

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III Year - B.Tech
SYLLABUS

I SEM & II SEM

III Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

EC317 LINEAR IC'S AND APPLICATIONS

Course Description & Objectives:

This subject introduces the theoretical & circuit aspects of Opamp, timer and OTAs, which are the backbone for the basics of linear integrated circuits and to understand the various linear and non-linear applications of opamp.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the characteristics and specifications of operational amplifiers.

CO2: Analyze the applications of the operational amplifiers.

CO3: Design various filters and regulators.

CO4: Understand the operation and applications of phase locked loop and voltage controlled oscillators.

UNIT I - Fundamentals of Linear ICs :

Differential DC amplifier, common mode analysis, differential mode analysis, CMRR, Constant current source in place of RE, design of a differential DC amplifier using bipolar transistors. 741 operational amplifier, ideal and practical characteristics, Inverting and Non-inverting configurations, summing amplifier, difference amplifier.

UNIT II - Application of operational amplifiers :

Opamp as instrumentation amplifier, integrator and lossy integrator, as differentiator and practical differentiator, logarithmic amplifier, astable multivibrator, monostable multivibrator, comparators and Schmitt trigger, RC phase shift and wien bridge oscillators.

UNIT III - Active filters and Regulators :

Application of op-amp as active filter, Butterworth first and second order filters, low pass, high pass, band pass and band reject filters, design of practical filters. 3-terminal regulators, LM723 regulator.

UNIT IV - TIMER & PLL :

Functional diagram of 555 timer, timer as astable and monostable multivibrators, Timer as FSK generator, Voltage Controlled Oscillator (VCO), Phase Lock Loop (PLL), Capture range, Lock range, PLL 565 and applications.

UNIT V - Data converter & Operational Transconductance Amplifier (OTA):

Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R ladder DAC, Parallel comparator ADC, Successive approximation ADC and Dual slope ADC, characteristics of A/D and D/A converters. Basic configuration of an OTA, OTA applications: OTA as Oscillators.

TEXT BOOKS :

1. D. Roy Choudhury, "Linear Integrated Circuits", 4th ed., New Age International(p)Ltd, , 2003.
2. Ramakant A. Gayakwad, "Op-amps and Linear Integrated Circuits", 3rd ed., PHI, 2001

REFERENCE BOOKS :

1. Tahira Parveen, "Operational Transconductance Amplifier and Analog Integrated Circuits " , I K International Publishing House Pvt. Ltd .,2010
2. G.B.Clayton, Operational Amplifiers, Butterworth, 1971.
3. Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits", McGraw Hill,1988.
4. Millman, "Micro Electronics", McGraw Hill, 1988.

III Year B.Tech. ECE I - Semester	L	T	P	To	C
	4	-	-	4	4

EC319 MICROPROCESSOR AND MICROCONTROLLERS

Course Description & Objectives:

This course introduces basic architecture and operation of microprocessor and microcontroller to the student. The course objective is to study the architecture and addressing modes of 8086/8051 and to know the importance of different peripheral devices and their interfacing to 8086.

Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Explain the architectures of 8086 microprocessors and 8051 micro controllers.

CO2: Outline hardware features and interfacing of memory with 8086.

CO3: Apply the concept of various communication interfaces to 8086.

CO4: Analyse the inbuilt components of 8051.

UNIT I - Introduction to 8086 microprocessor :

Evolution of microprocessors, 8086 microprocessor, architecture, register model, memory segmentation, physical address generation, addressing modes, instruction set, Interrupts of 8086, Interrupt vector table.

UNIT II - Hardware features of 8086 :

Pin diagram of 8086, multiplexed ADD/DATA and ADD/STATUS buses, control bus, minimum and maximum modes, Memory READ/WRITE and I/O READ/WRITE machine cycles, machine cycle with WAIT states. Physical Memory organization & memory interfacing to 8086.

UNIT III - I/O Interfacing Comparing I/O mapped I/O and memory mapped I/O. 8255 PPI :

Architecture, Modes of operation and Interfacing to 8086. A/D and D/A converter interfacing. 8259 PIC: Architecture, Initialization and operation of 8259, Interfacing of 8259 to 8086. Introduction to Serial Data Communication: Types of serial data transfers & serial data transmission modes. 8251 USART: Architecture, Interfacing of 8251 to 8086.

UNIT IV - Introduction to 8051 Microcontroller :

Comparing microprocessors and microcontrollers, 8051 Micro controller Architecture, Signal Description of 8051, memory organization, Addressing modes of 8051, Instruction set, Assembly language program examples in 8051.

UNIT V - 8051 Microcontroller Hardware :

Parallel Ports in 8051, External Memory interfacing with 8051, 8051 Timers, 8051 Serial ports, 8051 Interrupts. Introduction to ARM7TD

TEXT BOOKS :

1. Douglas V.Hall, "Microprocessors & Interfacing", 2nd ed., TMH, 2003.
2. Kenneth J. Ayala, "8051 Microcontrollers", Cengage Learning, 2008.

REFERENCE BOOKS :

1. A K Ray and K M Bhurchandi, "Advanced Microprocessors & Peripherals", 2nd ed., TMH, 2006.
2. Raj Kamal, "Microcontroller architecture, programming, Interfacing and System Design", Pearson Education, 2005
3. The 8051 Microcontroller and Embedded Systems using Assembly and C – Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, Pearson Education, 2008.
4. Barry B.Brey: Intel Microprocessor Architecture, Programming and Interfacing- 8086/8088, 80186, 80286, 80386 and 80486,PHI,1995.

III Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

EC321 DIGITAL COMMUNICATIONS

Course Description & Objectives:

This course gives students deep knowledge in digital communication systems at the theoretical & practical level. This subject introduces the fundamental concepts of digital communication system, theoretical aspects of digital modulation techniques, source coding and Error-control coding.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Relate the model of digital communication system and its performance.

CO2: Show the performance of digital modulation techniques.

CO3: Explain the concepts of information theory and source coding.

CO4: Apply error control coding techniques for efficient communication.

UNIT I - Introduction to Digital Communications, Sampling & Pulse Analog Modulation :

Introduction to Digital Communications- Elements of digital communication systems, advantages of digital communication systems. Sampling - Process, Types, Sampling Theorem for low frequency and band pass signals. Pulse Analog Modulation-Introduction to Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM), Time Division Multiplexing.

UNIT II - Pulse Digital Modulations :

Pulse Code Modulation - Elements of PCM, Sampling, Quantization Process, Uniform and Non-uniform Quantization (companding), Quantization error, SNR, encoding, Different formats of encoding, T1-system, Differential PCM systems (DPCM). Delta Modulation, draw backs of DM, Adaptive Delta Modulation, comparison of PCM and DM systems.

UNIT III - Digital Modulation Techniques & Optimal Reception of Digital Signal

Digital Modulation Techniques - Introduction, ASK, FSK, PSK, DPSK, QPSK, M-ary ASK, M-ary FSK, M-ary PSK. Optimal Reception of Digital Signal - Base band signal receiver, optimum filter, matched filter.

UNIT IV - Information Theory & Source Coding :

Information Theory - Discrete messages, concept of amount of information and its properties. Average information Entropy and its properties. Information rate, Basics of Channel, Concept of Mutual information and its properties. Source Coding - Introduction, Advantages, Shannon's theorem, Shannon-Fano coding, Huffman coding, efficiency calculations, channel capacity, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT V - Error Control Coding :

Linear Block codes- Introduction, Error detection and error correction capabilities of linear block codes, single error correcting hamming codes. Binary cyclic codes- encoding, syndrome calculation, Error detection and Error correction capabilities of cyclic codes, BCH codes. Convolution Codes- Introduction, encoding of convolution codes, Code tree, trellis diagram, decoding using Viterbi algorithm.

TEXT BOOKS :

1. Simon Haykin, Digital communications, JohnWiley, 2005
2. H. Taub and D. Schilling, Principles of Communication Systems, TMH, 2003

REFERENCE BOOKS :

1. John Proakis, "Digital Communications", TMH, 1983.
2. R.P.Singh & Sapre, "Communication Systems Analog & Digital", TMH, 2004.
3. Sam Shanmugam, Digital and Analog Communication Systems JohnWiley, 2005.
4. B.P.Lathi, "Modern Analog and Digital Communication", 3rd ed., Oxford reprint, B.S.Publications.

III Year B.Tech. ECE I - Semester	L	T	P	To	C
	4	-	-	4	4

EC323 TRANSMISSION LINES AND WAVE GUIDES

Course Description & Objectives

Review of network filters, attenuator, static electric and magnetic fields and applications, Maxwell's equations, transmission lines, propagation and reflection of plane waves, Introduction to guided waves. To become familiar with propagation of signals through lines & Understand signal propagation at Radio frequencies and analyze the Rectangular and circular waveguide

Course outcomes

Upon successful completion of this course, students should be able to:

CO1: Analyze and design the Network filters.

CO2: Understand and analyze the attenuators.

CO3: Understand and analyze the transmission lines.

CO4: Analyze the waveguides.

UNIT I - Network filters and attenuators :

Network function, driving point and transfer impedances and their properties, Poles and zeros of network function. Filter networks, Classification of filters-constant K filters, m-derived filters, band pass filter and band stop filter. Attenuators - T-type attenuator, Pi-type attenuator, lattice attenuator, Bridged T-attenuator, L-type attenuator.

UNIT II - Transmission lines – I :

Introduction, Lumped & Distributed Circuit elements, Transit Time Effect, Transmission line equations, Types of Transmission Lines, Complex Propagation Constant & Characteristic Impedance of Transmission Line, Travelling Waves, Formation of Standing Waves on a Line, Voltage Reflection Co-efficient and its Relation to Load Impedance, Impedance at any Point on the Line, Loss - less and Low - loss Transmission Lines, Voltage Standing

Wave Ratio, Return Loss & Reflection Co-efficient.

UNIT III - Transmission lines – II :

Power Transfer on Transmission Line, Complex Impedance (Z) & Reflection co-efficient planes, Constant Resistance Circles, Constant Reactance Circles, Smith Chart, Constant VSWR Circles, VSWR on the line, Analysis of Transmission Line in terms of Admittances, Admittance Smith chart, Applications of Transmission Lines — Measurement of Unknown Impedance, Transmission Line as a Circuit Element, Transmission Lines as Resonant Circuits, Impedance Matching, Single-Stub Matching Technique, Double-Stub Matching Technique.

UNIT IV - Wave guides -I :

Introduction to Rectangular Waveguides, Solutions of field Equations in Rectangular Co-ordinates, TE_{mn} & TM_{mn} Modes in Rectangular Waveguides, impossibility of TEM waves in Rectangular wave guides, Waveguide Parameters — Cut-off wavelength, Guide wavelength, Free space Wavelength, Phase velocity, Group velocity, Dominant and Degenerated Modes, Power Transmission and Power losses in Rectangular Waveguides.

UNIT V - Wave guides –II :

Introduction to Circular waveguides, solutions of a field equations in cylindrical coordinates, TE_{mn} & TM_{mn} Modes in Circular Waveguides, Waveguide Parameters — Cut-off wavelength, Guide wavelength, Free space Wavelength, Phase velocity, Group velocity, Dominant and Degenerated Modes, Power Transmission and Power losses in Circular Waveguides.

TEXT BOOKS :

1. Sudhakar & Shyammohan "Circuits and Networks Analysis and synthesis" 4th Edition, McGraw-Hill.
2. Samuel Y. Liao "Microwave Devices and Circuits" 3rd Edition, Pearson Education, Inc.

REFERENCE BOOKS :

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1. Umesh Sinha, "Transmission lines and Networks", Sathya Prakasham Publishers, 1997.
2. M. Kulkarni "Microwave and Radar Engineering" 3rd Edition, Umesh Publications.
3. Frankline F.Kuo, "Network Analysis and Synthesis", Wiley Eastern ed., 1996.
4. M.E. Van Valkenburg, "Network Analysis", 3rd edition, PHI, 2008.
5. John. D. Ryder, "Network lines and fields", 2nd edition, PHI Learning, 2005.
6. R.E. Collin, Foundations for Microwave Engineering, 2nd edition, McGraw-Hill, 1993.

III Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

CS315 OPERATING SYSTEMS (Elective-I)

Course Description & Objective:

In this course students should understand how the operating system effectively manages system resources.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: *Understand the fundamental concepts of operating system such as processes and scheduling.*

CO2: *Analyse various synchronisation problems in operating systems.*

CO3: *Understand the deadlock occurrence and avoidance methods in operating system.*

CO4: *Apply the concepts of paging, segmentation and various file management schemes in OS.*

UNIT I - Introduction :

What Operating System do, Operating System structure. Process Concept: Overview, Process scheduling, Operations on process, Inter process communication. Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Case Study: Process scheduling in Linux.

UNIT II - Process Synchronization :

The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors, Classical problems of synchronization, Case Study : Process Synchronization in Linux.

UNIT III - Deadlocks :

Deadlock Characterization, Methods of Handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock Detection and Recovery.

UNIT IV - Memory Management :

Continuous memory allocation, paging, structure of the page table, segmentation, demand paging, page replacement algorithms.

UNIT V - File System :

File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File-System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management.

Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, RAID Structure.

TEXT BOOK :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Principles", 7th edition, John Wiley & Sons Inc, 2006.

REFERENCE BOOKS :

1. William Stallings, "Operating Systems – Operating System: Internals and Design Principles", 6th edition, , Prentice Hall, 2005.
2. Andrew S Tanenbaum ,"Modern Operating Systems", 3rd edition, , Prentice Hall, 2007.

III Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

CS223 OBJECT ORIENTED PROGRAMMING THROUGH JAVA (Elective-I)

Course description and Objectives:

On Completion of this course, the student will be able to understand fundamentals of object- oriented programming in Java, including defining classes, invoking methods, using class libraries. Have the ability to write a computer program to solve specified problems. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply object oriented concepts on real time scenarios.

CO2: Understand Exception handling and multithreading mechanisms to create efficient software applications.

CO3: Utilize modern tools and AWT framework to create java applications to solve real world problems.

CO4: Design and develop GUI based applications using applets and swings for internet and system based applications.

UNIT I - Introduction, Classes and Objects :

Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects Class fundamentals – Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage

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collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT II - Inheritance, Packages and Interfaces :

Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces.

UNIT III - Exception Handling, Multithreading :

Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating own exception Sub classes, Concepts of Multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, deadlocks, Thread groups.

UNIT IV - Applets & Event Handling & AWT Controls :

Applets: Applet Class, Applet Architecture, Applet Skeleton - Applet Initialization and Termination, Overriding update(), Simple Applet, Display Methods, Requesting Repainting – A simple banner Applet, Using The Status Window, The HTML APPLET Tag, Passing parameters to Applets, Applet Context and show Document. Event Handling & AWT Controls: Event sources, Event classes – ActionEvent, AdjustmentEvent, ComponentEvent, Container Event, Focus Event, InputEvent, ItemEvent, KeyEvent and MouseEvent, Delegation event model, Event Listeners, Handling mouse and Keyboard events, Adapter classes.

UNIT V - AWT & Swing :

AWT: Concepts of components, Container, Panel, Window, Frame, Canvas, Font class, Color class and Graphics. AWT Controls : Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers - Flow, Border, Grid, Card and Grid bag. Swing: JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, Text fields, Buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS :

1. Herbert Schildt, “The Complete Reference Java J2SE”, 7th ed., TMH Publishing Company Ltd, New Delhi, 2008.
2. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd ed., TMH, 2009.

REFERENCE BOOKS :

1. Cay Horstmann, “Big Java”, 2nd ed., John Wiley and Sons, 2006.

III Year B.Tech. ECE I - Semester	L	T	P	To	C
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EC325 DIGITAL IC APPLICATIONS (Elective-I)

Course Description & Objectives:

Familiarization of Digital Logic families and Design of combinational and sequential circuits using digital ICs.To investigate the static and dynamic characteristics of popular MOS and bipolar logic families, with emphasis on CMOS and TTL technologies.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Analyze the behaviour of CMOS Logic Families.

CO2: Model high level designs with standard ICs.

CO3: Represent the combinational and sequential circuits using digital ICs.

CO4: Understand the different memories, internal structure and timings.

UNIT I-CMOS LOGIC :

Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families.

UNIT II-BIPOLAR LOGIC AND INTERFACING :

Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families, Familiarity with standard 74XX and CMOS 40XX series ICs – Specifications..

UNIT III-COMBINATIONAL LOGIC DESIGN :

Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, EX-OR gates and parity circuits,Comparators, adders &subtractors, ALUs, Combinational multipliers.

UNIT IV-SEQUENTIAL LOGIC DESIGN :

Latches and flip -flops, PLDs, counters, shift register, and synchronous design methodology, impediments to synchronous design.

UNIT V-MEMORIES :

ROMs:Internal structure, 2D -decoding commercial types, timing and applications. Static RAM: Internal structure, SRAM timing, standard SRAMS, synchronous SRAMS. Dynamic RAM: Internal structure, timing, synchronous DRAMs. Familiarity with Component Data Sheets – Cypress CY6116, CY7C1006, Specifications.

TEXT BOOKS :

1. Digital Design Principles & Practices John F. Wakerly, PHI/Pearson Education Asia, 3rd Ed., 2005.
2. Digital Fundamentals-Floyd and Jain,Pearson Education,8th Edition,2008.

REFERENCE BOOKS :

1. Modern Digital Electronics-RP Jain – 4/e- TMH,2010.
2. Introduction to Logic Design – Alan B. Marcovitz,TMH, 2nd Edition,2005.
3. Digital Logic and Computer Design By Mano, Pearson Education.
4. Cypress Semiconductors Data Book(Download from website).
5. Digital Integrated Circuits- A Design Perspective By Jan M.Rabaey,AnanthaChandrakasan,BorivojeNikolic,Pearson Education,2005.

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Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Carry out literature survey in the latest areas of chosen domain.

CO2: Prepare the report with the required contents, in the stipulated format.

CO3: Present the detailed study performed on the chosen topic and answer the queries raised.

III Year B.Tech. ECE I - Semester

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EC327 IC APPLICATIONS LAB

Course Description and Objectives:

The main aim of this lab is to teach the linear and non-linear applications of operational amplifiers (741). Students are made familiar with theory and applications of 555 timers. Students are made to Design combinational logic circuits using digital ICs.

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Analyze and design common electronic circuits using linear ICs.

CO2: Experiment on various types of filters and regulators using operational amplifiers.

PART – A : Linear IC Applications :

1. IC 741 OP AMP Applications – Inverting amplifier, non inverting amplifier and voltage follower.
2. IC 741 OP AMP as adder and subtractor.
3. Opamp as Integrator.
4. Opamp as Differentiator.
5. Active Filters – LPF, HPF (first order).
6. Function Generator using 741 OP AMP.
7. IC 741 opamp as D/A Converter.
8. IC 555 Timer as Astable Multivibrator.
9. IC 555 Timer as Monostable Multivibrator.

PART – B: Digital IC Applications

10. Study of Basic Digital IC's. (Verification of truth table for 7408, 7432, 7486, 7404,7402, 7400).
11. Implementation of Boolean Functions, Adder/ Subtractor circuits using gates.
12. Code converters: Gray to Binary and Binary to Gray.
13. Design and Implementation of JK FF, RS FF, D Flip-flops using gates.
14. Design and Implementation of 4:1 multiplexer .

TEXT BOOKS :

1. Ramakant A. Gayakwad, "Op-amps and Linear Integrated Circuits", 3^{rd} ed., PHI, 2001
2. Digital Design Principles & Practices, John F. Wakerly, PHI/Pearson Education Asia, 3^{rd} Ed., 2005.

III Year B.Tech. ECE I - Semester

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EC329 MICROPROCESSORS & INTERFACING LAB

Course Description &objectives:

This course introduces the assembly language programming of 8086 and also gives a practical training of interfacing the peripheral devices with the microprocessor. The course objective is to introduce the basic concepts of microprocessor and to develop in students the assembly language programming skills and real time applications of Microprocessors.

Course outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Develop applications based on different processors and controllers.

CO2. Experiment to interface various peripherals to 8051.

I. Microprocessor 8086 :

1. Introduction to Debug/MASM/TASM.
2. Arithmetic operations: Multi-byte Addition, Subtraction, Multiplication, Division.
3. Logical operations: Converting packed BCD to ASCII and ASCII to packed BCD.
4. Finding Arithmetic mean of given numbers.
5. Finding Sum of Squares, Cubes of given numbers.
6. Searching for Minimum, Maximum of given numbers.
7. Sorting given string in Ascending, Descending order.
8. Reading, Displaying of characters.
9. String operations: Moving, Reversing, Comparing, Scanning strings.

II. Interfacing :

1. Programmable Peripheral Interface-8255.
2. Interfacing DAC: to generate Square, Triangular, Ramp, and Staircase waves.
3. Interfacing ADC: to convert analog signal to digital.
4. 8279-Keyboard/ Display interface.
5. Interfacing 8259-Programmable Interrupt Controller.
6. Interfacing a Stepper motor.
7. Interfacing Elevator simulator.
8. Traffic control simulator interface.
9. Serial data transfer using USART-8251 interface

TEXT BOOK :

1. A K Ray and K M Bhurchandi, “Advanced Microprocessors & Peripherals”, 2nd ed., TMH, 2006.

III Year B.Tech. ECE I - Semester

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EC331 DIGITAL COMMUNICATIONS LAB

Course Description & Objectives:

This course gives students deep knowledge in digital communication systems at the practical level. This lab focuses the fundamental concepts on TDM, Pulse modulations, digital modulation techniques, source coding techniques and Error-control coding techniques.

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Analyze and design different digital modulation and demodulation systems.

CO2: Experiment on different types of digital communication systems using simulations and hardware for a given application / problem statement.

LIST OF EXPERIMENTS

I. Hard Ware

1. Time Division Multiplexing
2. PAM
3. PPM and PWM
4. Pulse Code Modulation
5. Delta Modulation
6. Amplitude Shift Keying
7. Frequency Shift Keying
8. Phase Shift Keying
9. Differential Phase Shift Keying
10. Quadrature Phase Shift Keying

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II. Soft Ware

(i) MATLAB

1. Implementing Convolutional Encoder/Decoder using MATLAB.
2. Implementing Viterbi Algorithm using MATLAB.

(ii) SIMULINK

1. PAM
2. QAM
3. FSK
4. PSK
5. DPSK
6. QPSK

Any twelve experiments

TEXT BOOK :

1. Simon Haykin, Digital communications, JohnWiley, 2005.

III Year B.Tech. ECE II - Semester

L	T	P	To	C
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EE219 LINEAR CONTROL SYSTEMS

Course Description &Objectives:

This course is to explore the modeling of linear dynamic systems via differential equations and transfer functions utilizing input-output representations; analysis of control systems in the time and frequency domains and using transfer function and state-space methods.

Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Apply mathematical modeling to the physical systems/electrical systems.

CO2: Analyse the response of the open and closed loop systems in time domain.

CO3: Investigate the stability of a given control system by using RH criteria, Root locus, Bode plot and Nyquist plot.

CO4: Understand the lag, lead and lead-lag compensators and PID controllers.

UNIT I - Introduction & Mathematical Models of Physical Systems :

Introduction: Concepts of Control Systems - Open Loop and closed loop control systems and their differences - Different examples of control systems - Clasification of control systems. Mathematical Models of Physical Systems: Differentical equations - transfer functions and block diagram representation of systems considering electrical systems as examples Block diagram algebra -Representation by Signal flow graph - reduction using Mason's gain formula - translational and rotational mechanical systems

UNIT II - Feed-Back Characteristics & Elements of Control Systems :

Feed-Back Characteristics : What is Feedback? Effects of feedback - reduction of parameter variations by use of feedback-Control over system dynamics - by the use of feedback.

Elements of Control Systems : DC Servo motor - AC Servo motor - Synchro transmitter and Receiver.

UNIT III - Time Response Analysis & Concepts of stability :

Time Response Analysis : Standard test signals - Time response of first order systems - Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications - Steady state response - Steady state errors and error constant

Concepts of stability : The concept of stability, Routh stability criterion

UNIT IV - Root Locus Technique & Frequency Response Analysis :

Root Locus Technique: The root locus concept - construction of root loci Frequency Response Analysis: Introduction, Frequency domain specifications - Bode diagrams - Determination of Frequency domain specifications from the Bode Diagram - Phase margin and Gain margin - Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots and Nyquist stability criterion

UNIT V - Design and Compensation Technique & State Space Analysis of Continuous Systems :

Design and Compensation Technique : Introduction and Preliminary design considerations - Lead, Lag, Lead-lag. PID controller. State Space Analysis of Continuous Systems : Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization - Solving the Time Invariant state Equations - State Transition Matrix.

TEXT BOOKS :

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", 2nd ed.,New Age International (P) Limited, 2010.
2. Katsuhiko Ogata, "Modern Control Engineering", 3rd ed.,Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS :

1. B. C. Kuo, "Automatic Control Systems", 8th ed., John wiley and son's, 2003.
2. John wiley, "Control Systems Engg"., 3rd ed.,NISE, 2000.

III Year B.Tech. ECE II - Semester

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EC320 VLSI DESIGN

CourseDescription & Objectives:

To introduce students to basic concepts of digital VLSI chip design using the simpler VLSI technology and CMOS devices and manufacturing technology. To Introduce CMOS logic gates and their layout design Combinational (e.g., arithmetic) and sequential circuit.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Explain different models of HDL.

CO2: Outline the fabrication process of different MOS technologies.

CO3: Analyse the operation and Electrical behaviour of MOS transistors.

CO4: Design VLSI circuits and Layouts of MOS circuits using Lambda based design rules and sub-systems using various logic methods.

UNIT I - Hardware Description Language :

The VHDL Hardware Description Language: Design flow, program structure, types and constants,Functions and procedures, libraries and packages.

The VHDL Design Elements: Structural design elements, data flow design elements, behavioral design elements,

UNIT II - Mos Technology :

Introduction : State of art of different technology, Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS technologies-Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation processes, N-MOS, C-MOS fabrication.

UNIT III - Basic Electrical Properties :

MOS Transistor, operation, I_{ds}-V_{ds} relationships, MOS transistor parameters: threshold Voltage, gm, gds, figure of merit (w_o); Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter , Zpu/Zpd with and without pass transistor, Bi-CMOS Inverters.

UNIT IV - VLSI Circuit Design Processes :

VLSI Design Flow, MOS Layers, Stick Diagrams, Layouts and Design Rules for NMOS, CMOS and BICMOS circuits, CMOS inverters and gates. The delay unit, Inverter delays, Driving capacitive loads, Propagation delays, wiring capacitances, Introduction to scaling.

UNIT V - Subsystem Design :

Adders-Carry ripple adder, carry propagate adder, Multipliers-Array Multiplier, Booth encoding,Latches,Flip Flops; Simulation, Synthesis, Design Capture Tools, Design For Testability, Alternate gate circuits-Pseudo-nMOS, Dynamic CMOS, CMOS Domino Logic and Cascaded Voltage Switch Logic (CVSL),Standard cell, Seaofgates, FPGA.

TEXT BOOKS :

1. Kamran Eshraghian, EshraghianDougles and A. Pucknell, Essentials of VLSI circuits and systems, PHI, 2005 ed.,
2. Weste and Eshraghian, Principles of CMOS VLSI Design , Pearson Education, 1999.

REFERENCE BOOKS :

1. John f walkerly, digital design principles and practices, 3rd ed., phi/pearson education, 2005.
2. J.Bhasker, vhdl primer, 3rd ed., pearsonedn / phi.
3. S.M. SZE, “VLSI Technology” , 2nd ed., TMH, 2003
4. Wayne Wolf, “Modern VLSI Design”, 3rd ed., Pearson Education, 1997

III Year B.Tech. ECE II - Semester

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EC322 ANTENNAS AND WAVE PROPAGATION

Course Description & Objectives:

Students will be introduced to antennas, their principle of operation, analysis and their applications. The course provides introduce the student to wave propagation over ground, through troposphere and ionosphere, propagation effects in radio frequencies.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply the concepts and properties of Electro-Magnetism to obtain parameters of antennas.

CO2: Analyze the different array techniques to improve directivity.

CO3: Determine the antenna characteristics for various applications.

CO4: Examine the characteristics of radiowaves and their propagation in the atmosphere.

UNIT I - Antenna Fundamentals-I :

Radiation Mechanism-Single wire, 2 wire and dipoles. Current Distribution on a thin wire antenna, Antenna Parameters-Radiation Patterns, Patterns in principal planes, Radiation pattern lobes, Beam Area, ,Beam Efficiency, Beam widths, Radiation Intensity, Radiation density, Directivity, Gain and Resolution, Radiation efficiency, Reciprocity, Input impedance.

UNIT II - Antenna Fundamentals-II :

Isotropic Antenna, Directional Antenna, Omni directional patterns, Radiation Resistance of dipole antenna, Antenna Apertures, Aperture Efficiency, Relation between maximum effective aperture and directivity, Effective height ,Field regions, Antenna polarization, PLF, FRIIS transmission equation.

UNIT III - Antenna Arrays :

Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, Principle of multiplication of patterns, Effect of earth on vertical patterns, Binomial array, Basic principle of Dolph- Tschebyscheff array.

UNIT IV - Characteristics of Typical Antennas ;

Folded Dipole, Loop antenna, Yagi-Uda array, Helical antenna, Log-periodic antenna, Pyramidal and conical Horn antenna, Parabolic reflector antennas - Paraboloid and Parabolic cylinder, Cassegrain system of reflectors, Basic principles of slot antennas and micro strip antennas, Concept and benefits of smart antennas.

UNIT V - Radio Wave Propagation :

Ground wave Propagation, Earth constants, Space wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Atmospheric effects in space wave Propagation, Radio-Horizon, Duct Propagation, Extended-range Propagation resulting from Tropospehreic Scattering, Ionospheric Propagation, Gyro frequency, Refraction and reflection of Sky Waves by the Ionosphere, Critical Frequency, Skip Distance, Maximum Usable Frequency.

TEXT BOOKS :

1. Constantain A Balanis, “Antanna Theory: Analysis and Design”, Harper and Row Publishers, 2002.
2. K.D.Prasad, Satya Prakasan, “Antenna and Wave Propagation”, Tech India Publications, New Delhi, 2001.

REFERENCE BOOKS :

1. Constantain A Balanis “Introduction to Smart antennas” Morgan& Claypool Publishers
2. J.D.Kraus, and Ronald J Marhefka, “Antennas and Wave propagation”, TMH, 2014.
3. G.S.N.Raju, “Antennas and Wave Propagation”, Pearson Publication, Singapore.
4. F.E.Terman, “Electronic and Radio Engineering”, Mc Graw Hill, 1985.

III Year B.Tech. ECE II - Semester

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EC324 COMPUTER ARCHITECTURE & ORGANIZATION

Course Description & Objectives:

The course covers the basic principles of computer organization, operation and performance. It also deals with peripheral devices, and memory management. The course discusses the role of pipelining and multiple functional units in processor design..

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: *Understand the basic components and functions of a digital computer.*

CO2: *Apply the concepts of arithmetical, logical and control units for CPU.*

CO3: *Apply the concepts of interfacing of I/O devices and memory with CPU.*

CO4: *Understand the concepts like parallel processing, pipelining and multiprocessors.*

UNIT I - Overview & The Computer System :

Introduction**: -**Organization and architecture. Computer Evaluation**: -** Brief history of computers. A Top-Level View of Computer Function and Interconnection**: –** Computer components, Computer function, Inter connection structure, Bus Inter connection, PCI.

UNIT II - The Central Processing Unit :

Computer Arithmetic**: -** Arithmetic and logic unit, Integer representation, Integer arithmetic, floating point representation & arithmetic. Instruction sets**: -** Machine instruction characteristics, types of operands, types of operations, addressing modes and instruction formats. CPU Structure and Function**: -** Processor organization, register organization, Stack organization and instruction cycle. Control Unit operation**: -** Micro operations, control of the

Processor, Hardwired implementation. Micro programmed control**: -** Basic concepts

UNIT III - Memory :

Internal memory**: -** computer system memory overview, semiconductor main memory, cache memory. External memory**: -** Magnetic disk, RAID, magnetic tapes.

UNIT IV - Input / Output :

External devices, I/O modules, programmed I/O, Interrupt driven I/O, DMA, I/O channels & Processors.

UNIT V - Pipeline, Vector Processing & Multiprocessors :

Pipeline, Vector Processing**: -** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors. Multiprocessors**:** - Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration. InterProcessor Communication and Synchronization, Cache Coherence.

TEXT BOOKS:

1. William Stallings, “Computer Organization and Architecture”, 7th ed., Pearson/ PHI, 2007.
2. M.Moris Mano, “Computer Systems Architecture”, 3rd ed., Pearson/PHI, 1993.

REFERENCE BOOKS:

1. Carl Hamacher , Zvonko Vranesic, Safwat Zaky, “Computer Organization”, 5th ed.

III Year B.Tech. ECE II - Semester

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EC326 OPTICAL COMMUNICTIONS
(Dept. Elective - II)

Course Description & Objectives:

This course illustrates basic optical laws, definitions and optical link design methods and Expound optical sources, detectors and connectors. It is to expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

Course Outcomes:

Upon successful completion of the course, students will be able to:

CO1: Understand the basic optical communication system, optic theories and materials.

CO2: Understand and apply the optical laws in fundamental propagation mode.

CO3: Analyse the efficiencies of various optical sources, connectors and detectors.

CO4: Evaluate link power budget and rise time budget.

UNIT I - Overview of optical fiber communication :

The general system, advantages of optical fiber communications. Fiber Materials, Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays. Cylindrical fibers- Modes, V_{number}, Mode coupling, Step Index fibers, Graded Index fibers.

UNIT II - Signal Degradation in Optical Fibers :

Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Types of Dispersion - Material dispersion, Wave-

guide dispersion, Polarization mode dispersion, Intermodal dispersion. Overall fiber dispersion in Multi mode and Single mode fibers, Pulse broadening.

UNIT III - Optical Fiber Connectors :

Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers. Fiber alignment and joint loss-, single mode fiber joints.

UNIT IV - Optical Sources :

LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations.

UNIT V - Optical Detectors & System Design :

Optical detectors- Physical principles of PIN and APD, Comparison of Photo detectors. Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Quantum limit, Analog receivers. Optical system design —Considerations, Component choice, Multiplexing. Point-to- point links, System considerations, Link power budget. Rise time budget.

TEXT BOOKS :

1. Gerd Keiser, “ Optical Fiber Communications”, 3rd ed., Mc Graw-Hill International , 2000.
2. John M. Senior, “Optical Fiber Communications” ,2nd ed., PHI, 2002.

REFERENCE BOOKS :

1. S.C.Gupta, “Text Book on Optical FiberCommunication and its Applications”, PHI, 2005.
2. Govind P. Agarwal, “Fiber Optic Communication Systems”, 3rd ed,, John Wiley, 2004.
3. Joseph C. Palais, “Fiber Optic Communications”, 4th ed., Pearson Education, 2004.

III Year B.Tech. ECE II - Semester

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EC328 EMBEDDED SYSTEMS (Dept.Elective-II)

Course Description &objectives:

About 99 percent of all computers today are embedded – they are found in cell phones, game consoles, digital cameras, cars, airplanes, medical equipment, home appliances, robots, etcetera. The market for embedded systems is enormous, and the industry's demand for high-skilled experts in these areas is constantly increasing. The course objective is to develop an understanding of the technologies behind the embedded computing systems such as technology capabilities and limitations of the hardware, software components and design methodologies

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the fundamentals of embedded computing system.

CO2: Understand and analyze the fundamental architectural features of 8051 and its on-chip peripherals.

CO3: Apply the concepts of various components in real time operating system.

CO4: Understand the advance processors and protocols to design a given system.

UNIT I - Embedded Computing :

Introduction, Complex Systems and Microprocessor, The Embedded System Design Process, Formalisms for System Design, Design Examples.

UNIT II - The 8051 Architecture :

Introduction, 8051 Micro controller Hardware, Input/Output Ports and Circuits,External Memory, Counter and Timers, Serial data Input/Output, Interrupts. The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

UNIT III - Applications :

Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication.

UNIT IV - Introduction to Real – Time Operating Systems :

Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.

UNIT V - Introduction to advanced architectures :

ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus; Internet- Enabled Systems, Design Example-Elevator Controller.

TEXT BOOKS:

1. Wayne Wolf, "Computers as Components", Elsevier, 2008.
2. Kenneth J.Ayala, "The 8051 Microcontroller", 3rd ed., Thomson, 2005.

REFERENCE BOOKS :

1. David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.
2. Labrosse, "Embedding system building blocks", CMP publishers, 2000.
3. Raj Kamal, "Embedded Systems", TMH, 2008.
4. Ajay V Deshmukhi, "Micro Controllers", TMH, 2005.
5. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley, 1999.
6. Raj kamal, "Microcontrollers", Pearson Education, 2005.

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EC330 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY
(Dept.Elective-II)

Course Description &objectives:

The course provides basic information on the different electromagnetic Interference problems occurring in Intersystem and their possible mitigation techniques in Electronic design. The course objective is to understand EMI sources, EMI problems and their solutions at PCB level, and also to understand sub system level design and to measure the emission, immunity level from different systems to couple with the prescribed EMC standards.

Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Diagnose and solve basic electromagnetic compatibility problems.

CO2: Design electronic systems that function without errors or problems related to electromagnetic compatibility.

CO3: Design the Cable routing & connection and understand the Interconnection Techniques

CO4: Design high speed Printed Circuit board with minimum interference and EMI free system.

UNIT I- EMI/EMC Concepts

Definition of EMI and EMC with examples, Classification of EMI/EMC - CE, RE, CS, RS, Units of Parameters, Sources of EMI, EMI coupling modes - CM and DM, ESD Phenomena and effects, Transient phenomena and suppression.

UNIT II- EMI Measurements

Basic principles of RE, CE, RS and CS measurements, EMI measuring instruments- Antennas, LISN, Feed through capacitor, current probe, EMC analyzer and detection t6echnique open area site, shielded anechoic chamber, TEM cell.

UNIT III - EMC Standards and Regulations

National and Intentional standardizing organizations- FCC, CISPR, ANSI, DOD, IEC, CENEEC, FCC CE and RE standards, CISPR, CE and RE Standards, IEC/EN, CS standards, Frequency assignment - spectrum conversation.

UNIT IV- EMI Control Methods and Fixes

Shielding, Grounding, Bonding, Filtering, EMI gasket, Isolation transformer, opto isolator.

UNIT V- EMC Design and Interconnection Techniques

Cable routing and connection, Component selection and mounting, PCB design- Trace routing, Impedance control, decoupling, Zoning and grounding.

TEXT BOOKS :

1. Prasad Kodali.V, “Engineering Electromagnetic Compatibility” S.Chand&Co, New Delhi, 2000
2. Clayton R.Paul, “Introduction to Electromagnetic compatibility”, Wiley & Sons, 1992

REFERENCES BOOKS :

1. Keiser, “Principles of Electromagnetic Compatibility”, 3rd ed., , Artech House
2. Electromagnetic Interference and Compatibility IMPACT series, IIT – Delhi, Modules 1 – 9.
3. Henry W.Ott.,”Noise Reduction Techniques in Electronic Systems”, A Wiley Inter Science Publications, John Wiley and Sons, Newyork, 1988.
4. Bemhard Keiser, “Principles of Electromagnetic Compatibility”, 3rd Ed, Artech house, Norwood, 1986.

III Year B.Tech. ECE II - Semester

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SR005 SEMINAR

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Carry out literature survey in the latest areas of chosen domain.

CO2: Prepare the report with the required contents, in the stipulated format.

CO3: Present the detailed study performed on the chosen topic and answer the queries raised.

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CS 344 Data Structures Laboratory using C++ Laboratory

Course Description & Objectives:

The main objective of this course is to provide an introduction to basic data structures and manipulating them, by using C++ programming language. The evaluation of the data structure needs of particular problems. The design and implementation of C++ programs by using basic data structures.

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Develop several ADTs using C++.

CO2: Apply the appropriate data structure for given problem.

List of programs

1. C++ Program to Implement Stack using arrays.
2. C++ Program to Implement Queue using arrays.
3. C++ Program to Implement Circular Queue using arrays.
4. C++ Program to Implement Priority Queue using arrays.
5. C++ Program to Implement Stack using Linked List.
6. C++ Program to Implement Queue using Linked List.
7. C++ Program to Implement Bubble sort.
8. C++ Program to Implement Merge sort.
9. C++ Program to Implement Quick sort.
10. C++ Program to Implement Linear Search and binary Search.
11. C++ Program to Implement Binary search Tree ADT for.

(a) Insertion (b) Deletion (c) Find_min (d) Find_max

(e) Find operations (f) Height of tree.

TEXT BOOK :

1. Data structures, Algorithms and Applications in C++, S. Sahni , University Press (India) Pvt. Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.

III Year B.Tech. ECE II - Semester

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EC332 VLSI DESIGN LAB

Course*Description &*Objective:

*Apply the concepts of basic combinational logic circuits, sequential circuit elements, and programmable logic in the laboratory setting.To develop familiarity and confidence with designing, building and testing digital circuits, including the use of CAD tools.*Behavioral, register- transfer, logic, and physical-level structured VLSI design using CAD tools and hardware description languages

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Synthesize the digital circuits with hardware description language.

CO2: Design and simulate VLSI circuits using MOS transistors at schematic level.

List of Experiments:

E-CAD Programs:

1. HDL Code to realize all the logic gates.
2. Design of 2-to-4 decoder.
3. Design of 8-to-3 encoder (without and with priority).
4. Design of 8-to-1 multiplexer.
5. Design of 4 bit Binary to Gray code converter.
6. Design of Multiplexer/ Demultiplexer.
7. Design of comparator.
8. Design of Full Adder using 3 modeling styles.
9. Design of Full Subtractor using 3 modeling styles.
10. Design of Flip Flops: SR, D, JK,T.
11. Design of 4-bit binary, BCD Counters.

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IV Year - B.Tech
SYLLABUS

I SEM & II SEM

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

MS310 - MANAGERIAL ECONOMICS

Course Description and Objectives:

To make the student familiar with the basic concepts and principles of Business Economics. The course aims to develop student's capacity to analyze the economic environment in which business entities operate and understand how managerial decisions can vary under different constraints that each economic environment places on a manager's pursuit of it's goals, focusing on analyzing the functioning of markets and the economic behavior of firms and other economic agents.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: To understand the economic principles and nature and scope of Managerial Economics and its role of economic environment in managerial decision making.

CO2: To estimate future demand using forecasting techniques and factors affecting the demand for the product.

CO3: To interpret long-run, short-run production functions and companies financial position using Break-Even-Analysis and cost output Relationship.

CO4: To design Competitive strategies like pricing, product differentiation etc. and marketing according to the market structure.

UNIT I - Nature & Scope of Managerial Economics :

Basic tools and techniques of Business Economics, Macro Economic Environment and Managerial decisions.

UNIT II - Demand Analysis :

Types of Demand, Demand determination Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT III - Theory of Production :

Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors,Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT IV - Cost Analysis :

Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis.

UNIT V - Markets and price determination :

Features and types of different competitive situations – Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

Text Books :

1. Gupta: Managerial Economics, 1/e TMH, 2005.
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010.

Reference Books :

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006.
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
3	1	-	4	4

EC431 DIGITAL SIGNAL PROCESSING

Course Description and Objectives:

This course will introduce the students the fundamental concepts of Discrete Time Signal processing and its algorithms for real time implementation of communication systems. Students will learn the algorithms useful for real time signal processing applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the characteristics of discrete time signals and systems.

CO2: Apply the concepts of transform techniques in realizing discrete time signals.

CO3: Analyze discrete time signals using FFT algorithms.

CO4: Design and realization of analog and digital filters for a given specifications.

UNIT I - Introduction to Discrete Signals and Systems :

Introduction: Review of Signals and Systems, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations: Impulse response, step response, response to arbitrary inputs. Frequency domain representation of discrete time signals and systems: Z-Transform and properties, analysis of linear time invariant systems using Z-domain.

Unit II - Fourier Analysis of Discrete Time Signals :

Frequency Analysis of Discrete Time Signals: Discrete Fourier representation of periodic sequences(DTFT), Properties, Frequency response.Discrete

Fourier Transform: Discrete Fourier transforms, Properties of DFT, linear convolution of sequences using DFT, Computation of DFT.

UNIT III - Fast Fourier Transform :

Fast Fourier Transform: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, Radix-4 FFT, Filtering of long data sequences: Overlap save and overlap add methods.

UNIT IV - FIR Filter Design and Realization :

FIR Filter Design & Realization: FIR System function, Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique. Structures of FIR: Direct form structure, cascade form structure, Linear Phase structure, signal flow graphs and transposed structures.

UNIT V - IIR Filter Design and Realization :

IIR Filter Design & Realization: IIR System Function, Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Analog-to- Digital transformations. Structures of IIR : Direct form I and II, cascade form, parallel form, signal flow graphs and transposed Structures. Comparison of IIR & FIR filters.

TEXT BOOKS :

1. John G. Proakis, Dimitris G.Manolakis, “Digital Signal Processing, Principles, Algorithms and Applications”, Pearson Education / PHI, 2007.
2. A.V.Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, PHI, 1997.

REFERENCE BOOKS :

1. Ramesh Babu, “Digital Signal Processing”, Scitech, 2003.
2. M H Hayes, “Digital Signal Processing : Schaum’s Outlines”, TATA McGraw Hill, 2007.
3. Alan V. Oppenheim, Ronald W. Schafer, “Digital Signal Processing”, PHI, 2006.
4. Salivahanan, Vallavaraj, Gnanapriya, “Digital Signal processing”, TMH, 2000.

IV Year B.Tech. ECE I - Semester	L	T	P	To	C
	4	-	-	4	4

EC433-RF AND MICROWAVE ENGINEERING

Course Description & Objectives:

This course will provide all students with the fundamental concepts associated with RF/microwave circuits and components. The course will allow students to become expert in new and evolving areas of microwave engineering including RF.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1. Explain microwave amplifiers and oscillators basic operation, characteristics, parameters, limitations.

CO2: Apply concepts of scattering parameters to various microwave components.

CO3: Analyze microwave linear beam tubes and cross field tubes.

CO4: Determine the various microwave parameters.

UNIT I - RF Amplifier Design & Basic Oscillator, Mixer model :

Introduction to RF concepts. Characteristics of amplifiers, Types of amplifiers, Amplifier power relation & problems, Power gain definitions, derivation and relations & problems, Basic Oscillators, Mixer models

UNIT II - Microwave Components :

Introduction: Microwave Frequencies and Band Designations. Microwave Junctions: E-plane Tee Junction, H-plane Tee Junction, Magic Tee Junction, fields and currents in Microwave Tee junctions, Applications of Magic Tee, Directional couplers, Faraday Rotation In Ferrite Devices- Gyrators, Circulators, Isolators.

UNIT III - Microwave Linear Beam Tubes (O TYPE) :

Limitations of Conventional tubes at Microwave frequencies, Two Cavity Klystron Amplifiers: Velocity modulation process, bunching process, output power and beam loading. Multicavity Klystron amplifiers: Beam current density, output current and output power. Reflex Klystron Oscillator: Velocity modulation, Power output and efficiency.

UNIT IV - Microwave Cross Field Tubes (M TYPE) & Microwave Solid-State Devices :

Magnetron Oscillators- Cylindrical Magnetron, Cross field Amplifiers. Transferred Electron Devices: GUNN-EFFECT Diodes, RWH Theory, Modes of operations.

UNIT V - Microwave Measurements :

Components of Microwave Bench Set-Up, Microwave power measurement, Impedance measurements, Attenuation Measurement, VSWR measurement, Frequency measurement.

TEXT BOOKS :

1. Reinhold Ludwig Pavel Bretchko '*RF circuit design , theory applications*'Pearson and Asia Education , Edition 2000 (Chapter 9.1 - 9.4 & 10.1 - 1 0 .3).
2. Samuel Y Liao, "Microwave Devices and Circuits", 3rd ed., Pearson Education, 2003.

REFERENCE BOOKS :

1. M. Kulkarni, "Micro Wave and Radar Engineering", Umesh Publications, 1998.
2. John Wiley, R.E. Collin, "Foundations for Microwave Engineering", 2nd ed., IEEE Press, 2002.
3. M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., "Microwave Circuits and Passive Devices", New Age International Publishers Ltd., 1995.
4. Peter A. Rizzi, "Microwave Engineering Passive Circuits", PHI, 1999.
5. R. Chatterjee, Affiliated East , "Elements of Microwave Engineering", West Press Pvt. Ltd., New Delhi,1988.

IV Year B.Tech. ECE I - Semester	L	T	P	To	C
	4	-	-	4	4

EC435-ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Course Description & Objectives:

To introduce to the students the operation of various electronic Instruments which are used to measure the basic parameters, oscilloscopes, function generators, wave analyzers and various sensors and transducers

Course outcomes:

Upon successful completion of this course, students should be able to:

CO1: Find the specifications of sensors and instruments using statistical approach.

CO2: Explain AC and DC bridges.

CO3: Summarize various signal generators, spectrum analyzer, sensors and transducers.

CO4: Examine the working principles of various display devices and signal conditioning circuits.

UNIT I - Electro Mechanical instruments and their characteristics: Static characteristics, Dynamic Characteristics, Errors: Gross error, systematic error, Random error, limiting error, Probable error. Electro Mechanical Instruments: Suspension galvanometer, PMMC mechanism, DC Ammeters, DC Volt meters, Ohmmeter, multi range ohmmeter, calibration of DC instruments. AC meters: Electro dynamometer, Rectifier meter, Thermo instruments, Watt hour meter, and power measurement using dynamometers, power factor measurements, and instrument transformers.

UNIT II - AC & DC Bridges & Electronic Instruments :

DC Bridges: Wheat stone bridge, Kelvin's double bridge. AC Bridges: Measurement of inductance: Maxwell's bridge, Anderson bridge.

Measurement of capacitance: Schering Bridge, Hays Bridge, Measurement of frequency: Wien's Bridge, Errors and precautions in using bridges. Electronic Instruments: Amplified DC Meter, True RMS responding Voltmeter, Electronic multimeter, Digital Voltmeter, Q-meter.

UNIT III - Signal Generators & Signal Analysis & Frequency Counter & Time Interval Measurement :

Signal Generator: Sine wave Generator: Sweep Generator, Pulse and Square Wave Generator, Frequency Synthesized Generator, Function Generator. Wave Analyzers: Harmonic Distortion Analyzer, FT spectrum analyzer, applications. Frequency Counter & Time Interval Measurement: Simple Frequency Counter, Time Period measurement, Precision Computing counter using dual counters

UNIT IV - Display Devices & Recorders and Signal Conditioning Devices: Display Devices: CRO Principles and operation and its applications, dual beam, dual trace oscilloscope, LCD, LED, Plasma displays. Recorders: Types of recorders, Strip chart recorders, XY recorders, Magnetic tape recorders. Signal Conditioning Devices: Signal conditioning, the op-amp, protection, filtering

UNIT V - Sensors & Transducers :

Classification of Transducers, strain gauge, photoelectric transducers, capacitive, inductive transducers, LVDT Thermoelectric transducers, load cell, light and proximity sensors, data acquisition systems.

TEXT BOOKS :

1. A.D. Helfrick and W.D. Cooper, “Modern Electronic Instrumen-tation and Measurement Techniques” 5th ed., PHI, 2002.
2. R.K. Rajput, “Electronic Measurements and Instrumentation”, 2nd ed., S. Chand, 2009.

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REFERENCES BOOKS :

1. David A. Bell, “Electronic Instrumentation & Measurements”, 2nd ed., PHI, 2003.
2. A.K. Sawhany, “Electrical and Electronics Measurements & Instrumentation”, Dhanpath Roy & Co, 200.

IV Year B.Tech. ECE I - Semester

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4	-	-	4	4

EC437 DATA COMMUNICATIONS AND COMPUTER NETWORKS
(Dept. Elective - III)

Course Description & Objectives:

This course will provide all students with the fundamental concepts associated with Data communications and Networks. The course will allow students to become expert in new and evolving areas of Various Networks, Architectures etc.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the basics of network hardware, software and various network models.

CO2: Analyze the functionalities of physical and data link layer and MAC sub-layer protocols.

CO3: Understand and apply the concepts of routing, congestion control and QoS methods in network layer.

CO4: Understand and apply the transport and application layer protocols.

UNIT I - Introduction:

Introduction to Data Communications, Protocol architecture, OSI & TCP/IP model, ATM, Transmission medium, Data link layer issues, Circuit Switching, Packet Switching.

UNIT II

Error Detection and Correction, CRC, Checksum, Cyclic Codes, Hamming Code, Framing, HDLC, Ethernet Bridges, Multiplexing, Spread Spectrum.

UNIT III

Network Layer: Routing Algorithms, Flooding, Internetworking ,Internet Protocol- IPv4, IPv6, Aloha in Data Networks.

UNIT IV

Transport Protocols: TCP, UDP, TCP Congestion Control, Techniques to improve QoS, Differentiated Services, QoS in Switched Networks.

UNIT V

Application Layer: DNS, WWW, SNMP, E-mail multimedia, Audio & Video Compression, Voice over IP & Multimedia Support – SIP.

TEXT BOOKS:

1. Data Communications and Networking, Fourth Edition by Behrouza A.Forouzan,TMH.
2. William Stallings, “Data and Computer Communications”, 7th ed.,Pearson Education 2004.

REFERENCES:

1. Computer Networks, A.S.Tanenbaum, 4th edition,Pearson education.
2. Introduction to Data communications and Networking,W.Tomasi,Pearson education.
3. Data and Computer Communications, G.S.Hura and M.Singhal,CRC Press,Taylor and Francis Group.
4. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
5. Understanding communications and Networks, 3rd Edition, W.A.Shay,Cengage Learning.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

EC439 SATELLITE COMMUNICATIONS (Dept. Elective - III)

Course Description & Objectives:

The course covers Fundamentals of satellite communications, its sub-systems, signals and noise associated with satellite communications and transmission concepts. The objective is to introduce the mechanics of satellite, satellite launchers and also study the design issues and operation of satellite systems.

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Understand different types of satellite orbits and satellite sub-systems.

CO2: Analyse link budget of a satellite system and satellite links for specified system.

CO3: Understand various multiple access techniques.

CO4: Distinguish different types of satellites based on their location.

UNIT I - Introduction & Orbital Mechanics and Launchers :

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II - Satellite Subsystems :

Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antennas Equipment reliability and Space qualification.

UNIT III - Satellite Link Designing :

Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT IV - Multiple Access :

Frequency division multiple access (FDMA) Intermediation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception.

UNIT V - Low Earth Orbit and Geo-Stationary Satellite Systems & Satellite Navigation and the Global Positioning System :

Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS :

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, “Satellite Communications”, 2nd ed., Wiley Publications, 2003.
2. M. Richharia, “Satellite Communications: Design Principles”, 2nd ed., BS Publications, 2003.

REFERENCE BOOKS :

1. Dennis Roddy, "Satellite Communications", 2nd ed., McGraw Hill, 1996.
2. Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, "Satellite Communications Engineering", 2nd ed., Pearson Publications, 2003.
3. V.S.Bagad, "Satellite Communications", 1st ed., 2009, Technical Publications, Pune.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

EC441 MICRO ELECTRO MECHANICAL SYSTEMS (Dept. Elective - III)

Course Description & Objectives:

This subject introduces the micro fabrication techniques and applications. It is to the design and manufacturing of MEMS devices or a micro systems. It is to know the major classes, components, and applications of MEMS devices/ systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the effects of miniaturization on device performance and applications of MEMS and NEMS.

CO2: Identify the process technology required for fabrication of MEMS and NEMS devices.

CO3: Analyze various micro sensors and actuators.

CO4: Understand quantum mechanics that is applicable at nano scale for NEMS devices.

UNIT I - Over view of MEMS and Microsystems :

Evolution of micro fabrication, difference between Microsystems and Microelectronics, Multidisciplinary nature of Microsystems design and manufacture. Working principles of Micro sensors-acoustic wave, chemical, pressure and thermal sensors. Working principles of Micro actuators-using thermal, piezoelectric and electrostatic forces.

UNIT II - Review of Mechanical Concepts :

Stress, Strain, static bending of thin plates, Deflection Curves for Canti Levers – Fixed beam. Electrostatic Excitation – Columbic Force between the Fixed and Moving Electrodes. Mechanical vibration –general formulation, resonant vibration and design theory of accelerometers.

Scaling laws in miniaturization: Introduction, scaling in Geometry, Rigid body dynamics, Electrostatic forces, Electromagnetic forces and Electricity.

UNIT III - Materials for MEMS and Microsystems :

Active substrate materials, silicon as a substrate Material, Silicon compounds, Silicon Peizoresistors, Galliam arsenide, Quartz, Polymers, Packaging materials and Piezoelectric crystals.

UNIT IV - Microsystem Fabrication Process :

Introduction, Photolithography, Ion implantation, Diffusion, Oxidation chemical vapour deposition technique, physical vapour deposition technique and etching.

UNIT V - Micromanufacturing :

Introduction, Bulk Micro manufacturing, Surface Micromachining and the LIGA process. Microsystem design: Introduction, design considerations, process design, mechanical design. Case study of MEMS pressure sensor fabrication process.

TEXT BOOK:

1. MEMS & Microsystems Design and Manufacture Tai-RanHsu Tata McGraw-Hill EDITION, 2002.

REFERENCE BOOKS :

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2006.

2. Stephen D.Senturia "Microsystem Design" Springer International edition, 2010.
3. Gabriel.M.Review, R.F. MEMS Theory, Design and Technology, John Wiley & Sons, 2003.
4. Vijay.K.Vardan, K.J.Vinoy, K.A.Bose, "RF MEMS and their applications", John Wiley & Sons, 2003.
5. Thimo Shenko, "Strength of Materials", CBS Publishers & Distributors., 2000.
6. Ristic L. (Ed.), "Sensor Technology and Devices", Artech House, London 1994.
7. Servey E.Lyshevski, "MEMS and NEMS, Systems Devices; and Structures", CRC Press, 2002.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

EC443 DIGITAL DESIGN THROUGH VERILOG (Dept. Elective-IV)

Course Description & Objectives:

It is a Hardware Description Language used to design digital systems at various levels of Abstraction. It is used at any level of design.To understand the constructs and conventions of the Verilog HDL programming and to understand the structural, register-transfer level (RTL), and algorithmic levels of abstraction for modeling digital hardware systems.

Course Outcomes :

Upon successful completion of this course, students should be able to:

CO1: Apply the concepts of Digital design to create digital building blocks in Verilog using gate level modeling.

CO2: Design CMOS circuits using switch level modeling with strength and time delays.

CO3: Model the combinational and sequential circuits using behavioral level modeling.

CO4: Understand system tasks, functions, compiler directives and FSM.

UNIT I - Introduction to Verilog & Language Constructs and Conventions :

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module,Simulation and Synthesis Tools, Test Benches.

Introduction, Keywords, Identifiers, White Space Characters,Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters,Memory, Operators, System Tasks, Exercises.

UNIT II - Gate Level Modeling :

Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives,Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flipflops with Gate Primitives, Delays, Strengths and Contention Resolution, Net Types, Design of BasicCircuits, Exercises.

UNIT III - Modeling at Data Flow Level & Switch Level Modeling :

Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets, Exercises.

UNIT IV - Behavioral Modeling :

Introduction, Operations and Assignments, Functional Bifurcation, *Initial* Construct,*Always* Construct, Examples, Assignments with Delays, *Wait* construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-blocking Assignments, The *case* statement, Simulation Flow.*if* and *if-else* constructs, *assign-deassign* construct, *repeat* construct, *for* loop, the *disable* construct, *while* loop, *forever* loop, parallel blocks, *force-release* construct, Event.

UNIT V - System Tasks, Compiler Directives and SubPrograms :

Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access, General Observations, Exercises.

Introduction, Function, Tasks, User- Defined Primitives(UDP), FSM Design (Moore and Mealy Machines).

TEXT BOOK :

1. T.R. Padmanabhan and B. Bala Tripura Sundari, Design through Verilog HDL – WSE, 2004 IEEE Press.

REFERENCE BOOKS :

1. Stephen. Brown and Zvonko Vranesic, “Fundamentals of Logic Design with Verilog” – TMH, 2005.
2. Michael D. Ciletti, “Advanced Digital Design with Verilog HDL” – PHI, 2005.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

EC445 CELLULAR & MOBILE COMMUNICATIONS (Dept.Elective-IV)

Course Description & Objectives:

This course will provide the basics to the students for applying math and engineering concepts in the analysis and design of mobile communication systems. The main objective is to have an understanding of digital cellular systems (GSM, CDMA), 3G systems, PANs like WLAN, Bluetooth technologies

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the basic mechanisms of cellular mobile systems and multiple access techniques.

CO2: Analyze various methods of improving cellular capacity.

CO3: Understand the different generations of cellular technologies, their architectures and protocols.

CO4: AnalyzePersonal Area Networks such as WLAN and Bluetooth.

UNIT I - Introduction to Wireless Communications & Multiple Access Techniques for Wireless Communication

Evolution of Mobile Radio Communications, Mobile radiotelephony in USA and around the world, Examples of wireless Communication Systems – Paging, Cordless Telephone systems and Cellular Telephone systems, Trends in Wireless and Personnel Communications. FDMA, TDMA, Spread Spectrum, Multiple access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation Protocols

UNIT II - The Cellular Concept – System Design Fundamentals :

Introduction, Frequency reuse, Channel Assignment strategies, Handoff Strategies – Prioritizing Handoffs, Practical Handoff Considerations, Interference and System Capacity – Co-channel Interference and System Capacity, Channel Planning for Wireless Systems, Adjacent Channel Interference, Power Control for Reducing Interference, Trunking and Grade Of Service, Improving Coverage and Capacity in Cellular Systems – Cell Splitting, Sectoring, Repeaters for Range Extension, A Microcell Zone Concept.

UNIT III - Cellular Wireless Networks :

Principles of Cellular Networks - Cellular Network Organization, Operation of Cellular System, Mobile Radio Propagation Effects, Handoff and Power Control, First Generation Analogue System – Spectral Allocation, Operation, AMPS Control channels, Second Generation (2G) TDMA Systems - First and Second Generation Cellular Systems, TDMA Design consideration, GSM Network and its Architecture, GSM Signalling Protocol Architecture , 2G CDMA Systems – CDMA, CDMA design consideration, IS-95, 3G Systems – CDMA Design Considerations, 3G WCDMA(UMTS), 3GCDMA 2000, 3G TD-SCDMA.

UNIT IV - Wireless Networking :

Cordless systems, Wireless local loop, IEEE 802.16 fixed broadband wireless access standard, Mobile IP & Wireless application protocol.

UNIT V - Wireless LANS & Bluetooth and IEEE 802.15 :

WLAN Overview, Infrared LANs, Spread spectrum LANs, Narrowband microwave LANs, IEEE 802 Protocol architecture, IEEE 802.11 Architecture and services, IEEE 802.11 Medium access control, IEEE 802.11 Physical layer. Bluetooth overview, Radio specification, Baseband specification, Link manager specification, Logical link control and adaptation protocol, IEEE 802.15 standards

TEXT BOOKS:

1. Theodore. S. Rapport, “Wireless Communications”, 2nd edition, Pearson education, 2002.
2. William Stallings, “Wireless Communications and Networks”, 2nd Edition, Pearson education, 2005

REFERENCE BOOKS :

1. W.C.Y. Lee, “Mobile Cellular Telecommunications”, 3rd edition, McGraw Hill, 2006.
2. R Blake, “Wireless Communication Technology”, Thompson Asia Pvt. Ltd., 2004.
3. Jon W. Mark and Weihua Zhqung, “Wireless Communication and Networking”, PHI, 2005.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
4	-	-	4	4

EC447 NANO ELECTRONICS
(Dept. Elective - IV)

Course Description & Objectives:

To introduce the students to nanoelectronics, nanodevices and molecular electronics.To identify quantum mechanics behind nano-electronics. To describe the principle and the operation of nano-electronic devices. To explain the principle and application of single electron devices.

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Understand the history, types and mechanism of Nano Technology.

CO2: Outline the concepts of CNT and Molecular Electronics.

CO3: Analyze the fundamentals of Nano Electronics and Principles of Spintronics and QCA.

CO4: Identify materials for Silicon MOSFET and quantum transport devices.

UNIT I - Introduction to Nano Electronics :

Basics of nanoelectronics – capabilities of nanoelectronics – physical fundamentals of nanoelectronics – basics of information theory – the tools for micro and nano fabrication – basics of lithographic techniques for nanoelectronics.

UNIT II - Fundamentals of Nano Electronics :

Quantum electron devices – from classical to quantum physics: upcoming electronic devices – electrons in mesoscopic structure – short channel MOS transistor – split gate transistor – Electron wave transistor – Electron spin transistor – quantum cellular automate – quantum dot array – Principles of Single Electron Transistor (SET) – SET circuit design – comparison between FET and SET circuit design.

UNIT III - Silicon MOSFETs & Quantum Transport Devices :

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts.Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV - Carbon Nano Tubes :

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes –assemblies – purification of carbon nanotubes – electronic propertics – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs –Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.

UNIT V - Molecular Electronics :

Electrodes & contacts – functions – molecular electronic devices – first test systems –simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

TEXTBOOKS :

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002.
2. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007.

REFERENCES :

1. George W.Hanson ,Fundamentals of nano electronics,PEARSON Education,2009.
2. Branda Paz, "A Handbook on Nanoelectronics", Vedams books, 2008.
3. K.Goser, P.Glosekotter & J.Dienstuhl, "Nanoelectronic and Nanosystems – From Transistors to Molecular Quantum Devices" Springer, 2004.
4. W.R. Fahrner, "Nanotechnology and Nanoelectronics: Materials, Devices, Measurement Techniques", Springer, 2010.
5. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
-	-	3	3	2

EC449-DIGITAL SIGNAL PROCESSING LAB

Course Description & Objectives:

The course will introduce the students to solve and simulate problems in the areas of communications and signal processing using MATLAB environment and programming aspects and programming of DSP hardware for real-time signal processing applications.

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Design of analog and digital Filters for a given specification

CO2: Verify various transform techniques and filters using simulation and experimentaion.

List of Experiments

Part - A: Using MATLAB

1. Generation and operations on discrete time signals.
2. To verify linear convolution and correlation.
3. To find and sketch impulse and step response.
4. To find the FFT of given 1-D signal and plot.
5. To verify circular convolution.
6. FIR filter design using different window techniques.
7. IIR filter design using analog approximations.
8. Filter design using filter design analysis tool (fdatool).
9. Experiment based on spectrum estimation.
10. Experiments based on simulink and signal processing block set.

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Part - B: DSP Processors

1. To study the architecture of DSP chips TMS 320 C 5X / 6X and instruction set.
2. Implementation of Linear and circular convolution on DSP Chips (TMS-320C6713).
3. Filter design and implementation using DSP chips (TMS-320C6713).
4. Filter design using FPGA Boards.

TEXT BOOKS :

1. Ramesh Babu, “Digital Signal Processing”, Scitech, 2003.

IV Year B.Tech. ECE I - Semester

L	T	P	To	C
-	-	3	3	2

EC451- MICROWAVE ENGINEERING LAB

Course Description & Objectives:

The lab course will give a practical exposure to students to learn the characteristics of Microwave components.

To gain the practical hands on experience by exposing the students to various microwave components.

Course outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Demonstrate the microwave bench setups and microwave components (Lab + Minor project).

CO2: Experiment on Wave guide and antennameasurements.

List of Experiments:

1. To verify the relationship between free space wavelength, Guide Wavelength and Cut-off wavelength.
2. Measurement of Low and High VSWR using Microwave bench.
3. Radiation pattern Measurement of rectangular wave-guide.
4 Radiation pattern Measurement of twisted wave-guide.
5. Radiation pattern Measurement of Horn Antenna
6. Gain measurement for Horn Antenna
7. Radiation pattern Measurement of Parabolic Dish Antenna
8. Attenuation measurement.
9. Scattering parameters of circulator.
10. Scattering parameters of magic Tee.
11. Measurement of coupling factor and directivity of directional coupler.
12. Mode characteristics of reflex klystron.
13. Characteristics of Gunn Oscillator.

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IV Year B.Tech. ECE I - Semester

L	T	P	To	C
-	-	3	3	2

EC453-INSTRUMENTATION LAB

Course* Description & *Objective:

The lab course will give a practical exposure to students to learn the types of Measuring Instruments and their Characteristics.

Course Outcomes:

Upon successful completion of this lab course, students should be able to:

CO1: Demonstrate the characteristics of various sensors.

CO2: Experiment with different measurement systems using NI Lab-View and hardware equipment.

Section - A

1. LVDT for displacement measurements.
2. LDR for distance measurement.
3. R.T.D and Thermocouple for temperature measurements.
4. Strain Gauge and Piezo-Electric Pick up for pressure measurements.
5. Capacitive Pick up for Angular displacement measurement.
6. Inductive Pick up for distance measurement.
7. Magnetic Pick up and Photo Electric Pick up for DC motor speed measurement.

Section – B

1. Data acquisition system for Temperature (Pressure, light intensity) and transport over ETHERNET
2. Parameter measurement using HART, CAN, GPIB & PROFIBUSES.
3. Measuring Temperature with RTD using NI Lab View.
4. Measuring Pressure with Strain Gauge using NI Lab View.
5. Measuring Temperature with Thermocouple using NI Lab View.

6. Single channel measurements – FFT, Power Spectrum using NI Lab View.
7. Dual Channel measurements – Frequency Response using NI Lab View.
8. Generating a Square Pulse and a Pulse Train using NI Lab View.

IV Year B.Tech. ECE II - Semester	L	T	P	To	C
	4	-	-	4	4

EC412 SENSORS AND ACTUATORS (Dept. Elective - V)

Course Description &objectives:

The course introduce the student to the different types of sensors, signal conditioning circuits, and actuators for Automation in science, Engineering and medicine. The course objective is to understand the basic working principles of different sensors and Actuators and to introduce the operation of various electronic Instruments which are used to measure the basic parameters.

Course Outcome :

Upon successful completion of this course, students should be able to:

CO1: Understand the basic working principles Actuators.

CO2: Identify various sensors, Transducers and their brief Performance specifications.

CO3: Understand principle of working of various transducers used to measure Temperature, Displacement, Level, and various miscellaneous other sensors.

CO4: Choose Suitable sensor/transducer for a given physical variable and understand its principle, characteristics.

UNIT I- Sensor -I :

Basic sensor technology, sensor systems, Characteristics, conditioning bridge circuits, amplifiers for signal conditioning, different ADCs. Temperature sensors: RTD, thermister, thermocouple, basic principles, resistance temperature, characteristics, material required, application comparison, Position sensor, LVDT. Displacement: capacitive sensors, potentiometer sensors. Speed: Hall Effect sensors.

UNIT II- Sensor –II :

IR sensors for distant measurement: basic principle and applications. Accelerometer: characteristic, shock, vibration, pressure sensors, Flow, level, force, weight, sensors. Bio sensors, humidity, optical and thermal infrared detectors.

Unit III- Electronic instrumentation :

Instrumentation and measurement systems, measurement system performance, static calibration, errors in measurement, true value, accuracy and precision, linearity, hysteresis, Errors in ammeters and voltmeters, permanent magnet moving coil, ohmmeters, measurement of self inductance, Schering bridge, measurement of frequency, sources of errors in bridge circuits,

Unit IV- Electronic Measurements :

CRO: Electro static deflection, post deflection acceleration of electron beam, observation of wave forms on CRO, measurements of voltages and currents, multi input oscilloscopes, Negative resistance oscillators, square wave and pulse generators, Function generator, Q meter.

UNIT V- Actuators :

The Electromechanical Relay working principle, Electrical Relay Contact Types. Working principle and applications of solenoid valves, Linear Solenoid Construction. Working of Brushed Motor, Brushless Motor. Working principle and block diagram of Servo Motor, stepper motor

TEXT BOOKS :

1. A.K. Sawhney, Puneeth sawhney, “A Course in Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai Publications, 2012.
2. Sensors and actuators: control systems instrumentation Clarence W. De Silva CRC Press, 2007

REFERENCES :

1. Ian Sinclair, “Sensor and Transducers”, Elsevier India Pvt Ltd, 3rd Edtion, 2011.
2. Patranabis D, “Sensor and Actuators”, Prentice Hall of India (Pvt) Ltd., 2006.
3. Ernest O. Doeblin, “Measurement System, Application and Design”, Tata McGraw Hill Publishing Company Ltd., 5th Edition, 2008.

IV Year B.Tech. ECE II - Semester

L	T	P	To	C
4	-	-	4	4

EC414 WIRELESS SENSOR NETWORKS
(Dept. Elective - V)

Course Description &objectives:

This course will provide all students with the fundamental concepts associated with Sensor networks, Architectures and tools The course will allow students to become expert in new and evolving areas of Wireless sensor networks engineering including Network platform Tools.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the fundamental principles and applications of wireless sensor networks.

CO2: Understand the architecture of the sensor node and the formation of sensor network with multiple nodes.

CO3: Analyse and compare various MAC and routing protocols for sensor networks.

CO4: Design the network architecture for required applications using sensor networks.

UNIT I - Overview of Wireless Sensor Networks :

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT II - Architectures :

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III - Networking Sensors :

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management,Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing,Geographic Routing.

UNIT IV- Infrastucture Establishment :

Topology Control, Clustering, Time Synchronization, Localization and Positioning,Sensor Tasking and Control.

UNIT V - Sensor Network Platforms and Tools :

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TEXT BOOKS :

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES :

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

IV Year B.Tech. ECE II - Semester

L	T	P	To	C
4	-	-	4	4

EC416 BIOMEDICAL SIGNAL PROCESSING

(Dept. Elective - V)

Course Description and Objectives:

This course will introduce the students' fundamental concepts of Biomedical signals, properties and its digital processing for identification of diseases. Students will learn DFT, FFT, Filtering Techniques, ECG, EEG and its analysis.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Analyze the signals using DFT and FFT.

CO2: Develop the filters for processing biomedical signals.

CO3: Understand the ECG and EEG signal and its characteristics.

CO4: Analyze the ECG and EEG signals for diagnosis purpose.

UNIT I - Simple signal conversion systems :

conversion requirement for biomedical signals – signal conversion circuits. Discrete Fourier Transform (DFT) – Properties – circular and sectioned convolution – Filtering long duration sequences - FFT computation using DIT and DIF algorithms.

UNIT II – FIR and IIR design :

Windowing techniques – Need and choice of Windows – Linear phase characteristics. IIR design: Analog filter design –Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation– Warping, prewarping – Frequency transformation.

UNIT III - Adaptive filters :

Principle noise canceller model – 50 Hz adaptive cancelling using a sine wave model – Maternal ECG cancellation in fetal electrocardiography – ECG cancellation in EMG recording – High frequency noise cancellation in Electro surgery. Signal averaging – Basics and limitations.

UNIT IV - EEG Signal Characteristics :

EEG analysis - time and frequency domain methods – Parametric model – Phenomenological model–linear prediction theory – Autoregressive method.

UNIT V - ECG QRS Detection Techniques :

Estimation of R-R interval – Estimation of ST segment inclination – Arrhythmia analysis monitoring – Long term ECG recording – Basics of ECG data reduction techniques.

TEXT BOOKS :

1. P.Ramesh Babu, “Digital Signal Processing”, Second Edition, Scitech publications, Chennai, 2003 (UNITS I & II)
2. DC Reddy, Biomedical Signal Processing – Principles and Techniques, Tata McGraw Hill Publishing company Ltd., 2005 (UNITS III,IV & V)

REFERENCES :

1. Willis J.Tompkins, Biomedical Digital signal processing, Prentice Hall of India Pvt. Litd., 2000
2. Biomedical Signal Analysis A case study approach by Rangaraj M.Rangayyan, John Wiley publications.
2. Biomedical Signal Analysis A case study approach by Rangaraj M.Rangayyan, John Wiley publications.

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IV Year B.Tech. ECE II - Semester

L	T	P	To	C
4	-	-	4	4

EC418 DIGITAL IMAGE PROCESSING

(Dept. Elective - VI)

Course Description & objectives:

To introduce to students the analytical tools and methods, which are currently used in digital image processing as applied to image information for human viewing. Students will learn to apply these tools in the Laboratory in image restoration, enhancement, compression and segmentation.

Course outcomes:

Upon successful completion of this course, students should be:

CO1: Understand the fundamentals of image processing and transform techniques.

CO2: Analyse the image using various enhancement techniques.

CO3: Understand the noise models and various image restoration approaches.

CO4: Understand and apply segmentation and compression techniques to images.

UNIT I- Digital Image Fundamentals :

Elements of visual perception, Image sensing and acquisition, Image sampling and quantization Basic relationship between pixels, Basic geometric transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT Separable Image Transforms, Walsh, Hadamard , Discrete Cosine Transform, Haar Transform, Slant Transform and Hotelling Transform.

UNIT II- Enhancement :

Spatial Domain methods, Basic grey level transformation, Histogram equalization, Image subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters: Smoothing, Sharpening filters, Homomorphic filtering.

UNIT III - Restoration :

Model of Image Degradation/Restoration process, Noise models, Inverse filtering, Least Mean Square filtering, Constrained Least Square filtering, Blind Image Restoration, Pseudo inverse, Singular Value Decomposition.

UNIT IV - Compression :

Fundamentals of image compression, image compression models, lossless compression, Variable length coding, LZW coding, Bit plane coding, predictive coding, DPCM. Lossy Compression: Transform coding, Wavelet coding, Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization.

UNIT V - Segmentation :

Detection of discontinuities, Thresholding, Region Based segmentation.

TEXT BOOKS:

1. Rafael C Gonzalez, Richard E Woods , "Digital Image Processing", 2nd ed., Pearson Education, 2003
2. A.K. Jain, "Fundamentals of Digital Image Processing", PHI.

REFERENCE BOOKS :

1. Millman Sonka, Vaclav hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", Thompson Learning (1999).
2. Chanda Dutta Majumdar, "Digital Image Processing and Applications", Prentice Hall of India, 2000.
3. Rafael C Gonzalez, "Digital Image Processing using MATLAB".

IV Year B.Tech. ECE II - Semester	L	T	P	To	C
	4	-	-	4	4

EC420 RADAR SYSTEMS
(Dept. Elective - VI)

Course Description & Objectives:

To introduce the components of a radar system and their relationship to overall system performance, the radar operating environment and techniques used to confront it, and top level measures of performance.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Explain the basic operating principle of Radar and derive the Range Equation.

CO2: Analyze the performance of different types of Radar Systems and compare.

CO3: Analyse the performance of simple tracking Radar and different types of Radar Antennas.

CO4: Discuss the Radar signals in Noise & Radar Receivers, Types of displays, and Duplexer types.

UNIT I - Introduction & Radar Range :

Introduction, Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Radar Equation: Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets

UNIT II- CW and Frequency Modulated Radar :

Doppler Effect, CW Radar Block Diagram. Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

UNIT III- MTI and Pulse Doppler Radar :

Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler radar.

UNIT IV -Tracking Radar& Radar Antennas :

Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar Antenna Parameters, Reflector Antennas, Lens Antennas, Cosecant Squared Antenna Patterns, Radomes, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency Scan Arrays, Radiators for Phased Arrays.

UNIT V - Detection of Radar Signals in Noise & Radar Receivers :

Introduction, Matched Filter Receiver Response Characteristics and Derivation, Correlation detection, Detection criteria. Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver.

Radar Receivers:Noise Figure and Noise Temperature. Display Types. Duplexers Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

TEXT BOOKS :

1. Introduction to Radar Systems Merrill I. Skolnik, SECOND EDITION, McGraw-Hill, 1981.

REFERENCE BOOKS :

1. Introduction to Radar Systems Merrill I. Skolnik, THIRD EDITION, Tata McGraw-Hill, 2001.2.
2. Radar: Principles, Technologies, ApplicationsByron Edde, Pearson Education.

IV Year B.Tech. ECE II - Semester

L	T	P	To	C
4	-	-	4	4

EC422 VLSI TESTING & VALIDATION

(Dept. Elective – VI)

Course Description & Objectives:

This course includes the testing of VLSI circuits and their validation. Each VLSI circuits has inbuilt testing process and validation. To make the students involve in the theory and practice of VLSI testing and validations and to introduce advanced techniques for efficiently testing and validating the VLSI design.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply the concept of faults and failure models to generate the number of fault models & Automatic Test Pattern Generator (ATPG) for the given design under test (DUT).

CO2: Identify the fault in given CUT(can be logic circuit or memory) and conclude the solution to test these faults.

CO3: Develop the built in self test with test Patterns.

CO4: Verify the fault diagnosis in combinational circuits, logic and system level design.

UNIT I - Introduction to VLSI Testing :

Introduction - VLSI Testing Process And Test Equipment - Test Economics and Product Quality – Fault Molding-Logic and Fault Simulation.

UNIT II -Test Generation for Combinational and Sequential Circuits :

Test generation for combinational logic circuits - Testable combinational logic circuit design - Test generation for sequential circuits - design of testable sequential circuits

UNIT III - Advanced Testing :

Memory Test- DSP-based analog and mixed signal test- Model based analog and mixed signal test - Delay Test - IDDQ Test.

UNIT IV - Design For Testability :

Design for Testability - Ad-hoc design - Storage cells for scan designs - Generic scan based design - System level DFT approaches.

UNIT V - Self Test and Test Algorithms :

Built-In Self Test - Test pattern generation for BIST - Circular BIST - BIST Architectures - Testable Memory Design - Test algorithms - Test generation for Embedded RAMs.

TEXT BOOKS :

1. Viswani D.Agarval Michael L.Bushnell, “Essentials of Electronic Testing for DigitalMemory & Mixed Signal VLSI Circuit “, Kluwer Academic Publications, 2000.
2. L. T. Wang, C. W. Wu, and X. Wen, VLSI Test Principles and Architectures, Morgan

REFERENCE BOOKS :

1. Kaufmann Morgan Kaufmann Publishers, 2006 M. Abramovici, M.A. Breuer and A.D. Friedman, “Digital Systems and Testable Design”, Jaico Publishing House, 2002.
2. Alfred L.Crouch “Design for Test for Digital IC’s And Embedded Core Systems “, -PHI 1999.

IV Year B.Tech. ECE I/II - Semester

L	T	P	To	C
-	-	20	20	10

EC424 PROJECT WORK

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Survey in independent study to literature in the identified domain and apply engineering tools to solve identified engineering problem.

CO2: Apply concepts and engineering tools to design solutions for the identified engineering problem and Make Use Of available tools for solving the identified engineering problems.

IV Year B.Tech. ECE I/II - Semester

L	T	P	To	C
-	-	20	20	10

EC426 INTERNSHIP

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Survey in independent study to literature in the identified domain and apply engineering tools to solve identified engineering problem.

CO2: Apply concepts and engineering tools to design solutions for the identified engineering problem and Make Use Of available tools for solving the identified engineering problems.

I

YEAR

ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech.

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16CS202 - Data Structures
- 16ME103 - Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- solve first and second order ordinary differential equations.
- evaluate ordinary differential equations numerically.
- apply the concepts of partial differentiation.
- solve partial differential equations.
- apply software tools to obtain and verify the solutions.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L- 9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L- 9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.
11. Solving first order O.D.E.
12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- Recognize the relevant applications of Ultrasonic waves by the grasp over their production and properties.
- Analyze the characteristics of Laser for suitable applications in the field of industry, medicine and communication and to foster the knowledge on optical fibers to realize fiber optic communication and fiber optic sensors.
- Apply the principles of quantum mechanics to learn the dynamics of free electrons in metals.
- Evaluate efficiency of Solar cell and to understand the functioning of Photonic devices.
- Demonstrate the knowledgeon fabrication and applications ofNano-materialsand latest advanced materials.

SKILLS:

- ✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*
- ✓ *Study the wavelengths of light sources and lasers.*
- ✓ *Estimate the efficiency of a given solar cell.*
- ✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*
- ✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non- linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to:

- Understand and apply the rules of grammar to speak in technical context.
- Strengthen reading and listening comprehension skills to follow academic discussions in the engineering context.
- Develop appropriate vocabulary for carrying out academic writing tasks.
- Attain adequate proficiency to participate in the classroom discussions and make simple presentations.
- Understand and apply the mechanics of writing to produce simple texts for academic purpose.

SKILLS:

✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**
  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory Practice : Introduction to phonetics
  (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role - Plays
  (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs
  Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions (from Energy Unit)
  Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**
  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 *"Mindscapes* - English for Technologists and Engineers", Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, "Strengthen Your Writing", 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, "The Most Common Mistakes in English Usage", 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. "Spoken English: A Self-Learning Guide to Conversation Practice", 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, "Examine Your English", 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to:

- Demonstrate the disassembling and assembling of a personal computer system.
- Install the operating system and other software required in a personal computer system.
- Analyze and visualize the data using various operations in Excel.
- Identify the various threats to users and data.
- Understand the concept of cyber security

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools.
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, "Introduction to Computers", 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, "Introduction to Computer Science", 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, "Fundamentals of Network Security", 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- Understanding of how to write simple, but complete C programs.
- Identification of suitable data types for operands and design of expressions having right precedence.
- Application of decision making and iterative features of C Programming language effectively.
- Design and development of problem specific data structures and accessing methods to build large modular programs.
- Development of C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L-10,T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L-9,T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L-9,T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L-9,T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L-8,T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of 'n' numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.

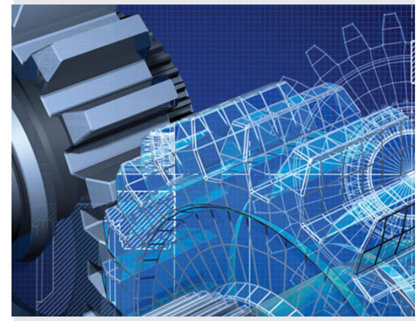
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1st edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2nd edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4th edition, Tata McGraw- Hill, 2008.



16EE101 BASICS OF ENGINEERING PRODUCTS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- Describe the working principle of Refrigeration and Air conditioning systems.
- Gain awareness on choosing appropriate construction materials.
- Operate and maintenance of basic electrical engineering appliances.
- Analyze the different lighting sources and it's features.
- Understand working of the basic electronics engineering appliances.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a Lighting scheme for specific working environment.*

✓ *Design a composition of Heating element for a particular application.*

✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

✓ *Provide an earthing for Domestic Outlet.*

✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L- 9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L- 10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks, Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-08**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

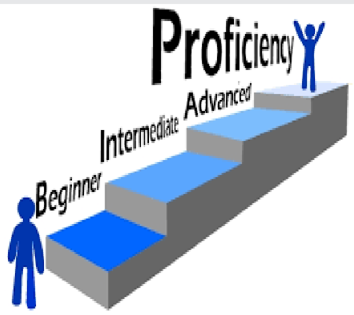
LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, “Concrete Technology”, 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, “Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, “Electrical engineering - Electrical machines and Appliances Theory”, 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, “How Stuff Works”, 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, “Basic Mechanical Engineering”, 1 st edition, Pearson Publishers, 2013.



16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to:

- Can understand routine information and factual articles in the news papers and understand general instructions, notifications, announcements, monologues and conversations. (Understand)
- Use functional English to speak and express themselves in everyday social contexts. (Apply & Create)
- Applying sentence structures and word collocations to produce simple and accurate sentences and create short compositions.
- Analyse complex reading and listening materials and draw inferences to evaluate the intentions of the writers and speakers.
- Creating concise and precise communication by analysing the relevance of the context and applying suitable formats.

SKILLS:

✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*

✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*

✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

Listening – Following long conversations / Interviews

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

PRACTICE: Objective PET Units 25 – 30

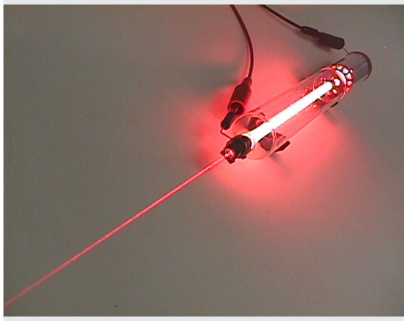
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, "Introduction to PET", Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

- Realize the concept of resonance by conducting the experiments of AC sonometer and Melde'sexperiment.
- Acquire the knowledge on magnetic field theory and thermal conductivity by conductingexperiments,
- Understand Magnetic field along the axis of a circular coil and thermal conductivity of bad conductor through experiments.
- Understand the concepts of light by conducting the experiments of determination of wavelength,
- Understand the numerical aperture of an optical fibre and also from V–I characteristics of Solar celland LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.

16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- Determine rank of a matrix and solution of a system of linear equations, Eigen values and Eigen vectors.
- Apply Cayley-Hamilton theorem for finding inverse and power of a matrix.
- demonstrate the applications of multiple integrals.
- Understand the concepts of vector calculus.
- Apply software tools to obtain and verify the solutions

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9,T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L-9,T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L-9,T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L-9,T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L-9,T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- Assess the quality of the water samples and identify suitable water purification methods.
- Analyze various batteries and fuel cells based on the principles of electrochemistry
- Analyze various factors affecting corrosion and apply proper corrosion control and prevention methods.
- Evaluate different synthetic procedures and properties of various polymers and apply them for engineering applications.
- Apply the principles of electromagnetic radiation to the spectroscopic methods for the analysis of different materials.

SKILLS:

- ✓ *Analyse the total hardness of water sample.*
- ✓ *Understand the basic principles involved in various batteries.*
- ✓ *Understand the mechanisms of corrosion and various controlling methods.*
- ✓ *Synthesize various polymers.*
- ✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to:

- Communicate the ideas and thoughts to other in the form of pictures.
- Develop the drawing skills while drawing engineering objects
- Implement the concept of quadrant system in drawing practice.
- Construct different engineering objects using drawing tools.
- Sketch simple objects and their pictorial views using AutoCAD

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT – 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT – 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT – 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT – 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT – 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

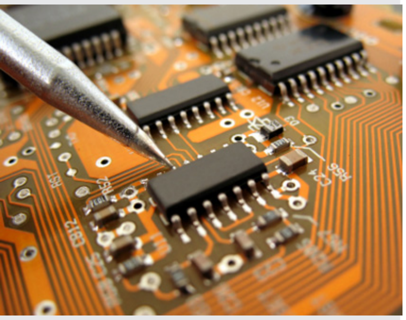
1. N.D.Bhatt, “Engineering Drawing”, 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal, C.M.Agrawal “Engineering Drawing” , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, “Engineering Drawing”, 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, “Engineering drawing”, 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- Analyse the resistive circuits with independent sources and find its solution.
- Solve the AC (single and three phase) and DC circuits using different methods.
- Familiarize the concepts of electromagnetism and it's applications.
- Explain the types of electrical equipment, machines and its applications.
- Acquire the knowledge about the characteristics and working principles of semiconductor diodes, transistor.

SKILLS:

✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*

✓ *Develop a simple loop generator.*

✓ *Design a voltage regulator using Zener diode.*

✓ *Design a half wave rectifier using PN junction diode.*

✓ *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.

6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, “Basic Electrical and Electronics Engineering”, 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, “Electrical Technology”, Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, “Basic Electrical Engineering”, 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to:

- Analyse the quality of the water by volumetric methods.
- Apply the principle of electrochemistry to determine the relative strength of oxidizing/reducing agents for the sample analysis.
- Analyse various factors effecting the rate of corrosion by using weight loss method
- Synthesize and analyse various polymers useful for engineering applications.
- Apply instrumentation methods for chemical analysis.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to:

- Observation and integration of diverse information from variable sources outside of the classroom and helps students to think critically, creatively, resourcefully, and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness
- Collaborating across diverse disciplines and practices to identify and create solutions that conserve and help manage biodiversity for the long term
- Analyze the sources of pollutants and their effects on atmosphere and Adapting eco-friendly technologies and maintain hygienic conditions
- Identify the evidence of Global warming, Ozone depletion and acid rain
- Recognize safe receiving storing and handling of raw and prepared food and maintain hygienic conditions.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES: Environmental studies - Definition scope and its importance, Need for public awareness; Natural resources - Forest resources, Deforestation, Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources, Land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY: Ecosystem - Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems; Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forest community, Bio-villages; Green technology for sustainable development; Life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental protection act; Environmental Impact Asssssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation - Food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions; Role of youth in the development, Promoting activities, Youth as initiators, Field work/environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment, Common plants, Insects, Birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

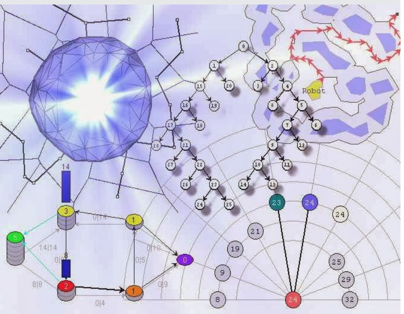
1. Anubha Kaushik and CP Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016
2. Benny Joseph, “Environmental studies”, 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008.
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*



16CS202 DATA STRUCTURES

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explaining how to implement them. It begins with the basic concepts of data and data structures and introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

Course Outcomes:

The student will be able to:

- Apply advanced C programming techniques such as pointers, dynamic memoryallocation, structures to develop solutions for particular problems.
- Analyze characteristics of various data structures.
- Differentiate between Graphs and Trees.
- Derive the importance of sorting and applying it wherever useful.
- Argue the usefulness of data structures in solving problems.

SKILLS:

✓ *Identify the required data structures for various applications.*

✓ *Identify the sorting algorithm suitable for a given scenario.*

✓ *Implement array or linked list for a given problem.*

✓ *Analyse Pros & Cons of each of the data structure.*

✓ *Usage of trees and graphs.*

UNIT - 1 **L-9**

SORTING AND SEARCHING: Introduction - Data, Data type, Data structure, Primitive and Non-primitive - Data type, Data structure; Storage structures - Sequential and linked storage representations; Applications of structures, Hashing.

SORTING: Selection sort, Bubble sort, Insertion sort, Quick sort, Merge sort.

SEARCHING: Binary search and linear search.

UNIT - 2 **L-9**

LINKED LISTS: Introduction, Types of linked list - Singly linked list, Doubly linked list, Circular linked List; Operations - Insertion, Deletion, Traverse forward/reverse order; Multi lists, Applications of linked lists.

UNIT - 3 **L-9**

STACKS AND QUEUES: Stacks - Introduction, Array and linked representations, Implementation and their applications; Queues - Introduction, Array and linked representations, Implementation and their applications, Types - Linear, Circular and doubly ended queues; Applications.

UNIT - 4 **L-9**

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and linked representations; Tree traversals and their Implementation, Expression trees, BST definition and implementation; AVL Trees - Definition and implementation.

UNIT - 5 **L-9**

GRAPHS: Introduction, Properties, Modeling problems as graphs representations - Adjacency matrix, Adjacency list; Traversals - Breath first search and depth first search; Application of graphs.

ACTIVITIES:

- *Design and Implement a School Management System.*
- *Design and Implement a Social Networking Site.*
- *Implement a project to find out the most common words in the articles.*
- *Design and Implement a Library Book Management System.*
- *Design and Implement a CricBuzz Application.*

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- understand the importance of structure, abstract data type and their basic usability in different applications through different programminglanguages.
- understand the linked implementation and its uses both in linear and non-linear data structure.
- understand various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
- decide a suitable data structure to solve a real world problem.

LIST OF EXPERIMENTS Total hours-30

1. Selection, Bubble, Insertion, Quick and Merge sorting algorithms.
2. Linear and Binary search algorithms.
3. Single linked list, doubly linked list, and circular linked list.
4. Stack using an array and linked list.
5. Queue using an array and linked list.
6. Tree using an array and linked list.
7. Check if given expression is fully parenthesis or not using stack.
8. Tree traversing techniques.

9. BST using an array and linked list.
10. Graph traversal techniques.

TEXT BOOK:

1. ReemaThareja, “Data Structures Using C”, 2nd edition, Oxford University Press, 2014.

REFERENCE BOOKS :

1. Richard F. Gilberg and Bhrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd edition, Cengage Learning, 2004.
2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd edition, Tata Mc-Graw Hill, 2004.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education, 2006..

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Course Description and Objectives :

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes :

The student will be able to:

- Identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy,Blacksmithy and House wiring.
- Understand Fabrication of wooden joints.
- Understand joining of metals.
- Make metal joints and sheet metal work.
- Make metal tools like knives, needles, swords, arrows etc.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs etc.*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*
- ✓ *CNC machines and various machining operations and processes.*

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin smithy and Black smithy.
4. House wiring.
5. Foundry and welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS:

1. S.K. Hazra Choudhury, "Elements of workshop Technology", 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice: Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S, "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

II

YEAR

ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech.

I SEMESTER	16EE201	-	Linear Systems and Signal Analysis
	16MS201	-	Management Science
	16EE203	-	Electrical Circuit Analysis
	16EE205	-	Electromagnetic Fields and Transmission Lines
	16EC205	-	Digital Electronics
	16EE207	-	Electronic Devices and Circuit Theory
		-	Employability and Life Skills Elective

II SEMESTER	16EE202	-	D.C Machines
	16EE204	-	Power Generation Systems
	16EE206	-	Power Electronic Devices and Circuits
	16EE208	-	Analog Electronics
	16EL102	-	Soft Skills Laboratory
		-	Department Elective
		-	Department / Open Elective
		-	Employability and Life Skills Elective

COURSE CONTENTS

I SEM & II SEM

16EE201 LINEAR SYSTEMS AND SIGNAL ANALYSIS

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course deals with the fundamentals of linear systems, their properties and analyzing methods. The objective of this course is to make the student to understand concepts of Signals, Systems and apply the tools like transform analysis, convolution etc. to analyze the behavior of linear systems.

Course Outcomes:

The student will be able to:

- Classify signals and systems as discrete/continuous, linear/non- Linear, causal/non-causal, time-variant/invariant.
- Compute the output of a continuous-time or discrete-time linearTime-invariant system using convolution in the integral or sum form.
- Develop the continuous-time Fourier transform from the Fourier series and understand related topics such as time scaling, convolution theorem, Parseval's relation, and uncertainty principleAnd Eigen functions of the Fourier operator..
- Characterize and analyze the properties of continues signals and to Compute Laplace transform.
- Characterize and analyze the properties of discrete signals and to Compute Z-transform.
- Develop the discrete signals from inverse z transforms.

SKILLS:

- ✓ *Simulate the test signals using MATLAB.*
- ✓ *Analyze non-sinusoidal signals using fourier representation.*
- ✓ *Identify system stability using impulse response.*
- ✓ *Analyze the harmonic content in a given signal.*
- ✓ *Analyze the system for application in signal processing.*

ACTIVITIES:

- *Analyse the properties of a system and comment on its stability.*
- *Represent a signal in continuous and frequency domains.*
- *Analyze the harmonic content of a signal using Fourier series.*
- *Analyze the physical resemblance of convolution operation.*
- *Analyze the response of a system by Laplace transform.*
- *Analyze the response of a system by z-transform.*

UNIT - 1 **L-10, T-3**

SIGNALS IN NATURAL DOMAIN: Introduction to signals and systems, Description of signals, Description of systems, Properties of systems, Signal classification, Basic signals in detail, Representation of continuous and discrete time signals, Shifting and scaling operations.

UNIT - 2 **L-8, T-3**

SYSTEMS AND PROPERTIES: Description of systems, Properties of systems, Impulse representation, Linear time invariant systems, Properties of systems - Causality, Time invariance, Linearity, Systems with memory; LTI Continuous time systems, Convolution representation.

UNIT - 3 **L-9, T-3**

SIGNALS IN FREQUENCY DOMAIN: Introduction to transformations, Fourier series representation of periodic signals, Convergence of fourier series and Gibb's phenomenon, Fourier transform, Fourier transform of periodic signals and properties, Convolution theorem, Periodic convolution and Parseval's theorem.

UNIT - 4 **L-9, T-3**

LAPLACE TRANSFORM: Laplace transform, Properties of laplace transform, Inverse laplace transform, Rational system functions, Inverse laplace transform of rational functions, Analysis of LTI systems with rational system functions.

UNIT - 5 **L-9, T-3**

Z TRANSFORM : Z transform, Properties of Z transform, Inverse Z transform, Rational system functions, Inverse Z transform of rational functions, Analysis of LTI discrete systems with rational system functions, Sampling theorem.

TEXT BOOKS:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd edition, Prentice Hall of India, 1997.
2. B.P.Lathi, "Linear Systems and Signals", 2nd edition, Oxford University Press, 2009.

REFERENCE BOOKS:

1. B.P. Lathi, "Signals,Systems & Communications", John Wiley, 1st edition, 2005.
2. Simon Haykin and Van Veen,Wiley, "An Introduction to Signals & Systems", 2nd edition, 2002.
3. John Alan Stuller, "An Introduction to Signals & Systems", 1st edition,Thomson, 2007.
4. H. PHsu "Signals & Systems", 2nd edition, Tata Mc-Graw-Hill Schaum's Outlines, 1995.

16MS201 MANAGEMENT SCIENCE

Hours Per Week :

L	T	P	C
3	-	-	3

Course Description and Objectives:

This course provides an introduction to the evolution of management along with the framework of managerial functions related to organization structure, production, operations, marketing, human resource management, strategy etc. The objective of the course is to introduce the students and make them well versed with the operational functions of management.

Course Outcomes:

The student will be able to:

- Understand the nature and Importance of managerial skills
- Identify the Significance of operations management
- Use production operations in an effective manner through work study, time study etc
- Understand the four P's of marketing for attracting and retaining customers.
- Use methods, tools and techniques for Managing workforce effectively

SKILLS :

✓ *Analyze and improve productivity.*

✓ *Analyze the customer needs, wants and demand.*

✓ *Recognize the need of different types/qualities of Human Resources.*

✓ *Analyze the reasons for the evolution of management.*

✓ *Analyze the philosophies of different management thinkers.*

ACTIVITIES:

- *Solve a test case to identify the various operational functions of management .*
- *Solve a test case to know the importance of marketing.*
- *Solve a test case to know the importance of human resources.*
- *Solve a test case to know the importance and evolution of management discipline.*

UNIT - 1 **L-9**

INTRODUCTION TO MANAGEMENT : Concepts of management and organization, Nature, Importance and functions of management, Systems approach to management, Taylor's scientific management theory, Fayol's principles of management, Mayo's hawthorne experiments, Maslow's theory of human needs, Douglas McGregor's theory X and theory Y, Herzberg's two-factor theory of motivation, Leadership styles, Social responsibilities of management.

UNIT - 2 **L-9**

OPERATIONS MANAGEMENT : Principles and types of plant layout; Methods of production (Job, Batch and Mass Production), Work study - Basic procedure involved in method study and work measurement

UNIT - 3 **L-9**

MATERIALS MANAGEMENT : Objectives, Need for inventory control, EOQ, ABC analysis, Purchase procedure, Stores management and stores records; Statistical quality control - Control charts for variables and attributes (simple problems), Acceptance sampling

UNIT - 4 **L-9**

HUMAN RESOURCES MANAGEMENT (HRM) : Concepts of HRM, Basic functions of HR manager; Manpower planning, Recruitment, Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfer, Separation, Performance appraisal, Grievance handling and welfare administration, Job evaluation and merit rating.

UNIT - 5 **L-9**

MARKETING MANAGEMENT : Evolution of marketing, Functions of marketing selling Vs marketing; 4 P's of marketing, Product mix, Product life cycle, Place mix, Channels of distribution, Price mix, Pricing methods, Promotion mix, Tools of promotions.

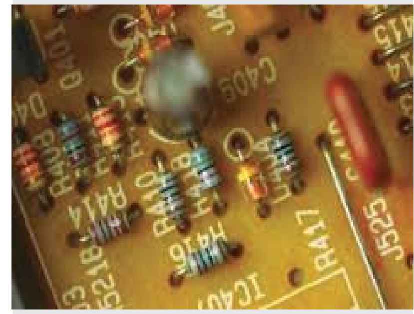
TEXT BOOKS:

1. P. Vijay Kumar, N. Appa Rao, Ashnab and Chnalill, "Introduction to Management Science", 6th edition, Cengage Learning India, 2012.
2. Stoner, Freeman and Gilbert, "Management", 6th edition, Pearson Education, New Delhi, 2004.

REFERENCE BOOKS:

1. Kotler Philip and Keller Kevin Lane, "Marketing Mangement" 12th edition, PHI, 2005.
2. Koontz and Weihrich, "Essentials of Management", 6th edition, TMH, 2005.

16EE203 ELECTRICAL CIRCUIT ANALYSIS



Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course deals with analysis of DC and AC circuits using methods like mesh, node and network theorems. It also introduces the concepts of magnetic circuits and two port networks. The objective of course is to introduce properties of network elements and methods of analysis for various electrical and magnetic circuits.

Course Outcomes:

The student will be able to:

- Analyse basicelectrical and magnetic circuits
- Apply the concepts of series and parallel resonance in networks
- Apply the concepts of series and parallel resonance in networks and analyse balanced and unbalanced three phase Circuits.
- Determinetwo-port parameters and understand concept of coupled circuits.
- Apply the Differential equation and Laplace Transform techniques to solve RL,RC and RLC circuits.
- Realize the electrical circuits practically and verifying them with theoretical knowledge.

SKILLS:

✓ *Determine currents and voltages of all elements in any electrical network.*
✓ *Analyze simple house wiring diagram.*
✓ *Analyze simple magnetic circuits with and without air gap.*
✓ *Calculate power, current and voltage in any three phase circuit.*
✓ *Design suitable fuse for over current protection.*
✓ *Design suitable battery for small applications.*

ACTIVITIES:

- *Design of AC 220V Power Strip for electronic work bench.*
- *Selection of switches , plugs, fuse and wire specifications for domestic loads.*
- *Realize the value of R, L and C for a given application.*
- *Verify different network theorems by conventional approach.*
- *Tune a given circuit for a specified frequency.*
- *Design of Power bank for mobile charger circuit.*

UNIT - 1 **L-10**

CIRCUIT ANALYSIS: Analysis of DC and AC circuits by Mesh and Nodal Analysis - Super mesh and super node analysis, Concept of capacitance, Effects, Energy stored, Series, Parallel and series parallel circuits.

MAGNETIC CIRCUITS: Parallel and Series parallel magnetic circuits-with and without air gap, Fringing effect.

UNIT - 2 **L-8**

NETWORK THEOREMS : Superposition, Thevenin's, Norton's, Reciprocity, Compensation, Maximum Power transfer, Tellegan's and Millman's theorems for both DC and AC circuits

UNIT - 3 **L-9**

RESONANCE: Series and Parallel Resonance, Different combinations, Quality factor, Bandwidth, Selectivity of different circuits.

THREE PHASE SYSTEMS: Three phase voltage generation, Wye and Delta connections, Relationships between line and phase quantities, Balanced and unbalanced systems, Power in three phase circuits.

UNIT - 4 **L-8**

TWO PORT NETWORKS: Open circuit (impedance), Short circuit (admittance), Transmission (ABCD) and Inverse Transmission, Hybrid and inverse hybrid parameters, Interrelation between them, Inter connection of 2-port networks.

COUPLED CIRCUITS: Concept of mutual coupling, Energy considerations, Calculation of equivalent inductance in complex coupled circuit, Coupled impedance, Linear transformer, Ideal transformer considerations.

UNIT - 5 **L-10**

TRANSIENTS : Initial value and final value theorems in laplace transforms, Response of simple R-L, R-C and R-L-C series and parallel circuits subjected to DC and sinusoidal excitations using differential equation approach and laplace transform method with initial conditions, Time constant of R-L, R-C, Series and parallel R-L-C circuits, Response of RL, RC, RLC circuits for impulse and pulse excitations using laplace transform method, Convolution integral, Applications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

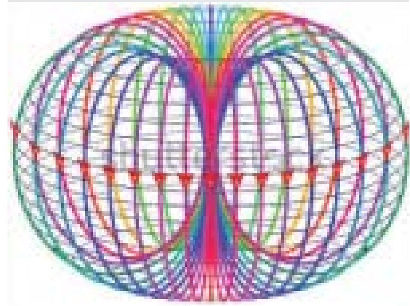
1. Verification of ohm's law, KVL and KCL
2. Determination of mutual inductance for 2 or 3 inductive coils connected in series and parallel.
3. Verification of source transformation technique.
4. Determination of Average and R.M.S. Values of various waveforms.
5. Determination of impedance in complex AC circuits.
6. Measurement of Active and Reactive Power for Star / Delta connected balanced load.
7. Measurement of 3-phase Power by two Wattmeter Method for balanced and unbalanced load (Star / Delta)
8. Verification of Thevenin's , Norton's Theorem , Super-position and Maximum Power Transfer Theorem
9. Determination of Z, Y, h and ABCD Parameters in a Two-Port Network
10. Determination of Time-Response in simple series RL and RC networks

TEXT BOOKS:

1. A.Chakrabarti, "Circuit Theory Analysis & Synthesis, 4th edition, Dhanpat Rai & Co, 2005
2. W.H.Hayt, J.E.Kimmerly and Steven.M.Durbin "Engineering circuit analysis" 6th edition, Tata Mc Graw Hill, 2009.

REFERENCE BOOKS:

1. Joseph Edminister and Mahmood Nahvi, "Electric circuits", 4th edition, Schaum Tata McGraw Hill, 2009.
2. Vanvalkenberg, "Network analysis", 3rd edition, Prentice Hall of India, 2009.
3. David K. Cheng, "Analysis of Linear systems", 1st edition, Narosa Publications, 2002.



16EE205 ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course offers the fundamental knowledge of electro magnetic fields involved in various electrical engineering applications. It introduces Cartesian, Cylindrical and Spherical coordinate systems for Electromagnetic Fields along with the concepts of electrostatics and dynamics for wave propagation in transmission lines and free space. The objective of course is to describe and analyze the facts behind the propagation of signals through transmission lines and free space.

Course Outcomes:

The student will be able to:

- Understand various coordinate systems and vector calculus to electric and magnetic fields.
- Analysethe characteristics, properties and applications of Static Electric fields
- Analysethe characteristics, properties and applications of Static Magnetic Electric fields
- Apply Faraday's Law and Maxwell's Equation to Electro Magneticfields
- Analyse the propagation of Electro Magnetic wave in different media and understand Poynting Vector
- Explain the characteristics of transmission lines used for Electromagnetic Wave propagation

SKILLS:

✓ *Classify the material as linear, isotropic and homogeneous.*

✓ *Draw the magnetic flux patterns for various magnetic sources.*

✓ *Determine electromagnetic field intensities for various kinds of sources in different media.*

✓ *Determine dimensions of the transmission line for various initial conditions.*

✓ *Calculate the transmission line parameters such as characteristic impedance, propagation constant and absorbtion coefficient for mismatched load conditions.*

ACTIVITIES:

- *Draw the field lines due to point charge, line of charges and sheet of charges.*
- *Draw the field lines to illustrate refraction through dielectric.*
- *Draw the field lines to illustrate reflection through a metal plate.*
- *Identify the useful operating frequency range of the given metallic wire.*

UNIT - 1 **L-10, T-3**

CO-ORDINATE SYSTEMS AND VECTOR CALCULUS : Introduction to coordinate systems, Cartesian, Cylindrical and spherical co-ordinate systems, Vector calculus - Differential length, area and volume, Introduction to line, Surface and volume integrals; Definition of Del operator, Gradient, Divergence and curl, Stokes theorem and Laplacian of a scalar.

UNIT - 2 **L-9, T-3**

ELECTROSTATIC FIELDS : Coulomb's law in vector form, Introduction of electric flux, Electric flux density, Electric field intensity, Gauss's law, applications of Gauss's law, Electric field due to continuous distribution of charge, Electric dipole and energy density in electrostatic fields, Electric field in material space - Properties of materials, Convection and conduction currents, Conductors; Polarization in dielectrics, Dielectric constants, Continuity equation and relaxation time, Boundary conditions in electrostatics, Poisson's and Laplace's equations and capacitance.

UNIT - 3 **L-9, T-3**

MAGNETO STATIC FIELDS : Magnetic flux and magnetic flux density, Biot-Savart's law, Ampere's circuit law, Application of Ampere's law, Scalar magnetic and vector magnetic potential, Nature of magnetic materials, Forces due to magnetic field, Magnetic torque and moment, Magnetic dipole, Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

UNIT - 4 **L-8, T-3**

MAXWELL EQUATIONS AND WAVES PROPAGATION : Faraday's Law, Transformer and motional electromotive forces, Displacement current, Maxwell equations in differential and integral form, Electromagnetic wave propagation - Wave propagation in lossy dielectrics, Plane waves in lossless dielectrics, Plane wave in free space, Plane waves in good conductors; Power and the pointing vector, Reflection of a plane wave in a normal incidence.

UNIT - 5 **L-9, T-3**

TRANSMISSION LINES : Introduction to transmission lines with parameters, Transmission line voltage and current equations, Input impedance, Characteristic impedance, Standing wave ratio and power, Some applications of transmission lines.

TEXT BOOKS:

1. William H. Hayt and John. A. Buck, "Engineering Electromagnetics", 7th edition, Mc. Graw-Hill Companies, 2005.
2. M.O.Sadiku, "Elements of Electromagnetics", 2nd edition, Oxford University Press, 1995.

REFERENCE BOOKS:

1. G.S.N. Raju, "Electromagnetic Field Theory and Transmission Lines", 2nd edition, Pearson Education, 2005.
2. John.D.Kraus, "Electromagnetics", 4th edition, McGraw Hill book Co., New York, 1991.
3. Joseph. A. Edminister, "Theory and Problems of Electromagnetics", 2nd edition, Schaum Series, Tata McGraw Hill, 1993.
4. S. Kamakshaiah, "Electromagnetic Fields", 1st edition, Right publishers, 2007.

16EC205 DIGITAL ELECTRONICS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

Digital Electronics deals with fundamentals of number systems, Boolean expressions that are used to realize combinational and sequential circuits. Its objective is to minimize the logical expressions using Boolean postulates, to design various combinational and sequential circuits and to provide with sufficient number of applications to demonstrate the techniques and mathematics used.

Course Outcomes:

Students will be able to:

- Understand the fundamental concepts of digital circuits.
- Designing and practical implementation of Combinational and Sequential logic circuits.
- Analyse the working of ADC and DAC.
- Apply the knowledge of Boolean algebra to implement logic gates.
- Explain the functioning of 8085 microprocessor.

SKILLS:

✓ *Making conversions between numbers of different radices.*

✓ *Identifing the different gates and their properties.*

✓ *Minimize Boolean expression.*

✓ *Constructing different combinational circuits.*

✓ *Constructing different sequential circuits.*

✓ *Verify the functionality of digital circuits.*

✓ *Designing memories.*

ACTIVITIES:

- o *Choose a Gate for digital circuit.*
- o *Design digital circuits using universal gates.*
- o *Design Combinational circuits like adder encoder, decoder.*
- o *Design Sequential circuits like flip flops, counters.*
- o *Design Finite state machines like Mealy and Moore machines.*

UNIT - 1 **L-9**

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Review of number systems - Conversions, Arithmetic operations, Binary codes, Parity code, Hamming code; Fundamental concepts of Boolean algebra- Basic theorems and properties, Canonical and standard forms, Logic gates, Algebraic simplification and realization with basic gates and universal gates.

UNIT - 2 **L-9**

MINIMIZATION OF SWITCHING FUNCTIONS: Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular method, Prime implicant chart.

UNIT - 3 **L-9**

COMBINATIONAL LOGIC DESIGN: Design using conventional logic gates - Encoder, Decoder, Multiplexer, Demultiplexer, Parity bit generator, Code converters, (Designing with gates along with mention of IC numbers); Basic PLDs - PAL, PLA, ROM and PROM.

UNIT - 4 **L-10**

SEQUENTIAL LOGIC DESIGN: Classification of sequential circuits - Latches, Flip-Flops, SR, JK, T, D, triggering and Excitation tables, Design of sequential circuits; Shift registers, Counters, FSM, Sequence detectors.

UNIT - 5 **L-8**

LOGIC FAMILIES: Introduction to logic families - CMOS logic, Bipolar logic, Transistor logic, TTL families; CMOS/TTL Interfacing.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to :

- understand different digital circuits.
- design combinational circuits.
- design sequential circuits.
- analyze FSM for completely specified and incompletely specified sequential machines.
- analyze different types of memories.

LIST OF EXPERIMENTS Total hours:30

Design and Implementation of

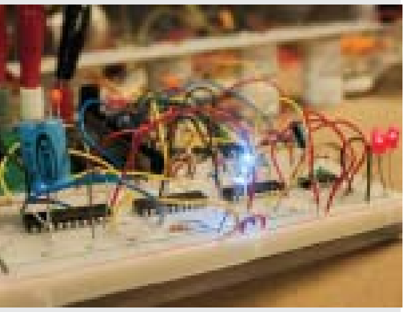
1 Basic Logic Gates.
2 Adders.
3 Subtractor.
4 Decoder.
5 Encoder.
6 Multiplexer.
7 De-Multiplexer.
8 Parity Circuits.
9 Comparator.
10 Flip Flops.
11 Registers.
12 Shift Registers.
13 Counters.
14 Finite State Machines (FSM).

TEXT BOOKS :

1. Morris Mano, "Digital Logic & Computer Design", 1st edition, Pearson, 2013.
2. John F.wakerly, "Digital Design Principles and Practices", 3rd edition, Pearson/PHI/Pearson Education, 2015.

REFERENCE BOOKS :

1. John M. Yarbrough, "Digital Logic Applications and Design", 1st edition, Thomson Publications, 2010.
2. Fletcher, "An Engineering Approach To Digital Design", 1st edition, Prentice Hall of India. 2009.
3. R.P.Jain, "Modern Digital Electronics", 3rd edition, Tata McGraw–Hill publishing company limited, New Delhi, 2010.
4. D. Roy Chowdhury, "Linear Integrated Circuits", 2nd edition, New Age International(p)Ltd, 2012.



16EE207 ELECTRONIC DEVICES AND CIRCUIT THEORY

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course deals with fundamental concepts of semiconductor physics, devices and circuits. The objective of the course is to enable students to hookup and understand working of simple electronic circuits such as clippers, clampers, amplifiers, filters and regulators.

Course Outcomes:

The student will be able to:

- Understand operation of semiconductor devices through energy band diagrams.
- Analyze the characteristics of various semiconductor devices.
- Differentiate between bipolar and unipolar conduction.
- Understand the usefulness of semiconductor devices in circuit making.
- Develop simple electronic circuits for various applications.
- Understand the different semiconductor devices with prescribed characteristics to implement or construct an electronic circuit to give specified output.

SKILLS:

✓ *Identify defective electronic devices.*

✓ *Identify semiconductor diode for a specific application.*

✓ *Identify the transistor type for a given application.*

✓ *Design and simulate simple electronic circuits using Multisim.*

✓ *Design of amplifier for specified gain.*

UNIT – 1 **L-10**

SEMICONDUCTOR DIODES: Intrinsic and extrinsic semi conductors with their energy band diagrams, Mass action law, Formation of pn junction diode, PN-diode working under forward and reverse bias, V-I characteristics of diode, Diode equation, Temperature dependence of V-I characteristics, Energy band diagram of diode, Transition and diffusion capacitances, specifications of diodes, Breakdowns in diodes, Zener diode, Tunnel diode, Varactor diode, LED, Photo diode and LCD.

UNIT – 2 **L-8**

DIODE APPLICATIONS: Basic building blocks of linear mode power supply, Derivations of ripple factor, Efficiency, TUF, Peak factor, Form factor, Percentage regulation and PIV of half wave rectifier, Centre-tapped full wave rectifier and bridge rectifier, Circuit operation and derivation of ripple factor for capacitor filter, Simple zener regulator, Basic operation and types of diode clippers and basic operation and types of diode clampers.

UNIT – 3 **L-9**

TRANSISTORS:

BJT: Formation of PNP and NPN transistors, Transistor current components, Transistor as an amplifier - CB, CE and CC configurations with performance comparison.

FET: Working principles and characteristics of JFET and MOSFET.

UNIT – 4 **L-8**

TRANSISTOR BIASING (BJT & FET): DC load line, AC load line and selection of operating point, Need for biasing, Various biasing techniques - Fixed bias, Collector to base bias and self bias with stability factors; Various compensation circuits, Thermal runaway and thermal stability.

UNIT - 5 **L-10**

SINGLE STAGE AMPLIFIERS:

BJT amplifiers: Small signal low frequency transistor amplifier circuits, h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters - Voltage gain, Current gain, Input impedance and output impedance; Comparison of transistor configurations in terms of A_i, Z_i, A_v and Z_o, Frequency response of common emitter amplifier, Common base amplifier, Common collector amplifier.

FET amplifiers: FET amplifiers at low frequencies, CS, CD and CG configurations at low frequencies, Gain band width product.

ACTIVITIES:

- *Choose a diode for a cell-phone / laptop / tablet adapter.*
- *Zener diode for voltage regulation.*
- *Design three types of biasing circuits and determine the stability factors in each case.*
- *Transistor as an amplifier for the given specifications.*
- *Design a wideband amplifier with FET.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. PN Junction diode characteristics.
2. Zener diode characteristics
3. Design Zener Diode based Voltage Regulator
4. Determination of ripple factor and efficiency of half wave rectifier with and without filter
5. Determination of ripple factor and efficiency of center tapped full wave rectifier with and without filter.
6. Determination of ripple factor and efficiency of bridge rectifier with and without filter.
7. Construction of various diode clipping circuits.
8. Transistor CB characteristics (Input and output).
9. Transistor CE characteristics (Input and output).
10. Transistor CC characteristics (Input and output).
11. FET characteristics.

TEXT BOOKS:

1. J. Millman, C.C. Halkias, "Electronic Devices and Circuits", 9th edition, Tata Mc-Graw Hill, 2012.
2. S.Salivahanan, "Electronic Devices and Circuits" , 5th edition,Tata Mc-Graw Hill, 2010.

REFERENCE BOOKS :

1. R.L.Boylestad and Lovis Nashelsky, "Electronic Devices and Circuits Theory", 10th edition, Pearson Education, 2010.
2. K Thomson, "Electronic Switching Circuits", 2nd edition, Oxford University Press, 2012.
3. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", 6th edition, Oxford University Press, 2010.

16EE202 DC MACHINES

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course deals with construction, types, working principle, operation and applications of DC Generators and Motors. The objective of the course is to enable the students to understand the characteristics of DC Machines and analyze their performance under different testing conditions.

Course Outcomes:

The student will be able to:

- Explain the operation of DC generator and types
- Identify armature reaction and commutation concepts
- Analyze the characteristics and performance of DC generators.
- Describe the torque developed and performance of DC motors.
- Apply the speed control of DC motors
- Testthe performance of different DC machines.

SKILLS:

- ✓ *Analyze magnetizing characteristics of DC Generators*
- ✓ *Analyze load characteristics of DC Generators*
- ✓ *Speed control of DC Motors*
- ✓ *Parallel operation of DC generators.*
- ✓ *Analyze performance of DC machines by conducting various tests.*

ACTIVITIES:

- *Validate Faraday's laws.*
- *Design a simple loop DC generator.*
- *Speed control of DC motor.*
- *Design a battery operated cooling fan.*
- *Design a battery operated electric car.*

UNIT - 1 **L-10**

CONSTRUCTION, WORKING OF D.C. GENERATORS AND EXCITATION METHODS: D.C. Generators - Constructional details, Principle of operation, Action of commutator; Armature windings types - lap and wave windings; E.M.F equation - Problems; Methods of excitation of generators - Separately excited and self excited; Causes of failure to self excitation and remedial measures.

UNIT - 2 **L-9**

TYPES OF D.C. GENERATORS, ARMATURE REACTION AND COMMUTATION: Types of generators - Shunt, Series and compound, Problems; Armature reaction - Effect of armature reaction, Cross magnetizing and de-magnetizing AT/pole, Compensating winding, Interpoles; Commutation process – Reactance voltage, Methods to improve commutation.

UNIT - 3 **L-10**

CHARACTERISTICS AND PARALLEL OPERATION OF D.C. GENERATORS: Build-up of E.M.F under no load, Critical field resistance and critical speed, Internal and external characteristics of shunt, Series and compound generators, Parallel operation of D.C. shunt and series generators, Use of equalizer bar and cross connection of field windings, Load sharing, Applications of DC generators.

UNIT - 4 **L-8**

WORKING OF D.C. MOTORS, TYPES, SPEED CONTROL METHODS AND STARTERS: Principle of operation, Back E.M.F, Torque equation, Starting of DC motors - Necessity and types of starters, 3 point and 4 point starters; Characteristics of shunt, Series and compound motors, Speed control of DC Motors - Armature and field control, Ward-Leonard system; Applications of DC motors.

UNIT - 5 **L-8**

TESTING OF D.C MACHINES: Types of losses - Constant and Variable losses; Calculation of efficiency - Condition for maximum efficiency; Methods of testing - Direct, Indirect and regenerative testing, Brake test, Swinburne's test, Hopkinson's test, Field's test, Retardation test, Problems.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Determination of critical field resistance and critical speed using magnetization characteristics of DC shunt generator.
2. Load test on DC shunt generator.
3. Load test on DC series generator.
4. Load test on DC compound generator.
5. Hopkinson's test on DC shunt machines.
6. Fields test on DC series machines.
7. Swinburne's test on DC shunt motor.
8. Brake test on DC compound motor.
9. Brake test on DC shunt motor.
10. Retardation test on DC shunt motor.
11. Separation of losses in DC shunt motor.
12. Speed control of D.C. shunt motor.

TEXT BOOKS:

1. P.S. Bimbra, "Electrical Machinery", 7th edition, Khanna Publishers, 2004.
2. I.J. Nagrath and D.P. Kothari, "Electric Machines", 3rd edition, Tata Mc-Graw Hill Publishers, 2004.

REFERENCE BOOKS:

1. S. Kamakshaiah, "Electromechanics–I (D.C. Machines)",1st edition, Right Publishers, 2005.
2. A.E. Clayton and Hancock, "Performance and Design of D.C Machines", 3rd edition, BPB Publishers, 2004.
3. R. D. Begamudre, "Electromechanical Energy Conversion with Dynamics of Machines", 2nd edition, New Age International (P) Ltd. Publishers, 2003.
4. M. V. Deshpande, "Electric Machines", 1st edition, Wheeler Publishing, 2000.
5. S.K. Battacharya, "Electrical Machines", 2nd edition, Tata Mc-Graw Hill Companies, 2006.

16EE204 POWER GENERATION SYSTEMS

Hours Per Week :

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course provides an overview of various conventional power generating stations consisting of hydro, thermal, gas, nuclear and non-conventional (solar and wind) power plants. It also deals with various types of electric substations, their layouts and overview of tariff methods. The objective of course is to enable the students to understand the various methods of electric power generation and economical aspects involved in it.

Course Outcomes:

The student will be able to:

- Understand different components and their functioning in thermal and nuclearpower plants.
- Understand different components and their functioning in hydro, gas and combined cycle power plants.
- Understand different components and their functioning in solar and wind power plants.
- Identify the different components and busbar schemes in a substation.
- Analyze the economic aspects of power generation and tariff schemes.
- Develop a prototype, analyze the practical substation and different tariff schemes and arrive at results and conclusions from the learned theoretical knowledge.

SKILLS:

✓ *Understand layout and functioning of conventional power generating plants.*

✓ *Understand layout and functioning of solar and wind power plants.*

✓ *Analyze the different tariff schemes.*

✓ *Analyze the performance indices of a power generating plants.*

✓ *Sketch the layout of substations with specifications of various equipments.*

UNIT - 1 **L-10, T-3**

STEAM AND NUCLEAR POWER GENERATION PLANTS:

Thermal power station: Advantages and disadvantages, Schematic arrangement, Selection of site, Major and auxiliary power plant equipment, Environmental aspects for selecting the site and locations of thermal power stations.

Nuclear power station: Advantages and disadvantages,Schematic arrangement, Selection of site, Radioactivity, Nuclear fuels, Types of reactors - Pressurized water reactors, Boiling water reactors, Gas-cooled reactors; Hazards, Radioactive waste disposal, Environmental aspects for selecting the sites and locations of nuclear power stations.

UNIT - 2 **L-10, T-3**

HYDRO, GAS TURBINE AND COMBINED CYCLE PLANTS:

Hydro power station: Advantages and disadvantages, Schematic arrangement, Choice of site, Constituents of hydro power plant, Hydrographs – Flow duration curve, Mass curve; Pumped Storage plant, Environmental aspects for selecting the sites and locations of hydro power stations.

Gas turbine power plants: Advantages and disadvantages, Schematic arrangement, Equipment and performance.

Combined cycle power pants: Need for Combined cycle power pants, Advantages and disadvantages, Schematic arrangement, types, Integrated gasification combined cycle (IGCC), cogeneration plant, Equipment and performance.

UNIT - 3 **L-8, T-3**

SOLAR AND WIND POWER GENERATION PLANTS:

Need for Renewable energy, Sources and their features.

Solar Power Plant: Importance, Working principle and types, Site selection, Plant layout, Components, Merits and demerits.

Wind Power Plant: Importance, Working principle and types, Site selection, Plant layout, Components, Merits and demerits.

UNIT - 4 **L-8, T-3**

SUBSTATIONS

Indoor and Outdoor substations, Substation layout, Bus bar arrangements in the Sub-Stations -Single bus bar, Sectionalized single bus bar, Main and transfer bus bar system with relevant diagrams.

UNIT - 5 **L-9, T-3**

ECONOMIC ASPECTS OF POWER GENERATION

Economics of Power Generation: Load curve, Load duration and integrated load duration curves, Load, Demand, Diversity, Capacity, Utilization and Plant use factors, Numerical Problems.

Tariff Methods: Costs of generation - Fixed, Semi-fixed and Running Costs; Desirable characteristics of Tariff methods, Tariff methods - Flat rate, Block rate, Two part, Three part, and power factor tariff methods, Numerical problems.

TEXT BOOKS:

1. M.L.Soni, P.V.Gupta,U.S.Bhatnagar and A.Chakraborti, “A Text Book on Power System Engineering”, 1st edition, Dhanpat Rai & Co. Pvt. Ltd., 2007.
2. V.K Mehta and Rohit Mehta, “Principles of Power Systems”, 1st edition, S.Chand & Company Ltd., New Delhi, 2009.

REFERENCE BOOKS:

1. G.D.Rai, “Non Conventional Energy Sources”, 4th edition, Khanna Publishers, New Delhi, 2000.
2. C.L.Wadhwa, “Electrical Power Systems”, 4th edition, New age International (P) Limited, 2008.
3. S.N.Singh, “Electrical Power Generation”, 2nd edition, Transmission and Distribution PHI, 2010.
4. S.P.Sukhatme, J.K.Nayak, “Solar Energy”, 1stedition, Tata Mc-Graw Hill Pvt. Ltd., New Delhi, 2010
5. Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, 1stedition, Oxford University Press, U.K., 2012.

ACTIVITIES:

- *Design a prototype of hydro electric power station with turbine.*
- *Design a working model of solar power plant.*
- *Design a prototype of wind energy conversion system.*
- *Study of power consumption trend in VFSTR University.*
- *Study of power tariff scheme in VFSTR University.*

16EE206 POWER ELECTRONIC DEVICES AND CIRCUITS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course deals with various applications of electronic devices for conversion, control and conditioning of the electrical power. It provides an overview of different types of power semiconductor devices, their switching characteristics, operation and application in power conditioning circuits. The objective of this course is to develop expertise in switching techniques, operation and control of AC-DC, DC-DC, DC-AC and AC-AC converters.

Course Outcomes:

The student will be able to:

- Understand the differences between signal level and power level devices.
- Analyse controlled rectifier circuits.
- Design of DC-DC converters for the given application
- Analyse the operation of voltage source inverters.
- Analyse the operation of AC-AC converters.
- Demonstrate the working of all Power Converters and analysing performance with MATLAB software for different loads.

SKILLS:

✓ *Understand the switching characteristics of various power semi conductor devices.*

✓ *Design the commutation circuits for SCRs based on application.*

✓ *Design a SCR based controlled converter for given specifications.*

✓ *Design a buck converter for given specifications.*

✓ *Design a boost converter for given specifications.*

✓ *Design a PWM generator for given duty ratio.*

UNIT - 1 **L-10**

POWER SEMI-CONDUCTOR DEVICES : Structure, Operation, Static and dynamic characteristics of SCR,TRIAC, Power transistor, MOSFET, IGBT and GTO; Protection schemes, Triggering and commutation of SCR.

UNIT - 2 **L-8**

PHASE–CONTROLLED CONVERTERS : Operation and analysis of 2-pulse, 3-pulse, 6-pulse and dual converters; Inverter operation of fully controlled converter, Effect of source inductance, Distortion, Displacement and ripple factor of converters.

UNIT - 3 **L-8**

CHOPPERS : Step-down and step-up choppers, Control strategies - Time ratio and current limit control; Voltage commutated, current commutated and load commutated choppers.

UNIT - 4 **L-9**

INVERTERS : Classification of inverters – Single phase, Three phase, Series and parallel inverters; Voltage control of single and three phase inverters, Current source inverters and harmonic reduction in inverters.

UNIT - 5 **L-10**

AC - AC CONVERTERS : Single phase AC voltage regulators with R and RL loads, Sequence control of AC voltage regulators; Single phase to single phase cyclo converter - Step up and step down with R and RL loads.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Study of characteristics of SCR, MOSFET and IGBT
2. Gate firing circuits for SCR
3. Single phase AC voltage controller with R and RL loads.
4. Single phase fully controlled bridge converter with R and RL loads.
5. Forced commutation circuits.
6. DC Jones chopper
7. Single phase parallel inverter with R and RL load.
8. Single phase cyclo-converter with R and RL load.
9. Single phase half controlled converter with R and RL load.
10. Single phase series inverter with R and RL load.
11. Single phase bridge converter with R and RL load.

TEXT BOOKS:

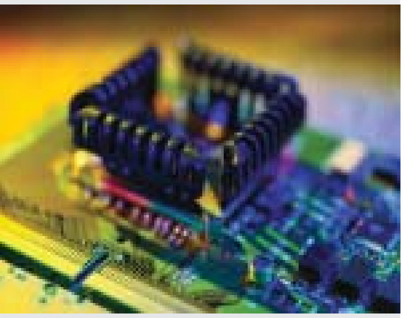
1. P.S.Bimbra, “Power Electronics” 5th edition, Khanna publishers, 2013.
2. M.D. Singh and K.B Khanchandani, “Power Electronics”, 2nd edition, Tata Mc-Graw Hill, 2009.

REFERENCE BOOKS:

1. Vedam Subrahmanyam, “Power Electronics”, 1st edition, New Age, 2001.
2. Ned Mohan, “Power Electronics”, 2nd edition, Wiley, 1995.
3. C.W Lander, “Power Electronics”, 3rd edition, Mc-Graw Hill, 1993.
4. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd edition, Prentice Hall of India, 2009.

ACTIVITIES:

- *Study the data sheets of commercial SCR, GTO and MOSFET.*
- *Design of commutation circuits*
- *Design of gate firing circuits*
- *Design of DC-DC converter for speed control of DC motor*
- *Design of a simple focus light.*
- *Design of a speed regulator for ceiling fan*
- *Design of cyclo converter based heater.*



16EE208 ANALOG ELECTRONICS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course is an extension of electronic devices and circuit theory and deals with feedback amplifiers, oscillators, multistage amplifiers, OP-amps, ADC, DAC, 555 timers and PLL. The objective of the course is to design simple circuits using these devices.

Course Outcomes:

The student will be able to:

- Understand the characteristics of diode, transistors and applications of op amp and 555 timer.
- Analyse various rectifier and amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Apply the knowledge of KVL and KCL to obtain voltage /current/waveform at different points in analog electronic circuits such as diode clippers, clampers
- Conduct experiment using analog electronic components to function as amplifier, comparator, rectifier, ADC and DAC.

SKILLS:

✓ *Analyze the operation of transistor based multistage and feedback amplifiers.*

✓ *Design and simulate amplifier circuits using multisim.*

✓ *Design and analysis of OP-amp based function generator.*

✓ *Realization of multivibrator circuits using 555 timer.*

✓ *Data acquisition using ADC and DAC.*

UNIT – 1 **L-10**

FEEDBACK AMPLIFIERS: Concept and types of feedback amplifiers, Effects of feedbacks, Different topologies of feedback amplifiers and their analysis.

OSCILLATORS: Barkhausen's crieterion for oscillations, Frequency of oscillation for hartley, Colpitts, RC phase shift, Weinbridge and crystal oscillators.

UNIT – 2 **L-8**

HIGH FREQUENCY TRANSISTOR AMPLIFIER CIRCUITS: High frequency model of transistor and its cut-off frequencies, Single stage and multistage amplifiers at high frequencies, Calculation of gain and bandwidth for single and multistage amplifiers.

UNIT - 3 **L-9**

OP-AMP AND ITS APPLICATIONS: Introduction to integrated circuits, Basic information of Op-amp, Ideal and practical Op-amp, Internal circuit, DC and AC characteristics of Op-amp, Modes of operation - Inverting, Non-inverting and differential; Basic application of Op-amp - V to I and I to V converters, Sample and hold circuits, Multipliers, Dividers, Comparators, Differentiators and integrators.

UNIT – 4 **L-9**

555 TIMER: Introduction to 555 timer and its functional diagram; Applications of 555 timer - Schmitt Trigger, Monostable and astable multivibrators, Frequency divider, Linear ramp generator and symmetrical square wave generator.

PHASE LOCKED LOOPS: Introduction to PLL, Principles and description of individual blocks of 565; Applications of PLL - Frequency multiplier and frequency synthesizer.

UNIT – 5 **L-9**

D/A AND A/D CONVERTERS : Introduction to D/A and A/D converters, Basic DAC techniques - Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, and IC1408 DAC; Different types of ADCs - Parallel comparator type ADC, Counter type ADC, Successive approximation ADC and dual slope ADC; DAC and ADC specifications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Design of oscillator circuits.
2. Non-linear wave shaping – clippers.
3. Non-linear wave shaping – clampers.
4. Schmitt trigger using 555 timer.
5. Design of astable multivibrator using 555 timer.
6. Design of monostable multivibrator using 555 timer.
7. Design of basic arithmetic circuits such as adder and subtractor.
8. Design of Integrator and differentiator.
9. Design of voltage comparators using OP-Amp.
10. Digital to analog converter (R-2R ladder).
11. Design of parallel comparator type ADC.

TEXT BOOKS :

1. J. Millman and C.C.Halkias, "Electronic Devices and Circuits", 9th edition, Tata Mc-Graw Hill, 2012.
2. D. Roy Chowdhury, "Linear Integrated Circuits", 3rd edition, New Age International (P) Ltd, 2010.

REFERENCE BOOKS:

1. David A. Bell, "Solid State Pulse circuits", 5th edition, Prentice Hall of India, 2011.
2. Ramakanth A. Gayakwad, "Op-Amps and Linear ICs", 5th edition, Prentice Hall of India, 2011.
3. R.L.Boylestad and Lovis Nashelsky, "Electronic Devices and Circuits Theory", 10th edition, Pearson Education, 2010.

ACTIVITIES:

- *Design of colpitts oscillator for a specific frequency.*
- *Design of Hartley oscillator for a specific frequency.*
- *Design of OP-amp based square wave generator.*
- *Design of pulse generator for triggering SCR.*
- *Design of basic arithmetic based circuits such as adder and subtractor.*
- *Design of Integrator and differentiator.*

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- Analyse the condition of workplace and develop formal communication skills
- Comprehend the working situation by teaming up and working group activities
- Apply the suitable language and speech pattern in a work place
- Enhance the ability of critical and lateral thinking while addressing the issues at any situation

SKILLS:

- ✓ *Communicate and understand the difference between soft skills and hard skills.*
- ✓ *Professionalism and employability skills.*
- ✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*
- ✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*
- ✓ *Prepare resumé and learn how to face interview.*
- ✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan and NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa and Co, 2004.

VFSTR UNIVERSITY

III Year - B.Tech
SYLLABUS

I SEM & II SEM

III Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE313 A.C. MACHINES – II

Course Description & Objectives:

To understand the construction of Synchronous generators & motors and special machines. Develop the ability to use Synchronous generators and motors for various practical applications.

Course Outcomes:

- *Describe the principle of operation and construction of synchronous machines.*
- *Determine and compare voltage regulation of alternators by different methods.*
- *Examine the real problem happening in parallel operation of Alternators.*
- *Plot V and inverted V curves for different power factors and loadings and Plot the power circles of Synchronous motor.*
- *Identify the different features of synchronous & special machines*

UNIT I - Construction & Characteristics of Alternators :

Constructional features of Alternators : Types of alternators–revolving field type- rotating armature type – salient pole and non-salient pole field structure. Speed and frequency – cooling.

Armature windings: Single layer – double layer – full and fractional pitch windings – pitch factor, distribution factor, winding factor – expression for induced emf – Harmonics and their reduction.

Load characteristics: Voltage regulation – causes – effective resistance – leakage reactance – armature reaction – synchronous reactance – open circuit and short circuit tests – phasor diagrams.

UNIT II - Voltage Regulation and SC Characteristics :

Methods of predicting regulation : EMF and MMF methods – ZPF characteristic – Potier reactance – ASA method

Regulation of Salient pole generator : Slip test – direct and quadrature axes synchronous reactance – phasor diagrams – regulation.

Armature current oscillograms on sudden short circuit – determination of subtransient and transient reactances, (Xd”, Xd’).

UNIT III - Parallel Operation :

Parallel operation-methods of synchronization-circulating current – effect of change in excitation – effect of change in prime mover torque – influence of governors on load division between parallel units – Hunting of Alternators – synchronizing power.

UNIT IV - Analysis of Synchronous motors:

Synchronous motor : Principle of operation – phasor diagram– effects of changes of load and excitation on the phasor diagrams V - and inverted V-curves at constant power output - Hunting – damping – starting methods.

Mathematical analysis – Expression for power developed various conditions of maxima – stiffness of coupling – phasor diagrams of salient pole motor – expression for power developed-applications.

Graphical Analysis: Excitation circles – Power circles – construction – maximum and minimum conditions.

UNIT V - Special Machines :

Single phase induction motor: Constructional details – starting arrangements – performance curves and applications - equivalent circuit based on double revolving field theory determination of parameters.

A.C. Series motor – Characteristics – phasor diagram – compensated motor-commutation – interpoles – universal motors - applications.

Special Motors : Permanent magnet motors – stepper motors.

TEXT BOOKS:

1. P.S. Bimbhra, “Electrical Machinery”, 7th ed., Khanna publishers, 2007.
2. I.J. Nagrath and D.P. Kothari “Electrical Machines”, 3rd ed., Tata McGraw Hill, 2006.

REFERENCE BOOKS:

1. Alexander S.Langsdorf , “Theory of alternating current machinery”, 2nd ed., Tata MC Graw Hill, 2005.
2. M.G. Say, “Performance and design of alternating current machines” 3rd ed., CBS, 2002.
3. Charles I Hubert, “Electric Machines (Theory, operation, applications, adjustment and control)” 2nd ed., Pearson, 2009.

III Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE315 POWER SYSTEMS – II

Course Description & Objectives:

To find the parameters, regulation and efficiency of different transmission lines. Study various types of insulators and various types of underground cables.

Course Outcomes:

- Compute the transmission line parameters and transposition of lines
- Analyze different transmission line parameters and performance.
- Describe the power system transients and different condition on transmission lines
- Classify the insulators and explain voltage distribution in a string of suspension.
- Explain UG cables and sag and tension calculations on lines.

UNIT I - Transmission Line Parameters :

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR& GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance Calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT II - Performance of Short and Medium Length Transmission Lines:

Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-Pie and A, B,C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems. Performance of Long Transmission Lines: Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves-Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pie network models (numerical problems).

UNIT III - Power System Transients:

Types of System Transients - Traveling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

UNIT IV - Performance of Transmission lines and Insulators :

Various Factors Governing the Performance of Transmission line:

Skin and Proximity effects Description and effect on Resistance of Solid Conductors -Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

Overhead Line Insulators: Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

UNIT V - Mechanical Design and UG Cables :

Sag and Tension Calculations : Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

Underground Cables: Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

TEXT BOOKS:

1. I.J.Nagarath and D.P Kothari, "Modern Power System Analysis" 3nd ed., Tata Mc Graw-Hill, 2008.
2. C.L.Wadhwa, "Electrical power systems", 4th ed., New Age International (P) Limited Publishers, 2008.

REFERENCE BOOKS:

1. John J Grainger William D Stevenson, "Power system Analysis", 1st ed., TMH Companies, 2005.
2. B.R.Gupta, "Power System Analysis and Design" 3rd ed., Wheeler Publishing, 1999.
3. Hadi Saadat, "Power System Analysis", 1st ed., TMH, 1999.

III Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE317 POWER ELECTRONIC DEVICES AND CIRCUITS

Course Description & Objectives:

This course is to explore the theory and applications of power electronics systems for high efficiency, renewable and energy saving conversion systems. To know the characteristics of different power electronics switches, drivers and selection of components for different applications. To understanding of the switching behavior and design of power electronic converters.

Course Outcomes:

- Understand the differences between signal level and power level devices
- Analyse controlled rectifier circuits.
- Design of DC-DC converters for the given application.
- Investigate the operation of voltage source inverters.
- Analyse the operation of AC-AC converters

UNIT I - Power semiconductor devices:

Power MOSFET, IGBT, GTO their operation and V-I characteristics- Basic theory of operation of SCR - static characteristics - Two transistor analogy - turn on and turn off methods - firing circuits - Dynamic characteristics-Specifications and ratings - Series and Parallel operation – protection circuits-numerical problems.

UNIT II - Single-Phase Control Rectifiers:

Single phase converters - single pulse and two pulse- mid point and bridge connections with R and RL loads –Effect of source inductance - problems.

UNIT III - Three-Phase Control Rectifiers:

Three phase converters - three pulse and six pulse - mid point and bridge connections - effect of source inductance- Dual converters - Problems - performance factors.

Choppers - principle of operation - Classification - Time ratio control and current limit control strategies - step down chopper - Derivation of load voltage and currents with R, RL loads- Jones Chopper - step up chopper - problems.

UNIT IV - AC Voltage Controllers:

Integral cycle control - Single phase half wave- two SCR's in anti parallel - with R and RL loads - modes of operation of Triac - Triac with R and RL loads- numerical problems .

Cyclo converters - Single phase mid point and bridge- with R and RL loads- step up and step down cyclo converters.

UNIT V - Inverters - single phase inverter:

Basic series inverter –modified- Basic parallel inverter - bridge inverters – THD-current source inverter-voltage control techniques for inverters - pulse width modulation techniques -numerical problems.

TEXT BOOKS:

1. Dr.P.S.Bimbra, "Power Electronics" 4th ed., Khanna publishers, 2009.
2. M.D. Singh & K.B Khanchandani, "Power Electronics", 2nd ed., Tata MC Graw Hill, 2009.

REFERENCE BOOKS:

1. Vedam Subrahmanyam, "Power Electronics", 1st ed., New Age, 2001.
2. Ned mohan, "Power Electronics", 2nd ed., Wiley, 1995.
3. C.W Lander, "Power Electronics", 3rd ed., MCGraw Hill, 1993.
4. M.H.Rashid, "Power Electronics: Circuits, Devices and Applications", 3rd ed., Prentice Hall of India, 2009.

III Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE319 LINEAR CONTROL SYSTEMS

Course Description & Objectives:

This course is to explore the modeling of linear dynamic systems via differential equations and transfer functions utilizing input-output representations; analysis of control systems in the time and frequency domains and using transfer function and state-space methods

Course Outcomes:

1. Formulate differential equations for electromechanical systems.
2. Describe the effects of feedback on control systems.
3. Apply mathematical techniques to perform time response analysis of a control system.
4. Analyse linear control systems for absolute stability and relative stability using Root Locus technique and frequency domain analysis.
5. Design controllers and compensators for the given system to achieve desired specifications.

UNIT I - Introduction to Control Systems :

Introduction: Concepts of Control Systems - Open Loop and closed loop control systems and their differences - Different examples of control systems - Clasification of control systems.

Mathematical Models of Physical Systems : Differentical equations - transfer functions and block diagram representation of systems considering electrical systems as examples Block diagram algebra -Representation by Signal flow graph - reduction using Mason's gain formula - translational and rotational mechanical systems.

UNIT II - Feed-Back Characteristics and Control Components :

Feed-Back Characteristics : What is Feedback? Effects of feedback - reduction of parameter variations by use of feedback-Control over system dynamics - by the use of feedback.

Elements of Control Systems : DC Servo motor - AC Servo motor - Synchro transmitter and Receiver.

UNIT III - Time Response Analysis & Stability :

Time Response Analysis : Standard test signals - Time response of first order systems - Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications - Steady state response - Steady state errors and error constant.

Concepts of stability : The concept of stability, Routh stability criterion.

UNIT IV - RL Technique & Frequency Response Analysis :

Root Locus Technique : The root locus concept - construction of root loci.

Frequency Response Analysis : Introduction, Frequency domain specifications - Bode diagrams - Determination of Frequency domain specifications from the Bode Diagram - Phase margin and Gain margin - Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots and Nyquist stability criterion

UNIT V - Design and Modern Control Systems :

Design and Compensation Technique : Introduction and Preliminary design considerations - Lead, Lag, Lead-lag. PID controller.

State Space Analysis of Continuous Systems : Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization - Solving the Time Invariant state Equations - State Transition Matrix.

TEXT BOOKS :

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", 2nd ed., New Age International (P) Limited, 2010.
2. Katsuhiko Ogata, "Modern Control Engineering", 3rd ed.,Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS :

1. B. C. Kuo, "Automatic Control Systems", 8th ed., John wiley and son's, 2003.
2. John wiley, "Control Systems Engg"., 3rd ed., NISE, 2000.

III Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE321 DIGITAL ELECTRONIC CIRCUITS
(Dept. Elective - I)

Course Description & Objectives:

As part of this course, students: To introduce the concepts and techniques associated with the number systems and codes. To minimize the logical expressions using Boolean postulates. To design various combinational and sequential circuits. To provide with an Sufficient Number of applications for the techniques and mathematics used in this course.

Course Outcomes:

- Assimilate the philosophy of number systems and codes.
- Perceive the Boolean laws and postulates and implementation using logic gates.
- Design and implement Combinational logic circuits.
- Design and implement Sequential logic circuits.
- Expound the nomenclature and technology in the area of logic families and memory devices.

UNIT I - Number System :

Binary arithmetic (Addition, subtraction, multiplication, division), octal number system, hexadecimal number system, 1's and 2's complement. Signed numbers, EX-3, gray code alphanumeric code, EBCDIC, ASCII,, Error detection & correction, parity, 7- bit hamming

UNIT II - Logic gates and Minimization :

Basic gates, Universal gates, and their truth tables, postulates of Boolean algebra, De-Morgan's theorem Min term and Max term representation of logical function, Minimization using K-map- Don't care condition, Quinn Mc-clusky method for minimization.

UNIT III - Combinational Logic :

Half and full adders, parallel adder, subs tractor, decoder (BCD to Seven segment), Encoder, Multiplexer, Demultiplexer, parity generation & checking, Look ahead carry generator.

UNIT IV - Sequential Logic :

Sequential circuits, flip-flops (SR,D,T, JK, Master-slave), timing specifications, asynchronous and synchronous counters-up/down counters. Registers , serial in serial out shift registers.

UNIT V - Memory and Logic Families :

Memory: RAM, ROM,PROM, EPROM and Flash memory, Introduction to Cache memory

Logic Families: Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin, Comparison of logic families and their characteristics. TTL (NAND, NOT, TOTEMPOLE), CMOS (NOR,NOT and NAND) integrated circuits .

TEXTBOOKS :

1. ZVI KOHAVI, " Switching and Finite Automata Theory",2nd ed. TMH,2009
2. Morris Mano, "Digital Logic & computer Deisgn",1st ed,Pearson

REFERENCES :

1. John M. Yarbrough, "Digital Logic Applications and Design",1st ed.,Thomson Publications, 2006.
2. Fletcher, "An Engineering Approach To Digital Design" , 1st ed.,Prentice Hall of India. 2009.
3. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
4. Thomas. L.Floyd, "Digital fundamentals",9th ed, Prentice Hall,2005
5. John F walkerly, Digital Design Principles and Practices, 3rd ed., PHI/ Pearson Education, 2005.

III Year B.Tech. EEE   I - Semester

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4	-	-	4	4

EC221 SIGNALS AND SYSTEMS
(Dept. Elective - I)

Course Description & Objectives:

This course is an introduction to the basic concepts and theory of analog signal processing. In this course signals & systems, the concepts associated with continuous-time signals and systems are focused.

The objective of this course is to provide understanding of the fundamental properties of linear systems, linear systems tools, especially transform analysis and convolution, to analyze and predict the behavior of linear systems.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Understand basic signals and their representation using Fourier series. (unit-1)
- Apply the concept of transform techniques, convolution and correlation for continuous time signals (unit-2 and 4)
- Evaluate the step, impulse and system response of a LTI System to arbitrary inputs. (Unit-3)
- Learn the fundamentals of sampling including the implications of sampling theorem. (unit-5)

UNIT I - Introduction & Fourier series Representation of Periodic Signals:

Introduction to signals and systems. Basic signals, classification and operations.

Vectors vs Signals, Orthogonal functions, Representation of signals using orthogonal functions, Mean square error. Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series , Exponential Fourier series and Complex Fourier spectrum.

UNIT II - Fourier Transforms & Laplace Transforms :

Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function, Introduction to Hilbert Transform.

Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, relation between L.T and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT III - LTI Systems & Analysis:

Classification of Systems, Linear Time Invariant (LTI) System, Impulse Response, Step Response, response of a LTI system to arbitrary inputs, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT IV - Convolution & Correlation of Signals :

Concept of convolution in time domain and frequency domain, Graphical representation of Convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and power spectral density. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT V - Sampling:

Sampling theorem: Graphical and analytical proof for Band Limited Signals, Impulse sampling, Natural and Flat Top Sampling, Reconstruction of signal from its samples, effect of under sampling- Aliasing, Introduction to Band Pass sampling.

TEXT BOOKS:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd ed.,Prentice Hall of India, 1997.
2. B.P.Lathi, "Linear Systems and Signals", 2nd ed., Oxford University Press, 2009

REFERENCE BOOKS:

1. B.P. Lathi, "Signals,Systems & Communications", John Wiley, 2005.
2. Simon Haykin and Van Veen,Wiley, "An Introduction to Signals & Systems", 2nd ed., 2002.
3. John Alan Stuller, "An Introduction to Signals & Systems" Thomson, Indian ed., 2007.
4. H PHsu "Signals & Systems", 2nd ed., Tata McGraw-Hill Schaum's Outlines, 1995.

III Year B.Tech. EEE   I - Semester

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EE323 ENERGY CONVERSION AND STORAGE TECHNOLOGIES
(Dept. Elective - I)

Course Description & Objectives:

Direct energy conversion systems. Need and necessity of energy storage systems and their desirable characteristics. To discuss on the working of a typical fuel cell, its types and to elaborate on its thermodynamics and kinetics. To detail on the various Hydrogen storage options

Course Outcomes:

- Analyse the basic concepts of energy storage system.
- Apply the energy storage systems in real time application.
- Design of suitable battery configuration.
- Examine various hydrogen storage options.
- Compare the electrical, mechanical and thermal energys storage systems.

UNIT I - Direct Conversion Of Thermal To Electrical Energy:

Thermoelectric Converters –Thermionic converters – MHD – Ferro electric converter – Nernst effect generator.

UNIT II - Chemical & Electromagnetic Energy To Electrical Energy:

Batteries – types – working – Cell capacity; Types & Specifications of Batteries; Charging & Discharging of Battery; Safe disposal of Batteries -performance governing parameters.

UNIT III - Energy Storage Systems:

Energy Storage Technologies - Mechanical energy, Electrical energy, Chemical energy, Thermal energy.

UNIT IV - Fuel Cells:

Basics – types – working – comparative analysis – thermodynamics and kinetics of fuel cell process –performance of fuel cell – applications - advantages and drawbacks - comparison on battery Vs fuel cell

UNIT V - Hydrogen Storage:

Hydrogen storage options – compressed gas – liquid hydrogen – Hydride – chemical Storage – Comparisons. Safety and management of hydrogen.

TEXT BOOKS:

1. Archie.W.Culp, Principles of Energy Conversion, McGraw-Hill Inc., 1991, Singapore.
2. Viswanathan, B and M Aulice Scibioh, Fuel Cells – Principles and Applications,Universities Press (2006).

REFERENCE BOOKS:

1. Kordesch, K and G.Simader, Fuel Cell and Their Applications, Wiley-Vch, Germany (1996).
2. Kettari, M.A.Direct Energy Conversion, Addison-Wesley Pub. Co. 1997.
3. Bent Sorensen (Sørensen), Hydrogen and Fuel Cells: Emerging Technologies and Applications, Elsevier, UK (2005).

III Year B.Tech. EEE I - Semester

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SR004 SEMINAR

Course Description & Objectives:

In this course students are expected to study specialized area by doing literature survey, understanding technical problems and arriving at a status report in that area. During the preparation of seminar, the student is expected to learn investigation techniques, study suitable research papers, understanding concepts, techniques, prevailing results etc., analyze it and present a seminar report.

Course Outcomes:

- Collect information about emerging technologies /market demands/ current trends.
- Organize & Analyze information about emerging technologies /market demands/current trends
- Exhibit effective communication skills, stage courage, and confidence.
- Demonstrate intrapersonal skills
- Prepare a well-organized report employing elements of technical writing and critical thinking

III Year B.Tech. EEE I - Semester

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EE325 A.C. MACHINES LAB

Course Description & Objectives:

To analyse the performance of 1-p and 3- p transformers by conducting various experiments. To analyse the performance of 1-p and 3- p Induction motors by conducting various experiments. To analyse the performance of 3- p Synchronous Machines by conducting various experiments.

Course Outcomes:

- *Test the transformer and find its performance.*
- *Perform parallel operation of transformers.*
- *Test the induction motors and find their performance.*
- *Test the Synchronous Machine and find its performance.*
- *Obtain the synchronous reactrance values for different synchronous machines.*

List of Experiments :

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single phase transformers
3. Scott connection of transformers
4. No-load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
6. V and Inverted V curves of a three—phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor
8. Determination of Xd and Xq of a salient pole synchronous machine
9. Parallel operation of Single phase Transformers
10. Separation of core losses of a single phase transformer
11. Brake test on three phase Induction Motor
12. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
13. Load Test on three-phase alternator
14. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
15. Measurement of sequence impedance of a three-phase alternator.

Note : Any 10 of above experiments are to be conducted.

III Year B.Tech. EEE   I - Semester

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EE327 ELECTRICAL MEASUREMENTS & INSTRUMENTATION LAB

Course Description & Objectives:

The ability to conduct experiments to determine the constitutive parameters like resistance, inductance and capacitance using bridge methods. The ability to conduct experiments to determine electrical parameters like active power, reactive power, energy using Wattmeter and Energy meters and also to calibrate these instruments. The ability to calibrate meters with the available loads including Power factor meter at different load conditions. The ability to conduct experiments on Transducers like LVDT, strain gauge to find displacement and strain.

Course Outcomes:

- Understand the usage of various types of Analog and Digital meters.
- Examine and calibrate various Wattmeters using direct loading and phantom loading.
- Understand the methods of Measurement of Resistance, Inductance and Capacitance using AC & DC bridges.
- Determine the errors in Potential Transformers and Current Transformers
- Interpret measurement of 3 phase powers using various wattmeter connections.

List of Experiments:

1. Calibration and Testing of single phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter \ and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.

5. Measurement of % ratio error and phase angle of given C.T. by comparison.
6. Schering bridge & Anderson bridge.
7. Measurement of 3 phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
9. Calibration LPF wattmeter – by Phantom testing.
10. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
11. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given C.T. by Null method.
12. Dielectric oil testing using H.T. testing Kit
13. LVDT and Stain gauge – characteristics and Calibration
14. Transformer turns ratio measurement using a.c. bridge.
15 A.C. Potentiometer – Polar form/Cartesian form – Calibration of AC Voltmeter, Parameters of Choke.

Note : Any 10 of above experiments are to be conducted.

III Year B.Tech. EEE I - Semester

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HS304 PROFESSIONAL COMMUNICATION LAB

Course Description & Objectives:

The Professional Communication exposes students to conventions of corporate communication and documentation procedures involved in the day-to-day functioning of the business world. The course is aimed at improving written communication skills of undergraduate students and preparing them to meet professional challenges in the work spheres. Writing and Personality are not two exclusive spheres of influence and this course will work on the relationship between professional writing and a personality that is able to meet the goals of an organization in creative and innovative ways.

Training Methodology:

The methodology is designed to give hands-on practice to students in formal and informal report writing, structure and format of letters as well as other organization related work.

Course Outcomes:

- Analyze and ability to write business correspondence and reports and proposals clearly and precisely
- Communicate effectively both in their academic as well as professional environment
- Identify clear grasp on the register of business language and ethical communication in communication
- Distinguish the differences between formal and informal communication

Mechanics of writing

- Elements of Technical Writing : Sentence structure - reducing verbosity - arranging ideas logically – building coherence - paragraph level and document level - topic sentence - cohesive devices – transitionals – paraphrasing – précis-writing.
- Mechanics of Writing: Stylistic elements – the rapporteur- the purpose- the reader (audience) - elementary rules of grammar- choice of diction - elementary principles of composition - matters of form – punctuation - conventions of business communication -language and tone - weak links in business correspondence - ethical concerns in business writing.

Business Report Writing

- Parts of the Report: Writing an abstract - features of a good abstract – approach - compare and contrast - cause and effect.
- Types of Technical Reports : Drafting a technical proposal - formal and informal proposals - factual reports, feasibility reports, survey reports – parts of a report - title page –declaration – acknowledgements – table of contents - abstract – introduction – conclusion – citations – references - appendices - oral reports and presentations

Business Letter Writing

- Letter-Writing - Formal and informal letters - structure of formal letters - expressions of salutations, introductory and concluding paragraphs - different types of letters - sales letter - complaint letter - adjustment letter - letter to the editor - covering letter - claim letter – letter of condolence.

Business E- writing:

- E-mail – nature and scope - e-mail etiquette – Common Errors in composing e-mails – Quotations - Inviting quotations - sending quotations –placing orders Office Communication - agenda - notice - circular
- Effective Resume-Writing: Structure and presentation - defining career objective - projecting one's strengths and skill-sets
- Summarizing - formats and styles - covering letter.

Business visual presentations

- Business Proposals: Drafting business proposals - calculating profit and loss-averages - ratios and proportions – partnership - simple interest - compound interest - calculating volumes and areas
- course of action - cause and effect- theme detection - making judgments - logical deductions - analyzing arguments – syllogisms - Venn diagrams - matching definitions -verbal reasoning - numerical reasoning - working out justifications.

REFERENCE BOOKS:

- Strunk, William, Jr.*The Elements of Style*, Fourth Edition,
- Rozakis, Laurie, Ph.D, (2003). *English Grammar for the Utterly Confused*, McGraw-Hill
- Sharma. C. (1978) *Business Correspondence & Report Writing*, Tata McGraw-Hill
- Kirkman, John. *Good Style: Writing for science & technology*, Routledge Study Guides, Second Edition.
- Monippally, Matthukutty. M. 2001, *Business Communication Strategies*, 11th Reprint, Tata McGraw-Hill, New Delhi.

III Year B.Tech. EEE II - Semester

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EE316 MICROPROCESSOR ARCHITECTURE AND CONTROL

Course Description & Objectives:

To learn the fundamentals of 8086 architecture. To gain knowledge in interfacing devices. To learn the concepts microcontroller and their applications.

Course outcomes:

- Understand the 8086 microprocessor architecture and functional block diagram of 8086 microprocessor along with the pins.
- Apply the programmers model of 8086 with complete instruction set.
- Interface memory and I/O devices with 8255 Programmable peripheral Interface (PPI) to 8086 microprocessor and to analyze the 8259 PIC and 8257 DMA controller.
- Analyze the internal architecture and real time control of 8051 microcontroller.
- Interface the input and output devices like LCD, ADC, DAC, and sensor and stepper motor interface with 8051 microcontroller.

UNIT I - INTRODUCTION TO 16 BIT MICROPROCESSORS – H/W ARCHITECTURE:

8086 – Hardware Architecture, Memory, Registers, Pin diagram, Bus cycles, Maximum and Minimum mode operations and bus cycle, Interrupt processing.

UNIT II - 16 BIT MICROPROCESSOR INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING:

Programmer's model of 8086: Assembler directives, instruction set - Data transfer group, Arithmetic group, logical group, control transfer group, miscellaneous instruction groups, programming. Introduction to Procedures and Macros.

UNIT III - MICROPROCESSOR PERIPHERAL INTERFACING - I:

Introduction to I/O Interfacing, Generation of I/O Ports, Programmable Peripheral Interface (PPI)-Intel 8255- Architecture, Modes, LED interfacing, D-to-A converter, A-to-D converter, stepper motor interfacing.

UNIT IV - INTERFACING II:

Programmable interrupt controller Interfacing(8259), Direct Memory Access Controller Interfacing(8257), USART Interfacing(8251).

UNIT V - 8 BIT MICROCONTROLLER- H/W ARCHITECTURE, INSTRUCTION SET AND PROGRAMMING:

Introduction to 8051 Micro-controller, Architecture, Memory organization, Special function registers, Port Operation, Memory Interfacing, I/O Interfacing, Programming 8051 resources, interrupts, Programmer's model of 8051, Operand types, Operand addressing, Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions.

TEXTBOOKS:

1. Advanced Microprocessors and Peripherals - A. K. Ray and K.M. Bhurchandani, TMH, 2nd Edition 2006.
2. Microprocessors and Interfacing – Hall, TMH, 2nd Edition 2006.

REFERENCE BOOKS:

1. Micro Computer System 8086/8088 Family Architecture. Programming and Design - By Liu and GA Gibson, PHI, 2nd Edition 2008.
2. MicroProcessors and Microcontrollers, Krishna Kant, PHI, 2007.
3. The 8051 Microcontroller – Kenneth.J.Ayala, Cengage learning, 3rd Edition 2007.

III Year B.Tech. EEE II - Semester

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EE318 SWITCH GEAR AND PROTECTION

Course Description & Objectives:

To understand the need of protection of electric equipment and their protection schemes. To understand operations & characteristics of various electromagnetic and static relays. To understand the operations of various types of circuit breakers and their ratings. To understand the unit protection and over voltage protection of different apparatus in power system.

Course Outcomes:

- Apply quenching mechanisms used in air, oil, sf6 and Vacuum Circuit Breakers
- Design the Relay Settings for different types of relays.
- Analyze the Bus bar Protection and neutral grounding
- Design the Protection schemes for generator and transformer.
- Understand the causes of over voltages and analyze different types of lighting arresters

UNIT I - Introduction to Power System Protection & Circuit Breakers:

Introduction to Power System Protection: Importance and Requirements of Protective system - Overview of Switchgear equipments.

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restricking Voltage - Restricking Phenomenon, Average and Max. RRRV, Numerical Problems. Current Chopping and Resistance Switching. CB ratings and Specifications, Auto reclosures.

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT II - Relays :

Electromagnetic and Static Relays : Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays.

Relays Classification: Instantaneous, DMT and IDMT types, Over current, Direction relays, Differential Relays and Percentage Differential Relays, Universal torque equation,

Distance Relays: Impedance, Reactance and Mho Characteristics of Distance Relays and Comparison.

Static Relays: Static Relays verses Electromagnetic Relays.

UNIT III - Fuses, and Grounding Practices:

Fuses: Desirable Characteristics of Fuse Elements, Important terms in Fuses, Types of Fuses, HRC fuse.

Feeder and Bus-Bar Protection : Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay. Protection of Bus bars – Differential protection.

Neutral Grounding : Grounded and Ungrounded Neutral Systems - Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

UNIT IV - Generator & Transformer Protection:

Generator Protection : Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected.

Transformer Protection : Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay.

UNIT V - Protection against over voltages :

Generation of Over Voltages in Power Systems - Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters. Insulation and Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics and Insulation Co-ordination.

TEXT BOOKS:

1. Sunil S Rao, "Switchgear and Protection" 12th ed., Khanna Publlishers, 2007.
2. Badari Ram , "Power System Protection and Switchgear" 1st ed., D.N Viswakarma, TMH Publications, 2005.

REFERENCE BOOKS:

1. T S Madhav Rao, "Power System Protection : Static Relays", 2nd ed. Tata MC Graw-Hill, 2007.
2. CL Wadhwa, "Electrical Power Systems", 4th ed., New Age international (P) Limited, 2008.
3. Paithankar and S.R.Bhide., "Fundamentals of Power System Protection" 1st ed., Prentice Hall of India, 2007.

III Year B.Tech. EEE II - Semester

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MS310 MANAGERIAL ECONOMICS

Course Description & Objectives:

To make the student familiar with the basic concepts and principles of Business Economics. The course aims to develop student's capacity to analyze the economic environment in which business entities operate and understand how managerial decisions can vary under different constraints that each economic environment places on a manager's pursuit of it's goals, focusing on analyzing the functioning of markets and the economic behavior of firms and other economic agents.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

- To understand the nature and scope of Managerial Economics and the role of demand analysis in managerial decision making.
- To interpret long-run, short-run production functions and companies cost analysis using cost output Relationship in the short-run and long-run:
- To design Competitive strategies like pricing, product differentiation etc. according to the market structure
- To estimate the profit or loss position of an organisation using brak-even analysis.
- To analyse the financial position of a company using ratios.

UNIT I - Nature & Scope of Managerial Economics:

Basic tools and techniques of Business Economics, Macro Economic Environment and Managerial decisions.

UNIT II - Demand Analysis:

Types of Demand, Demand determination Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT III - Theory of Production:

Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors, Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT IV - Cost Analysis:

Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis.

UNIT V - Markets and price determination :

Features and types of different competitive situations – Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

TEXT BOOKS:

1. Gupta: Managerial Economics, 1/e TMH, 2005.
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010.

REFERENCE BOOKS:

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006.
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004.

III Year B.Tech. EEE II - Semester

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CS223 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course description and Objectives:

On Completion of this course, the student will be able to understand fundamentals of object- oriented programming in Java, including defining classes, invoking methods, using class libraries. Have the ability to write a computer program to solve specified problems. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

- Apply propositional logic, predicate logic and Boolean functions to formally express the mathematical properties.
- Analyze the basic mathematical objects such as sets, relations and functions to verify the mathematical properties.
- Construct solutions to solve different Graph problems includes Coloring, Searching and traversing.
- Construct solutions to solve different Graph problems includes Coloring, Searching and traversing.
- Implement pattern matching and string searching algorithms.

UNIT I - Introduction, Classes and Objects:

Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects Class fundamentals – Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT II - Inheritance, Packages and Interfaces:

Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and

Accessing a Package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces.

UNIT III - Exception Handling, Multithreading:
Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating own exception Sub classes, Concepts of Multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, deadlocks, Thread groups.

UNIT IV -

Applets -Applet Class, Applet Architecture, Applet Skeleton - Applet Initialization and Termination, Overriding update(), Simple Applet, Display Methods, Requesting Repainting - A simple banner Applet, Using The Status Window, The HTML APPLET Tag, Passing parameters to Applets, Applet Context and show Document.

Event Handling & AWT Controls: Event sources, Event classes – ActionEvent, AdjustmentEvent, ComponentEvent, Container Event, Focus Event, InputEvent, ItemEvent, KeyEvent and MouseEvent, Delegation event model, Event Listeners, Handling mouse and Keyboard events, Adapter classes.

UNIT - V
AWT: Concepts of components, Container, Panel, Window, Frame, Canvas, Font class, Color class and Graphics. AWT Controls : Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers - Flow, Border, Grid, Card and Grid bag.

Swing:JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, Text fields, Buttons–The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS :
1.Herbert Schildt, “The Complete Reference Java J2SE”, 7th ed., TMH Publishing Company Ltd, New Delhi, 2008.
2.Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd ed., TMH, 2009.

REFERENCE BOOK :
1. Cay Horstmann, “Big Java”, 2nd ed., John Wiley and Sons, 2006.

III Year B.Tech. EEE II - Semester

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EE320 HIGH VOLTAGE DC TRANSMISSION (Dept. Elective - II)

Course Description & Objectives:

To know importance, advantages and applications of HVDC over HVAC transmission system. To know the concepts of 6 pulse and 12 pulse converters and their characteristics. To know the principle of operation of DC Motors. To know the operation of DC link, constant current, constant extinction angle control and firing angle control methods. Able to know the parallel operation of HVDC and HVAC systems, operation MTDC systems. Able to know the converter faults in HVDC, over voltages, AC&DC filters design functions.

Course Outcomes:

- Compare EHV AC and HVDC system and to describe various types of DC links.
- Analyze Graetz circuit for rectifier and inverter mode of operation.
- Describe various methods for the control of HVDC systems.
- Apply the concepts of MTDC systems operation and stability analysis of interconnected systems.
- Competency in designing filters & describe various protection methods for HVDC systems.

UNIT I - Introduction to HVDC Transmission :

Introduction to AC and DC Transmission – application of DC Transmission – description of DC transmission – DC system components and their functions – modern trends in DC Transmission.

UNIT II - Analysis of Converter Circuits :

Pulse Number – Converter configuration – analysis of Graetz circuit – converter bridge characteristics – characteristics of 12 Pulse converter.

UNIT III - HVDC Controllers :

General principle of DC link control – converter control characteristics – system control hierarchy – firing angle control – current and extinction angle control – DC link power control – high level controllers.

UNIT IV - Inter Connected Systems :

Simulation of HVDC systems, Parallel operation of HVDC and AC systems, multi terminal DC systems. Stability of AC/DC interconnected systems Reactive Power requirement, types of forced commutation. Smoothing reactors - Functions, double commutation failure, consequent commutation failure - their prevention.

UNIT V - Filters and Protection :

Introduction to harmonics – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise. Basics of protection – DC reactors – voltage and current oscillations – circuit breakers – over voltage protection – switching surges – lightning surges – lightning arresters for DC systems.

TEXT BOOKS:

1. Das Begamudre R, "The E H V A C Transmission" 3rd ed., New Age International, 2007.
2. S. Rao, "HVAC and DC Transmission", 3rd ed., Khanna Publishers, 2001.

REFERENCE BOOK:

1. Padiyar. K. R., "HVDC Power Transmission Systems", 2nd ed., New Age Publishers, 2010.

III Year B.Tech. EEE II - Semester	L	T	P	TO	C
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EE322 AI TECHNIQUES IN ELECTRICAL ENGINEERING
(Dept. Elective - II)

Course Description & Objectives:

This course is to understand the fundamentals of fuzzy sets, fuzzy logic control systems and artificial neural networks based on biological neuron in electrical engineering. To study and understand the principle of Genetic Algorithms and its applications.

Course Outcomes:

- Understand the basic concepts of biological and artificial neurons and their networks.
- Design artificial neural networks using back propagation algorithm and associative memories.
- Compare classical and fuzzy set theory.
- Design fuzzy logic based electrical systems.
- Apply genetic algorithms for optimization problems in electrical engineering.

UNIT I - Fundamentals of Neural Networks :

Basic concepts of neural networks, Human Brain, Model of an artificial neuron, Neural network architectures, characteristics of neural networks, learning methods, taxonomy of neural network architectures. Broad application areas in Electrical Engineering.

UNIT II - BP Networks and Memories :

Backpropagation networks : Architecture of a Backpropagation network, backpropagation Learning, Illustration, Applications, Effect of tuning parameters of the backpropagation neural network, selection of various parameters in BPN.

Associative Memory : Autocorrelators, Heterocurrelators, BAM.

Application of Neural Networks in some basic problems of Electrical Engineering.

UNIT III - Classical & Fuzzy Sets:

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT IV - Fuzzy Logic System Components:

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

Application of Fuzzy logic in some basic problems of Electrical Engineering

UNIT V - Genetic Algorithms :

Fundamentals of Genetic Algorithms : Genetic algorithms : History, basic concepts, Creation of offsprings, working principle, Encoding, Fitness function, Reproduction.

Genetic Modeling : Inheritance operators, Cross over, Inversion and Deletion, Mutation Operator, Bit-wise Operators, Generational Cycle, Convergence

Application of GA in Power Systems and Power Electronics(Qualitative treatment only).

TEXT BOOKS:

1. Rajasekharan and Pai, “Neural Networks, Fuzzy logic, and Genetic algorithms: Synthesis and Applications”, 1st ed., Prentice Hall of India Publication, 2009.
2. Jacek M. Zurada, “Introduction to Artificial Neural Systems”, 1st ed., Jaico Publishing House, 2006.

REFERENCE BOOKS:

1. James A Freeman and Davis Skapura, “Neural Networks”, 1st ed., Pearson, 2008.
2. Simon Haykins, “Neural Networks”, 2nd ed., Pearson Education, 2009.
3. Bork Kosko, “Neural Networks and Fuzzy Logic System” 1st ed., Prentice Hall of India Publications, 2009.

III Year B.Tech. EEE II - Semester

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4	-	-	4	4

EE324 - EMBEDDED SYSTEMS IN ELECTRICAL ENGINEERING
(Dept. Elective - II)

Course Description & Objectives:

To learn and understand the characteristics of Embedded systems and its architectures. To understand the types of embedded architectures and its variants. To understand and use the CPU bus and its protocols. To understand the operation of real time operating systems. To learn the operation of control systems applications of electrical engineering and design the same.

Course Outcomes:

- Analyse various design issues regarding • Usage of on chip resources • Low power modes • Communication support.
- Design embedded systems using MSP430 series microcontrollers to suit market requirements.
- Solve engineering problems and arrive at solutions in designing embedded systems to support interconnectivity.
- Apply techniques, program skills, On-Chip resources to design networked embedded systems with an understanding of limitations.
- Reason out and practice professional engineering to deliver efficient and cost effective embedded based products to society.

UNIT I - Introduction to Embedded Systems :

Characteristics of Embedding Computing Applications-Concept of Real time Systems,-Challenges in Embedded System Design- Design Process-Requirements, Specifications, Architecture Design- Designing of Components and System Integration

UNIT II - Embedded System Architecture:

Instruction Set Architecture-CISC architecture [8051] and RISC instruction set architecture [ARM processors], DSP Processors, Harvard Architecture-PIC. Coprocessors and Hardware Accelerators, Processor Performance Enhancement-Pipelining, Super-scalar Execution, CPU Power Consumption, Memory System Architecture-, Caches, Virtual Memory, Memory management unit and address Translation.

UNIT III - Designing Embedded Computing Platform:

Designing with Processors-System Architecture, Hardware Design, Implementation-Development Environment, Debugging Techniques, Manufacturing and Testing. Design Using CPU Bus: Bus Protocols, Bus Organization, I/O Device Interfacing, Interfacing Protocols-GPIB, FIREWIRE, USB, Watchdog Timers. 133 EE-Engg&Tech-SRM-2013.

UNIT IV - Operating Systems:

Kernel Features: Real-time Kernels, Polled Loops System, Co-routines, Interruptdriven System, Multi-rate System, Processes and Threads, Context Switching, Cooperative Multi-tasking, Pre-emptive Multi-tasking. Scheduling-Rate-Monotonic Scheduling, Earliest-Deadline First Scheduling, Task Assignment, Fault-Tolerant Scheduling. Inter-process Communication-Real-time Memory Management: Stack Management, Dynamic Allocation-Evaluating and Optimizing Operating System Performance-Response.

UNIT V - Embedded Control Applications:

Open-loop and Closed Loop Control Systems-Application Examples-Washing Machine, Automotive Systems, Auto-focusing digital camera, Air-conditioner, Elevator Control System, ATM System.

TEXT BOOKS:

1. Raj Kamal, "*Embedded Systems*", TMH,first edition, 2004.
2. David E. Simon, "*An Embedded Software Primer*", Pearson Education, 1999.

REFERENCES BOOKS:

1. Wayne wolf, "*Computers as components*", Morgan Kaufmann publishers, 2nd Edition, 2008.
2. Ayala. K.J. "*The 8051 Microcontroller*", Penram International, 1991.
3. Dr. Prasad, "*Embedded Real Time System*", Wiley Dreamtech, 2004.
4. Jean J.Labrosse, "*Embedded system building blocks*", CMP books, 2nd Edition, 1999.
5. Arnold berger, "*Embedded system design*", CMP books, 1st Edition, 2001.
6. Narayan and gong, "*Specifications and design".*

III Year B.Tech. EEE II - Semester

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SR005 TECHNICAL SEMINAR

Course Description & Objectives:

In this course student is expected to develop knowledge on an emerging field at the intersection of multi-disciplinary areas such as robotics, hybrid vehicles ect., and understandings the concepts , techniques, prevailing results etc., analyze it and present a seminar report.

Course Outcomes:

- Collect information about emerging technologies /market demands/ current trends.
- Organize & Analyze information about emerging technologies /market demands/current trends.
- Exhibit effective communication skills, stage courage, and confidence.
- Demonstrate intrapersonal skills.
- Prepare a well-organized report employing elements of technical writing and critical thinking.

III Year B.Tech. EEE II - Semester

L	T	P	TO	C
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EE326 POWER ELECTRONICS LAB

Course Description & Objectives:

This course aims at obtaining characteristics of power electronic devices. To understand the commutation techniques used in power electronics circuits and to test different power electronics converters.

Course Outcomes:

- Able to Elucidate the basic operation of various power semi conductor devices and passive components.
- Able to analyze the performance of single phase AC voltage controller and AC voltage rectifier circuit with R and RL load.
- Able to analyze the performance of forced commutation circuits and Jones Chopper.
- Able to analyze the performance of Parallel and series inverter with R and RL load.
- Able to analyze the performance of of half controlled converter, Cyclo converter and Dual converter.

List of Experiments:

1. Study of Characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase Parallel, inverter with R and RL loads
8. Single Phase Cycloconverter with R and RL loads
9. Single Phase Half controlled converter with R load
10. Three Phase half controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase Bridge converter with R and RL loads
13. Single Phase dual converter with RL loads

Note : Any 10 of above experiments are to be conducted.

III Year B.Tech. EEE II - Semester

L	T	P	TO	C
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EE328 LINEAR CONTROL SYSTEMS LAB

Course Description & Objectives:

This course aims to familiarize with the modeling of dynamical systems and the characteristics of control components like ac servo motor, synchro and magnetic amplifier. To simulate and analyze the stability using MATLAB software and design the compensators.

Course Outcomes:

- Perform conversion of models between State Space and transfer function, time response analysis, stability analysis and error analysis of any LTI system using MATLAB.
- Design a PID controller for any LTI system using MATLAB.
- Experimentally verify the performance characteristics of Magnetic Amplifier, Synchros and AC Servo Motor.
- Analyze the Time Response of Second Order Systems, Temperature Control System and effect of PID controller.
- Program digital logic gates using PLC.

List of Experiments :

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot

8. Transfer function of DC generator

9. Characteristics of magnetic amplifiers

10. Characteristics of AC servo motor

11. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.

12. Design of PID controller and simulation using MATLAB

13. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB

14. State space model for classical transfer function using MATLAB – Verification.

Note : Any 10 of above experiments are to be conducted.

III Year B.Tech. EEE II - Semester

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EE330 MINI PROJECT

Course Description & Objectives:

To be able to apply some of the techniques/principles to do effective trouble-shooting, time planning for the project, inculcate hardware implementation skills by learning design tools and developing effective communication skill by delivering a seminar based on mini project.

Course Outcomes:

Upon completion of mini project the students will be able to:

- Demonstrate a through and systematic understanding of project contents.
- Understand methodologies and professional way of documentation and communication.
- Know the key stages in development of the project.
- Extend or use the idea in mini project for major project.

VFSTR UNIVERSITY

IV Year - B.Tech
SYLLABUS

I SEM & II SEM

IV Year B.Tech. EEE I - Semester

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EE415 ELECTRIC DRIVES

Course Description & Objectives:

This course describes the structure of Electric Drive systems and their role in various applications such as flexible production systems, industrial ac/dc drives, energy conservation, renewable energy, transportation etc., Understand the basic principles of power electronics in drives using switch-mode converters and pulse width modulation to synthesize the voltages in dc and ac motor drives.

Course Outcomes:

- Understand the fundamental concepts of Electric drives
- Understanding of DC Drives and their performance and also their application in single and three phase controlled rectifiers
- Understanding the four quadrant operation of DC drives and related applications.
- Understand various Induction motor drives.
- Understand various Synchronous motor drives.

UNIT I - Fundamentals of electric drives:

Fundamentals of electric drives - block diagram of an electric drive - parts of electric drives - dynamics of electric drives - Fundamental torque equation, speed torque conventions and Multi-quadrant operation. Equivalent values of drive parameters, components of load torques, nature and classification of load torques, Load Equalization- control of electrical drives - closed loop control.

UNIT II - DC Drives - I :

DC Motors and their performance, starting, speed control, constant torque and constant power control, single phase controlled rectifiers with motor loads - fully controlled and half controlled rectifier fed dc drives - continuous operation, three phase controlled rectifier fed dc drives- Three phase semi and fully controlled converter fed dc drives – Speed and Torque expressions – Speed – Torque characteristics – Problems.

UNIT III - DC Drives - II :

Four Quadrant operation of DC Drives – dual converter fed control, Electric

Braking – Plugging, Dynamic and Regenerative Braking operations – Closed loop operation of DC motor, Chopper fed DC Drives- Single quadrant, Two – quadrant and four quadrant chopper fed DC Drives – Continuous current operation– speed torque characteristics – Problems Three phase induction motor analysis and performance-starting, Braking speed control-variable frequency control from voltage source and from current source.

UNIT IV - Induction Motor Drives :

Various PWM methods. Slip power recovery, Rotor resistance control and their industrial applications.

UNIT V - Synchronous Motor Drives :

Operation from fixed frequency supply- variable frequency control - VSI and CSI fed drives- self-controlled synchronous motor drives employing cycloconverter.

TEXT BOOKS:

1. G opal K Dubey, “Fundamentals of Electric Drives”, 2nd ed., Narosa Publishing house, 2005.
2. MD Singh and K B Khanchandani, “Power Electronics”, 2nd ed., Tata – Mc Graw- Hill Publishing company, 2009.

REFERENCE BOOK:

1. B K Bose, “Power Electronic Control of AC drives”, 1st ed., 2005.

IV Year B.Tech. EEE I - Semester

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EE417 RENEWABLE ENERGY SOURCES

Course Description & Objectives:

To understand the differences between conventional and non conventional energy sources. To understand the methodology for conducting Energy Audit. To understand Various solar energy systems and their applications. It also introduces the Wind Power, Biomass energy, Tidal energy and ocean energy as alternative energy sources.

Course Outcomes:

- Understand the main sources of energy and their primary applications in India, and the World.
- Analyze daily global solar radiations at different locations on the Earth
- Understand concepts of Wind energy.
- Understand concepts of Biomass Energy.
- Understand concepts of Ocean Tidal Energy.

UNIT I - Conventional Sources of Energy :

Energy - Conventional, renewable, non-conventional and alternate sources of energy - Energy supply system in India. Coal and Coal technologies - Petroleum and natural gas - nuclear fuels and power plants - Hydro sources and power plants - Energy strategies - energy conservation - energy audit - cost of energy.

UNIT II - Solar Power :

Application of Solar Energy - Various solar energy systems and their applications, radiations, solar spectra-latitude and longitude, Declination angle, solar window, cosine law, seasonal variations, daily variation, hour angle, calculation of angle of incidence, angstroms equation and constants, solar radiation data, daily global radiation calculations.

UNIT III - Wind Power :

Wind energy - energy chains, application - historical background, merits and limitations, nature of wind, planetary and local day / night winds, wind energy quantum, variables and units used in calculations, wind power density Pw, Power calculations, power in wind, power by turbine, efficiency, kinetic energy, incoming velocity Vi, exit velocity Ve, Power, torque thrust calculations, velocity at different heights, site selection, Favourable wind speed range, wind energy wind velocity duration, energy pattern factor.

UNIT IV - Biomass Energy :

Biomass energy resources : Photosynthesis and origin of biomass energy, biomass energy resources, cultivated biomass resources, waste to biomass resources, Terms and definitions, Incineration, wood and wood waste, Harvesting super trees and energy forests, phyrolysis, Thermo chemical biomass conversion to energy, gasification, Anaerobic digestion, Fermentation, Gaseous fuel from biomass.

UNIT V - Ocean & Tidal Energy :

Ocean and Tidal energy conversion, Energy sources in ocean - Ocean tidal, wave and thermal energy, Ocean saline gradient concept, ocean currents, ocean chemical energy, ocean energy conversion routes, electrical and non electrical routes, Bipolar, mono polar HVDC cable transmission Advantages and merits of ocean energy technologies, limitation, preconditions for commercial installation. Tides - spring tide, neap tide, daily and monthly variation, Tidal range, Tidal Power, Types of tidal power plants, single basin & double basin schemes, main requirements in tidal power plants, energy storage, prospects of tidal power, economic factors.

TEXT BOOK:

1. Rao. S. & Pamlekar Dr.B.B. “Energy Technology” 2nd ed., Khanna Publishers, 1997.

REFERENCE BOOKS:

1. Rai G.D., “Non – Conventional Energy Sources”, 20th ed., Khanna Publishers, 2007.
2. Freris L. L., “Wind Energy Conversion”, 1st ed., Prentice Hall (UK) Ltd., 1990.

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EE419 ANALYSIS AND OPERATION OF POWER SYSTEM

Course Description & Objectives:

To Able to understand that in real world, how to analyze the status of power system. To understand the different heat rate curves and economic distribution of loads in thermal generators. To understand typical graphs of power system networks, and basis for Loadflow problem. To solve Loadflows in typical power systems. To understand the basic concepts of fault analysis and its importance. To understand the concept of stability and its importance in power system.

Course Outcomes:

- Understand the Distribution of load economically between the thermal plants
- Model the components of a power system, Perform steady state load flow analysis using Newton – Raphson methods
- Apply symmetrical components to analyze the unsymmetrical faults
- Analyze steady state and transient stabilities; determine transient stability using equal area criterion
- Model LFC and AGC for one and two area power systems

UNIT I - Power System Analysis and Optimal Operation:

Introduction To Power System Analysis And Control: Introduction to Modern Power System Analysis and Operational Studies, Comparison between present and old structure, Importance of Planning, Analysis and Control.

Optimal Operation In Thermal Power Stations: Cost Curve – Incremental fuel and Production costs, Optimum generation allocation with and without line losses, Loss Coefficients, Numerical problems.

UNIT II - Graph Theory & Power Flow Problem:

Power System Graphs: Formation of system Y-bus by inspection method, Power system Z-bus building up algorithm (Without Derivation), Simple Problems up to four bus systems.

Power Flow Problem: Formulation of power flow problem, types of buses, classification of variables, expressions for real and reactive power injections, Solution of static power flow equations by Newton Raphson's method, Jacobian elements, convergence condition. Fast-decoupled method for power flow problem and its derivation from Newton's method, Including Q-limit check, Numerical problems for systems up to 3-buses.

UNIT III - Fault Analysis:

Importance of Fault Analysis in Power systems, Basic Assumptions in Power System Fault Analysis.

Symmetrical Faults: Symmetrical Faults, Problem formulation and solving procedure, Selection of Circuit Breakers.

Unsymmetrical Faults: Introduction to Symmetrical Components, Computation of all Sequence impedances, and Sequence networks for Alternators, Transformers, Transmission Lines and Loads. Representation of Sequence networks for LG, LL and LLG faults and Numerical Problems.

UNIT IV - Power System Stability:

Introduction to Power system stability, Classification of power system stabilities, steady state and transient stability limits. Power angle curve, Derivation of Swing equation, synchronizing power coefficient, Equal area criterion, determination of critical clearing angle, Numerical problems, Methods to improve the stability limits.

UNIT V - Load Frequency Control:

Necessity of keeping frequency constant, Definitions of Control area, Load frequency control of single and 2-area system, Block diagram representation of an isolated power system, Steady state analysis, Dynamic response, Controlled and Uncontrolled case, Tie-line bias control, Proportional plus Integral control of single area and its block diagram representation.

TEXT BOOKS:

1. J. Grainger and WD Stevenson Jr, "Power System Analysis", 1st ed., TMH, 2005.
2. D.P. Kothari, I.J. Nagrath, "Modern Power System Analysis", 3rd ed., TMH, 2008.

REFERENCE BOOKS:

1. Hadi Saadat, "Power System Analysis", 1st ed., TMH, 1999.
2. O I Elgerd, "Electric Energy Systems Theory an introduction", 2nd ed., TMH, 2006.

IV Year B.Tech. EEE I - Semester

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EE421 DSP AND ITS APPLICATIONS

Course Description & Objectives:

To understand the representation of discrete time signals and systems with discrete inputs both in time domain and frequency domain as these constitute basics for DSP. To study both direct and inverse Z-Transforms, DFT (Discrete Fourier Transforms), FFT (Fast Fourier Transforms) and their properties in detail. To design and realize various Infinite Impulse Response (IIR) & Finite Impulse Response (FIR) filters and study their properties. To provide idea about DSP based applications and Wavelet transforms.

Course Outcomes:

- Able to apply different transformations and operations on signal.
- Apply Discrete Fourier transforms and Fast Fourier transform for different types of signals, interpret the information obtained and able to reconstruct it as well as to apply Z-transform on a system to get its response.
- Design of FIRfilters and their realizations.
- Realization of IIR filters.
- Apply to DSP knowledge to electrical drives.

UNIT I - Introduction:

Review of Signals and Systems, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems, Review of Z-Transform and properties, Discrete fourier representation of periodic sequences.

UNIT II - Frequency Transformations:

Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering.

UNIT III - IIR Filter Design:

Structure of IIR – Analog filter Design - Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (HPF, BPF, BRF) filter design using frequency translation. Realization of IIR Filters- Direct form, Cascade form, Signal flow graph and Transposed structure, Application in speed controller design.

UNIT IV - FIR Filter Design:
Structures of FIR – Linear phase FIR filter – Filter design using windowing techniques, Frequency sampling techniques – Finite word length effects in digital Filters, Comparison of IIR and FIR. Realization of FIR filters- Direct form, Cascade form and linear phase realization, Application in speed controller design.

UNIT V - Applications:

Introduction to Speech processing, Image Processing, Digital Signal Processing Based Speed Control of Industrial Motor Drive, power system protection and planning, Importance in building smart grid.

TEXT BOOKS :

1. John G. Proakis, Dimitris G.Manolakis, “Digital Signal Processing, Principles, Algorithms and Applications”, Pearson Education / PHI, 2007.
2. A.V.Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, PHI, 1997.

REFERENCE BOOKS :

1. Ramesh Babu, “Digital Signal Processing”, Scitech, 2003.
2. M H Hayes, “Digital Signal Processing : Schaum’s Outlines”, TATA McGraw Hill, 2007.
3. G. Strang and T. Q. Nguyen, “Wavelets and Filter Banks,” Wellesley-Cambridge Press, Revised Edition, 1998.

IV Year B.Tech. EEE I - Semester

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EE423 HIGH VOLTAGE ENGINEERING
(Dept. Elective - III)

Course Description & Objectives:

The course provides advanced knowledge associated with high voltage engineering methods, techniques and equipment. Learn fundamentals of the failure mechanisms of solid, liquid and gaseous insulation at high voltages. Learn consequent design principles for high voltage equipment; of the generation of high direct, alternating and impulse voltages for testing high-voltage equipment; and of methods for monitoring and assessing the condition of high-voltage equipment such as dissolved gas analysis for oil-filled transformers and partial discharge in cables. Learn the high-voltage equipment and in particular underground cables, overhead transmission lines, transformers, bushings and switchgear.

Course Outcomes:

- Recognize with the performance of high voltages with regard to different configurations of electrode systems
- Identity theory of breakdown and withstand phenomena of all types of dielectric materials.
- Analyze the techniques of generation of AC,DC and Impulse voltages.
- Apply knowledge for measurement of high voltage and high current AC,DC and Impulse.
- Determine the dielectric property of material used for HV equipment.
- Discover the techniques of testing various equipment's used in HV engineering.

UNIT I - Introduction To High Voltage Technology & Applications :

Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT II - Conduction and break down in gases, liquies & solid dielectrics:

Gases as insulating media, Townsend's criteria of breakdown in gases, Break down in Electro negative gases ,Time lags for Break down ,Streamer Theory of Break down in Gases Paschen's law, pure and commercial liquids, breakdown in pure and commercial liquids. Intrinsic breakdown, electromechanical breakdown, thermal breakdown, Breakdown in composite dielectrics.

UNIT III - Generation of high voltages & currents :

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

UNIT IV - Measurement of High Voltages & Currents :

Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct , alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT V - High Voltage Testing of Electrical Apparatus :

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements, Testing of Insulators and bushings, Testing of cables, Testing of Transformers, Radio Interference measurements.

TEXT BOOKS:

1. M.S.Naidu and V. Kamaraju, "High Voltage Engineering" 3rd ed., Tata MC Graw Hill Publications, 2009.
2. E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, " High Voltage Engineering Fundamentals", 2nd ed., Elsevier, 2008.

REFERENCE BOOKS:

1. C.L.Wadhwa, "High Voltage Engineering" 3rd ed., New Age Internationals (P) Limited, 2010.
2. Ravindra Arora, Wolfgang Mosch, "High Voltage Insulation Engineering" 1st ed., New Age International (P) Limited, 2005.

IV Year B.Tech. EEE I - Semester

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EC302 VLSI DESIGN
(Dept. Elective - III)

CourseDescription &Objective:

To introduce students to basic concepts of digital VLSI chip design using the simpler VLSI technology and CMOS devices and manufacturing technology. To Introduce CMOS logic gates and their layout,to design Combinational (e.g., arithmetic) and sequential circuit.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- Program on combinational/sequential circuits.
  (Unit-1)
- Understand the fabrication process of different MOS technologies.
  (Unit-2)
- Analyse the operation and Electrical behaviour of MOS transistors.
  (Unit-3)
- Design VLSI circuits and Layouts of MOS circuits using Lambda based design rules and sub systems using various logic methods.
  (Unit-4 and 5)

UNIT I - Hardware Description Language:

The VHDL Hardware Description Language: Design flow, program structure, types and constants,Functions and procedures, libraries and packages.

The VHDL Design Elements: Structural design elements, data flow design elements, behavioral design elements,

UNIT II - Mos Technology:

Introduction : State of art of different technology, Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS technologies-Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation processes, N-MOS, C-MOS fabrication.

UNIT III - Basic Electrical Properties:

MOS Transistor, operation, I_{ds}-V_{ds} relationships, MOS transistor parameters:

threshold Voltage, gm, gds, figure of merit (w_o); Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter , Zpu/Zpd with and without pass transistor, Bi-CMOS Inverters.

UNIT IV - VLSI Circuit Design Processes:

VLSI Design Flow, MOS Layers, Stick Diagrams, Layouts and Design Rules for NMOS, CMOS and BICMOS circuits, CMOS inverters and gates. The delay unit, Inverter delays, Driving capacitive loads, Propagation delays, wiring capacitances, Introduction to scaling.

UNIT V - Subsystem Design:

Adders-Carry ripple adder, carry propagate adder, Multipliers-Array Multiplier, Booth encoding,Latches,Flip Flops; Simulation, Synthesis, Design Capture Tools, Design For Testability**,** Alternate gate circuits-Pseudo-nMOS, Dynamic CMOS, CMOS Domino Logic and Cascaded Voltage Switch Logic (CVSL),Standard cell, Seaofgates, FPGA.

TEXT BOOKS:

1. Kamran Eshraghian, EshraghianDougles and A. Pucknell, Essentials of VLSI circuits and systems, PHI, 2005 ed.,
2. Weste and Eshraghian, Principles of CMOS VLSI Design , Pearson Education, 1999.

REFERENCE BOOKS:

1. John f walkerly, digital design principles and practices, 3rd ed., phi/pearson education, 2005.
2. J.Bhasker, vhdl primer, 3rd ed., pearsonedn / phi.
3. S.M. SZE, “VLSI Technology” , 2nd ed., TMH, 2003
4. Wayne Wolf, “Modern VLSI Design”, 3rd ed., Pearson Education, 1997

IV Year B.Tech. EEE I - Semester

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MT431 AUTOMOTIVE ELECTRONICS
(Dept. Elective - III)

Course Description & Objectives:

To equips the students with fundamentals of automotive electronics. To understand the electronics systems onboard the automobile. To present an overview of technologies in the field. To provide an understanding of different automotive systems used in automobiles.

Course Outcomes:

At the successful completion of AME, the student is expected to have:

- *A broad understanding of automotive technology.*
- *A thorough knowledge of application of electronics in automotive engineering.*
- *Knowledge of automotive sensors and control systems.*
- *Understand the use of microcomputer, sensors, actuators and the use of various instrumentation systems in automobiles.*

UNIT I - Introduction:

Automotive component operation, electrical wiring terminals and switching, multiplexed wiring, systems Circuit diagrams and symbols. Charging Systems and Starting Systems: Charging systems principles, alternations and charging circuits, New developments, requirements of the starting system, basic starting circuit.

UNIT II - Ignition systems:

Ignition fundamentals, electronic ignition systems, programmed ignition, distribution less ignition, direct ignition, spark plugs. Electronic Fuel Control: Basics of combustion, Engine fuelling and exhaust emissions, Electronic control of carburetion, Petrol fuel injection, Diesel fuel injection.

UNIT III - Instrumentation Systems:

Introduction to instrumentation systems, various sensors used for different parameters, driver instrumentation systems, vehicle condition monitoring, trip computer, different types of visual display. Electronic control of braking and traction: Introduction and description, control elements and control methodology, Introduction and description of electronic control of automatic transmission, Control of gear shift and torque converter lockup, Electric power steering, Electronic clutch.

UNIT IV - Engine Management Systems:

Combined ignition and fuel management systems, exhaust emission control, Digital control techniques, complete vehicle control systems, artificial intelligence and engine management.

UNIT V - Microprocessor applications in Automotive engineering:

Lighting and Security Systems: Vehicles lighting Circuits, Signaling Circuits, Central locking and electric windows security systems, Airbags and seat belt tensioners, Miscellaneous safety and comfort systems.

TEXT BOOK:

1. TOM DENTON, "Automobile Electrical and Electronic Systems", Edward Arnold publications, 1995.

REFERENCE BOOKS:

1. DON KNOWLES, "Automotive Electronic and Computer controlled Ignition Systems", Prentice Hall, 1988.
2. WILLIAM, T.M., "Automotive Mechanics", McGraw Hill Book Co.,
3. WILLIAM, T.M., "Automotive Electronic Systems", Heiemann Ltd., London, 1978.
4. Ronald K Jurgen, "Automotive Electronics Handbook", McGraw Hill, Inc, 1999.

IV Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE425 ENERGY CONSERVATION & AUDIT (Dept. Elective - IV)

Course Description & Objectives:

Understand the types of electricity tariffs and energy auditing by knowing simple electrical principles. Understand the types of instruments for auditing and assessment, and economic methods for energy analysis by considering case studies. Analysis of transformers, cables and feeders by considering case study models. Understand the economical load flow problems

Course Outcomes:

- Understand and determine the performance of various lighting systems.
- Analyse effective energy management policies, methods and planning.
- Carryout energy audit and economic analysis.
- Design energy utilization systems for heat recovery.
- Design a capacitor bank to address low power factor issues.

UNIT I - Introduction to Energy auditing:

Introduction : System approach, end use approach to efficient use of Electricity; Electricity tariff types.

Energy auditing: Types and objectives, audit instruments, ECO assessment and Economic methods, Specific energy analysis, Minimum energy paths, consumption models, Energy auditing of a typical industrial unit - case studies.

UNIT II - Electric motors:

Energy efficient controls and starting efficiency, motor efficiency and Load analysis, Energy efficient / high efficient Motors - Case studies; Load Matching and selection of motors. Variable speed drives. Pumps and Fans: Efficient Control strategies-optimal selection and sizing, optimal operation and storage - case studies.

UNIT III - Distribution and Reactive Power Management:

Transformer Loading/Efficiency analysis, feeder/cable loss evaluation, case studies.

Reactive power management: Capacitor Sizing, Degree of Compensation, Capacitor losses, Location-placement-Maintenance, case studies.

UNIT IV - Peak Demand Control :

Methodologies, types of Industrial loads, optimal Load scheduling, case studies; Lighting: Energy efficient light sources, Energy conservation in Lighting Schemes, Electronic ballast, Power quality issues, Luminaries, case studies.

UNIT V - Cogeneration:

Types and Schemes, optimal operation of cogeneration plants, case studies. Electric loads of Air conditioning and Refrigeration, Energy conservation measures, Cold storage types – Optimal operation, case studies; Electric water heating: Geysers, Solar Water Heaters, Power Consumption in Compressors, Energy conservation measures; Electrolytic Process; Computer Controls - software - EMS.

TEXT BOOKS:

1. Industrial Energy Management: Principles and Applications by Giovanni Petrecca, The Kluwer international series-207 (1999)
2. Guide to Electric Load Management by Anthony J.Pansini, Kenneth D.Smalling, Pennwell Publications (1988)

REFERENCE BOOKS:

1. Energy-Efficient Electric Motors and their applications by Howard E.Jordan, Plenum publishing corp; 2nd ed. (1994)
2. Energy Management Hand book by Turner, Wayne C, Lilburn, The Fairmont press, 2001
3. Handbook of Energy Audits by Albert Thumann, Fairmont Pr; 5th edition (1998)
4. Recommended practice for Energy Conservation and cost effective planning in Industrial facilities by IEEE Bronze book, IEEE Inc, USA
5. Electric Energy Utilization and Conservation by Tripathy S.C , TMH
6. Hand book on Energy Audit and Management by Amit kumar Tyagi, published by TERI (Tata energy research Institute).

IV Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE427 ADVANCED CONTROL SYSTEMS (Dept. Elective - IV)

Course Description & Objectives:

This course deals with state space, describing function, phase plane and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

Course Outcomes:

- Understand different state model for the given electrical/electro-mechanical systems and have the knowledge to find its solution.
- Model nonlinear systems, and analyse stability using describing function method.
- Analyse the stability of various nonlinear systems using the phase plane trajectory.
- Identify the stability of the given linear and nonlinear system using Lyapunov stability theory.
- Design pole placement controller and/or observer for the given system to achieve desired specifications.

UNIT I - State Space Analysis:

State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms – Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form.

Controllability and observability : Tests for controllability and observability for continuous time systems – Time varying case, minimum energy control, time invariant case, Principle of Duality, Controllability and observability form Jordan canonical form and other canonical forms.

UNIT II - Methods of Analysis:

Describing Function Analysis: Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

Phase-Plane Analysis: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT III - Stability Analysis:

Stability in the sense of Lyapunov., Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.

UNIT IV - Modal Control:

Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer.

UNIT V - Optimal Control:

Calculus of Variations: Minimization of functionals of single function, Constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrangine Equation.

Optimal Control: Formulation of optimal control problem. Minimum time, Minimum energy, minimum fuel problems. State regulator problem. Output regulator problem. Tracking problem, Continuous-Time Linear Regulators.

TEXT BOOKS:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998

REFERENCE BOOKS:

1. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
2. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.
3. Systems and Control by Stainslaw H. Zak , Oxford Press, 2003.

IV Year B.Tech. EEE I - Semester

L	T	P	TO	C
4	-	-	4	4

EE429 PROGRAMMABLE LOGIC CONTROLLERS (Dept. Elective - IV)

Course Description & Objectives:

This course deals with importance of PLC and its components. It also deals with Ladder Programming and various functions available.

Course Outcomes:

- Understand the working of PLC system components.
- Develop PLC Programming using Digital logic for Industrial process systems.
- Understand the characteristics of PLC Registers.
- Develop PLC Programming using timers and counters for industrial process systems.
- Develop PLC Programming using data handling functions for a specific application.

UNIT I - PLC Basics:

PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules.

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

UNIT II - Logic Circuits:

Digital logic gates, programming in the Boolean algebra system, conversion examples, Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system.

UNIT III - PLC Registers:

Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.

UNIT VI - PLC Functions:

Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

UNIT V - Data Handling functions:

SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications

TEXT BOOKS:

1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, PHI.
2. Programmable Logic Controllers- Programming Method and Applications – JR.Hackworth &F.D Hackworth Jr. –Pearson, 2004.

IV Year B.Tech. EEE I - Semester

L	T	P	TO	C
-	-	3	3	2

EE431 POWER SYSTEMS LAB

Course Description & Objectives:

To analyze the performance of power system networks by conducting various experiments. To study different power system protective equipment by conducting suitable experiments. To develop computer programs for analysis of power systems

Course Outcomes:

- Formulate the bus incidence, impedance and admittance matrices of a power system using MATLAB software.
- Investigate the economic load dispatch problem, load frequency control problem and different faults using MATLAB software.
- Find and examine the efficiency, regulation and ABCD parameters of a 420kv simulated transmission system.
- Examine performance of percentage biased differential relay, over current relay and short circuit problem in DC network fed at one and both end cases.

Group 1: Software/PC related

1. Formation of incidence matrices
2. Building Z_{BUS} using step by step method
3. Formulation of Bus Admittance matrix.
4. Load flow studies by using N-R method.
5. Fault (Single phase ground) analysis using PC
6. Solution of Swing equation.
7. Economic Load Dispatch using Lambda – Iteration method.
8. Simulation of Single area load frequency control with and without integral controller.

Group 2: Hardware/Equipment related

1. Determination of ABCD parameters using Transmission line model
2. Determination of Regulation and efficiency of transmission line using Transmission line model
3. Determination of regulation of transmission line including Ferranti effect.
4. Percentage biased differential relay
5. Finding the sequence impedances of an Alternator and transmission line.
6. Electrical Power transmission line training system.
7. DC network analyzer for short circuit studies.
8. IDMT over current relay

Any 5 from each of the above two groups must be chosen.

IV Year B.Tech. EEE I - Semester

L	T	P	TO	C
-	-	3	3	2

EE433 MICROPROCESSOR PROGRAMMING AND ITS INTERFACING LAB

Course Description & Objectives:

To develop the programming fundamentals of 8086 Microprocessor kit. To interface 8086 Microprocessor kit with external peripherals. To develop the programming concepts in TASM

Course outcomes:

- Able to understand the instruction set of 8086 Microprocessor
- To formulate the programmes and to implement either with 8086/8051. (Programme related to arithmetic, logical and related to I/O interfacing).
- Able to develop the programming with TASM assembler.
- Able to do String operations i.e Moving, Reversing, Comparing, Scanning strings.
- Able to Interface the input and output devices like LCD, ADC, DAC, sensor and stepper motor interface with 8051 microcontroller.

I. Programming of Microprocessor 8086:

1. Introduction to Debug/MASM/TASM
2. Arithmetic operations: Multi-byte Addition, Subtraction, Multiplication, Division.
3. Logical operations: Converting packed BCD to unpacked BCDand BCD to ASCII.
4. Finding Arithmetic mean of given numbers.
5. Finding Sum of Squares, Cubes of given numbers.
6. Searching for Minimum,Maximum of given numbers.
7. Sorting given string in Ascending,Descending order.
8. Reading, Displaying of characters.
9. String operations: Moving, Reversing, Comparing, Scanning strings.

II. Interfacing of Microprocessor 8086:

1. Programable Peripheral Interface-8255.
2. Interfacing DAC: to generate Square, Triangular, Ramp, Staircase waves.
3. Interfacing ADC: to convert analog signal to digital.
4. 8279-Keyboard/ Display interface.
5. Interfacing 8259-Programmable Interrupt Controller.
6. Interfacing a Stepper motor.
7. Interfacing Elevator simulator.
8. Traffic control simulator interface.
9. Serial data transfer using USART-8251 interface.

Any 5 from each of the above two groups must be chosen.

IV Year B.Tech. EEE I - Semester

L	T	P	TO	C
-	-	3	3	2

EE435 ELECTRICAL SYSTEMS SIMULATION LAB

Course Description & Objectives:

This course enables to simulate a given electrical circuits in any environment to analize its dynamic characteristics and to figure out its stability considerations.

Course Outcomes:

- Design single phase and three phase uncontrolled rectifier circuits as per the load specifications using MATLAB/SIMULINK
- Design single phase and three phase controlled Rectifier circuits as per the load specifications using MATLAB/SIMULINK
- Design single phase and three phase AC Voltage Controllerand single phase Cyclo-Converter circuits as per the load specifications using MATLAB/SIMULINK
- Design single phase and three phase Inverter circuits as per the load specifications using MATLAB/SIMULINK
- Design Buck and Boost Chopper circuits as per the input voltage, duty cycle specifications using MATLAB/SIMULINK

List of Experiments :

The following experiments are required to be conducted as compulsory experiments:

1. Simulation of Transient and Parametric Analysis of RLC circuits to an input (i) Pulse (ii) Step and (iii) Sinusoidal signals.
2. Analysis of three phase circuit representing the generator transmission line and load. Plot three phase currents & neutral current.
3. Simulation of single-phase full converter using RLE loads and single phase AC voltage controller using RLE loads.
4. Simulation of DC Circuits (Thevenin's Equivalent, Transfer Function).
5. Linear system analysis (Time domain analysis, error analysis) using MATLAB.
6. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant Systems using MATLAB.
7. Simulation of Dynamical Systems (Single area and two area Power Systems) using SIMULINK.
8. Circuit Analysis using MATLAB (Sim Power Systems Tools Box)
9. Simulation of Resonant pulse commutation circuit and Buck chopper
10. Simulation of single phase Inver with PWM control
11. Modelling of transformer and simulation of loss less transmission line.
12. Simulation of Op-Amp based Integrator & Differentiator circuits.

Note : Any 10 of above experiments are to be conducted.

IV Year B.Tech. EEE II - Semester

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4	-	-	4	4

EE414 UTILIZATION OF ELECTRICAL ENERGY (Dept. Elective - V)

Course Description & Objectives:

To understand types of drives, speed control and applications of motors. To understand electric heating and welding concepts. To understand types o0f lamps and lightning schemes and light control methods. To understand different types traction systems, features, braking mechanisms and Train movement and energy consumption.

Course Outcomes:

- To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading condition.
- To acquaint with the different types of heating and welding techniques.
- To study the basic principles of illumination and its measurement.
- To understand the basic principle of electric traction including speed–time curves of different traction services.
- To understand the method of calculation of various traction system for braking, acceleration and other related parameters, including dem and side management.

UNIT I - Utilization and Control of Electric Drives:

Introduction, Factors governing selection of Electric motors, Type of electric drives, starting and running characteristics, speed control, temperature rise, Choice of Rating of motor, Control devices for Industrial motors , Motors for particular services, load equalization.

UNIT II - Electric Heating and Electric Welding:

Introduction, Methods of Transfer of Heat, Classification of Electric Heating methods, resistance heating induction heating and dielectric heating. Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT III - Illumination Engineering:

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light, MV and SV lamps, tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types of Lighting schemes, flood lighting, Methods of Lighting Calculations.

UNIT IV - Traction Systems:

Introduction, Different systems of Traction, Systems of electric traction, Systems of track electrification. General features of traction motor, Operating characteristics of D.C Motors, Three Phase Induction motor methods of electric braking-plugging, Rheostatic braking and regenerative braking.

UNIT V - Train movement and energy consumption:

Mechanics of train movement. Typical Speed-time curves for different services – trapezoidal and quadrilateral speed time curves Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

TEXT BOOKS:

1. E. Openshaw Taylor, "Utilisation of Electric Energy" 1st ed., Orient Longman, 2006.
2. Partab, "Art & Science of Utilization of electrical Energy" 3rd ed., Dhanpat Rai & Sons, 2006.

IV Year B.Tech. EEE II - Semester

L	T	P	TO	C
4	-	-	4	4

EE416 SPECIAL ELECTRICAL MACHINES (Dept. Elective - V)

Course Description & Objectives:

This course enable to understand the working principle and construction of commutator motors, stepper motors and switched reluctance motors. To gain knowledge in principle of operation and characteristics of permanent magnet brushless dc motors and synchronous motors.

Course Outcomes:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor.
- To explain the theory of travelling magnetic field and applications of linear motors.
- To understand the significance of electrical motors for traction drives.

UNIT I - Stepper Motors:

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi stack configurations – Theory of torque predictions – Linear and non-linear analysis – Characteristics – Drive circuits.

UNIT II - Switched Reluctance Motors:

Constructional features – Principle of operation – Torque prediction – Power controllers – Non-linear analysis – Microprocessor based control – Characteristics.

UNIT III - Permanent Magnet Brushless D.C. Motors:

Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations – Power controllers – Motor characteristics and control.

UNIT IV - Permanent Magnet Synchronous Motors:

Principle of operation – EMF and torque equations – Reactance – Phasor diagram – Power controllers - Converter - Volt-ampere requirements – Torque speed characteristics - Microprocessor based control.

UNIT V - Commutator Motors:

Construction – Principle of operation - Characteristics – Applications – Universal, repulsion motors and linear induction motors.

TEXT BOOKS:

1. Bimbhra.P.S "Generalized Theory of Electrical Machines", Khanna Publishers, Fifth edition, 2013.
2. Sen.P.C "Principles of Electrical Machines and Power Electronics", John willey & Sons, Second edition, 2008.

REFERENCE BOOKS:

1. Dubey.G.K. "Fundamentals of Electric Drives", Alpha Science International Limited, Second revised edition, 2008.
2. Cyril G. Veinott, "Fractional and Sub-fractional horse power electric motors", McGraw Hill International Limited, Fourth edition,1986.
3. Say. M.G "Alternating current Machines", John willey & Sons, Fifth edition 1983.
4. Rai. H.M "Electrical Machine Design", Satya Prakashan Publications, Third edition, 2004.

IV Year B.Tech. EEE II - Semester

L	T	P	TO	C
4	-	-	4	4

EE418 POWER QUALITY
(Dept. Elective - V)

Course Description & Objectives:

This course introduces the basics of power quality assessment and control techniques due to extensive use of power electronic devices in operation and control of electrical systems and apparatus.

Course Outcomes:

- Demonstrate knowledge and understanding of concepts and basic principles of power quality.
- Illustrate and describe solutions for different problems in various ways: verbally, graphically, and using simulation.
- Understand computer modelling, simulation, rendering and presentation techniques.
- Identify problems, list customer needs and requirements and gather relevant information.
- Demonstrate knowledge and understanding of electrical system regulations and standard codes.

UNIT I - Introduction to Power Quality :

Over view of power Quality and quantity standards - IEC and IEEE definitions - voltage fluctuations-transients-unbalance-waveform distortion-power frequency variations.

UNIT II - Voltage Quality & Mitigation Techniques :

Voltage variations, Voltage sags and short interruptions – flicker-longer duration variations - sources – range and impact on sensitive circuits-standards – solutions and mitigations – equipment and techniques.

UNIT III - Transient behaviour :

Transients – origin and classifications – capacitor switching transient – lightning-load switching – impact on users – protection – mitigation.

UNIT IV - Power System Harmonics :

Harmonics – sources – definitions & standards – impacts - calculation and simulation – harmonic power flow - mitigation and control techniques – filtering – passive and active.

UNIT V - Power Quality conditioners:

shunt and series compensators-DStatcom-Dynamic voltage restorer-unified power quality conditioners-case studies.

TEXT BOOKS:

1. Heydt, G.T., “Electric Power Quality”, 2nd ed., Stars in a Circle Publications, Indiana, 1994.
2. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, “Essentials of VLSI circuits and systems”, 1st ed., PHI, 2009.

REFERENCE BOOKS:

1. S.M. SZE, “VLSI Technology”, 2nd ed., TMH, 2003.
2. Weste and Eshraghian, “Principles of CMOS VLSI Design”, 2nd ed., Pearson Education, 2004.
3. John P. Uyemura, “Chip Design for Sub micron VLSI: CMOS Layout & Simulation”, 1st ed., Thomson Learning, 2009.

IV Year B.Tech. EEE II - Semester

L	T	P	TO	C
4	-	-	4	4

EE420 ELECTRICAL DISTRIBUTION SYSTEMS (Dept. Elective - VI)

Course Description & Objectives:

To Understand the distribution system planning and automation. To Understand the Design Considerations of Distribution Feeders. To Understand the different types of distribution substations. To Understand design of protection in distribution systems.

Course Outcomes:

- Differentiate the types of loads and their characteristics and design a radial and loop type distribution feeders.
- Calculate the voltage drop and power loss in a distribution system.
- Recognize the necessity of distribution system protection and devices available for discriminating faults
- Discuss the need of pf correction and voltage drop compensation
- Design a suitable capacitance for voltage control in a Distribution System

UNIT I - Introduction to Distribution Systems :

General Concepts : Introduction to distribution systems, Load modelling and characteristics. Coincidence factor, contribution factor loss factor. Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Distribution Feeders : Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system.

UNIT II - Substations & Analysis :

Substations : Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

System Analysis : Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

UNIT III - Distribution System Protection:

Protection : Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers.

Coordination : Coordination of Protective Devices: General coordination procedure.

UNIT IV - Compensation for Power Factor Improvement :

Capacitive compensation for power factor control. Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation. Economic justification. Procedure to determine the best capacitor location.

UNIT V - Voltage Control :

Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

TEXT BOOKS:

1. Turan Gonen, "Electric Power Distribution system Engineering" 2nd ed., CRC Press, 2010.
2. A.S. Pabla, "Electric Power Distribution", 4th ed., Tata Mc Graw-hill Publishing company, 1997.

REFERENCE BOOKS:

1. S. Sivanagaraju "Electric Power Transmission and Distribution", Pearson Education India, First Edition,2008
2. Anthony J. Pansini "Electrical Distribution Engineering", CRC Press, First edition,2005.
3. H Lee Willis, "Distributed Power Generation Planning and Evaluation", CRC Press, First edition 2000.

IV Year B.Tech. EEE II - Semester

L	T	P	TO	C
4	-	-	4	4

EE422 RELIABILITY ENGINEERING (Dept. Elective - VI)

Course Description & Objectives:

Reliability Engineering subjects deals with basic probability theory and network modeling for the simple system and gives the evaluation techniques, frequency balance approaches. In last unit deals with Monte - Carlo simulation technique.

Course Outcomes:

- Define the concepts of reliability, common reliability functions, parameters and methods of their modeling and prediction.
- Estimate reliability functions and parameters of an item using life testing, Weibull and hazard plotting, stress-stress analysis, and relevant reliability databases.
- Estimate reliability functions and parameters of product/component systems using reliability block diagram, fault tree and event tree.
- Evaluate maintainability and availability of product/component systems, and different maintenance strategies.
- Describe the benefits and elements of reliability program and product liability management.

UNIT I - Basic Probability Theory:

Probability concepts, permutations and combinations, rules for combining probabilities, probability distributions, binomial distribution and properties; effects of redundancy, partial output and unavailability.

UNIT II - Network Modeling of Simple Systems:

Series, parallel and series-parallel systems, partially redundant and stand-by redundant systems; perfect and imperfect switching, complex systems: cut-set method, tie-set method and connection matrix techniques, multi-failure modes.

UNIT III - Reliability Evaluation:

General reliability functions and their evaluation, Poisson distribution, normal distribution, exponential distribution, Weibul distribution; stand-by systems and their reliability evaluation.

Markov chains: Stochastic Transitional Probability Matrix, probability evaluation of different states, continuous Markov process4es: state space diagrams, limiting state probabilities, repairable systems, MTTF evaluation, complex systems.

UNIT IV - Frequency and Duration Techniques:

Application to multi-state problems, frequency balance approach, two-stage repair and installation process, approximate system reliability evaluation.

UNIT V - Monte-Carlo Simulation:

Concepts of simulation, random variables, simulation output, applications of Monte-Carlo technique, reliability and availability of repairable systems and stand-by systems.

TEXT BOOKS:

1. Roy Billington and Ronald N Allen, “Reliability Evaluation of Engineering Systems”, 2nd ed., Springer International Edition, 2008.
2. Roy Billington and Ronald N Allen, “Reliability Evaluation of Power Systems”, 2nd ed., Springer International Edition, 1996.

IV Year B.Tech. EEE II - Semester

L	T	P	TO	C
4	-	-	4	4

EE424 MACHINE MODELLING AND ANALYSIS (Dept. Elective - VI)

Course Description & Objectives:

The student learns the mathematical modeling of electrical machines.

Course Outcomes:

- To learn about the basic concepts of AC/ DC machine modeling.
- To study about the dynamic modeling and phase transformation.
- To analyze various methodologies in small signal machine modeling.
- To understand the modeling of synchronous machine modeling.
- To learn the performance and dynamic modeling of synchronous machines.

UNIT I - Elements of generalized theory:

Essentials of rotating electrical machines-conventions-Basic two pole machine-representation of DC and three phase AC machines-Transformer and speed voltages in the armature – Kron's primitive machine – voltage equations – expression for power – Torque.

UNIT II - Linear Transformations:

Linear transformations in machines - invariance of power - Transformation from a displaced brush axis – Transformation from three phases to two phases (a,b,c to a,b,0)-power invariance –transformation from rotating axes (a,b,0) to stationary axes (d,q,0) – park's transformation – physical concepts.

UNIT III - Mathematical Models of DC Machines:

Mathematical model of separately excited, series, shunt and compound DC motors transfer functions of separately excited DC motor – equations in state variable form computation of dynamic characteristics.

UNIT IV - Mathematical Models of Three Phase Induction Motor:

Circuit model-winding inductances-flux linkages-voltage equations-transformation to equivalent two phase representation – equations in the stator frame – equations in rotor reference frame - equations in synchronously rotating frame – expression for Torque – equations in state variable form – equations for sinusoidal voltages – equivalent circuit of the induction motor.

UNIT V - Mathematical Models of Synchronous Motor:

Synchronous motor – circuit model of a three –phase synchronous motor – winding inductances – flux linkages voltage equations – parks transformation to d,q,0 variables – direct and quadrature – axes synchronous inductances and zero sequence inductance – voltage equations in steady state and phasor representation – expression for Torque power angle characteristic of salient pole motor.

TEXT BOOKS:

1. Vedam Subramanyam, “Thyristor control of Electric Drives”, 1st ed., TMH, 2002.
2. Paul C.Krause, Oleg wasynezuk, Scott D. Sudhoff “Analysis of electric machinery and Drive systems”, 2nd ed., John Wiley, 2004.

IV Year B.Tech. EEE II - Semester

L	T	P	TO	C
-	-	20	20	10

EE426 PROJECT

Course Description & Objectives:

To be able to apply some of the techniques/principles to do effective trouble-shooting, time planning for the project, inculcate hardware implementation skills by learning design tools and developing effective communication skill by delivering a seminar based on mini project.

Course Outcomes:

- Pursue their interest in Electrical Engg., through design, research, theoretical and experimental approach.
- Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach.
- Get capable of self education and clearly understand the value of achieving perfection in project implementation & completion.
- Understand methodologies and professional way of documentation and communication.
- Demonstrate a sound technical knowledge of their selected project topic.

IV Year B.Tech. EEE II - Semester

L	T	P	TO	C
-	-	36	36	18

EE428 INTERNSHIP

Course Description & Objectives:

The major focus of the semester long internship is to learn professional skills, abilities, and activities practiced in Industry. The purpose of the internship is to provide real-world experience that enables students to put everything they have learned into action. It also can help them gain skills that can be applied to future jobs.

Course Outcomes:

- **Apply the** learned theoretical knowledge into the practical industrial scenario. (Apply)
- Develop strategies like communication, team work, time management, multi-tasking etc in an industrial setup. (Create)
- **Generate new skills and supplement knowledge**. (Create)
- **Analysis / modelling / simulation / design / problem solving / experiment as per the** industrial needs. (Create)
- **Develop a final product/** process, perform testing, arrive at results & conclusions and suggest future directions. (Create)

I

YEAR

INFORMATION TECHNOLOGY

B.Tech.

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16EC202 - Electronic Devices and Circuits
- 16ME103 - Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L- 9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L- 9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.
11. Solving first order O.D.E.
12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fiber which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*

✓ *Study the wavelengths of light sources and lasers.*

✓ *Estimate the efficiency of a given solar cell.*

✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*

✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non- linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V. Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to:

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**
  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory Practice : Introduction to phonetics
  (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role - Plays
  (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs
- Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions (from Energy Unit)
  Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**
  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 *“Mindscapes* - English for Technologists and Engineers”, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, “A Textbook of English Phonetics for Indian Students”, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. “Spoken English: A Self-Learning Guide to Conversation Practice”, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine Your English”, 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, “Effective Technical Communication”, Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to:

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools.
    a. Text formatting and table.
    b. Mathematical equations.
    c. Watermarking using Analysis tool.
    d. Calculate student mark details.
    e. Create four types of charts.
    f. Import external data, sort & filter using Power Point tool.
    g. Create text and images with effects.
    h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, “Introduction to Computers”, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

✓ *Identify suitable data types for an application.*

✓ *Apply control statements for decision making problems.*

✓ *Use multidimension array for matrix application.*

✓ *Design a program to calculate average of a class.*

✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L- 10,T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L- 9,T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L- 9,T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L- 9,T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L- 8,T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of 'n' numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

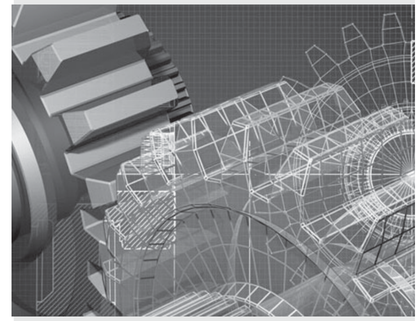
TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1st edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2nd edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4th edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a Lighting scheme for specific working environment.*

✓ *Design a composition of Heating element for a particular application.*

✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

✓ *Provide an earthing for Domestic Outlet.*

✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks, Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-08**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, "Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, "Electrical engineering - Electrical machines and Appliances Theory", 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, "How Stuff Works", 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, "Basic Mechanical Engineering", 1 st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
0	-	30	-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to:

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*

✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*

✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

Listening – Following long conversations / Interviews

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

PRACTICE: Objective PET Units 25 – 30

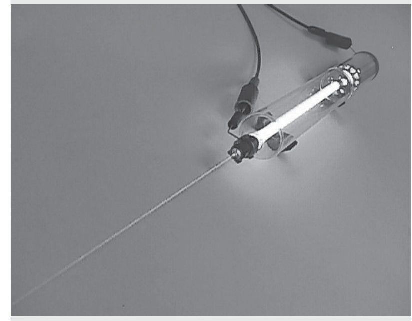
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, "Introduction to PET", Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

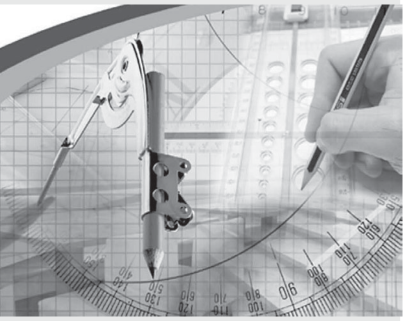
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments, field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- carry out the basic operations of matrix algebra.
- use row operations to reduce a matrix to echelon form, normal form.
- determine consistency of a system linear equations.
- compute eigen values and eigen vectors.
- evaluate double integrals and triple integrals.
- evaluate double integrals in polar coordinates.
- utilize Cartesian and polar coordinates to find area.
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals.

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9,T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L-9,T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L-9,T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L-9,T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L-9,T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

✓ *Analyse the total hardness of water sample.*

✓ *Understand the basic principles involved in various batteries.*

✓ *Understand the mechanisms of corrosion and various controlling methods.*

✓ *Synthesize various polymers.*

✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to:

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT – 1 **L-3,P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT – 2 **L-3,P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT – 3 **L-3,P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT – 4 **L-3,P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT – 5 **L-3,P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

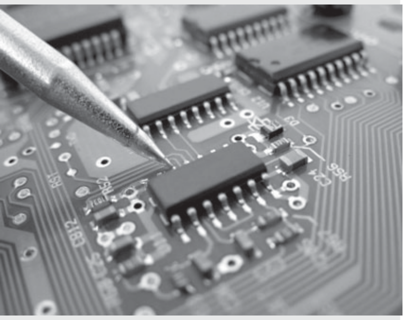
1. N.D.Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal, C.M.Agrawal "Engineering Drawing" , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC, AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*

✓ *Develop a simple loop generator.*

✓ *Design a voltage regulator using Zener diode.*

✓ *Design a half wave rectifier using PN junction diode.*

✓ *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, “Basic Electrical and Electronics Engineering”, 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, “Electrical Technology”, Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, “Basic Electrical Engineering”, 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to:

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to:

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES: Environmental studies - Definition scope and its importance, Need for public awareness; Natural resources - Forest resources, Deforestation, Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources, Land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY: Ecosystem - Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems; Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forest community, Bio-villages; Green technology for sustainable development; Life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental protection act; Environmental Impact Asssssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation - Food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions; Role of youth in the development, Promoting activities, Youth as initiators, Field work/environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment, Common plants, Insects, Birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

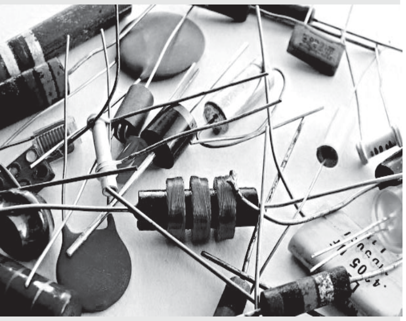
1. Anubha Kaushik and CP Kaushik, "Perspectives in Environmental Studies", 5th edition, 2016
2. Benny Joseph, "Environmental studies", 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, "A Text book of Environmental Studies", HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, "A Text book of environmental science and Technology", B S Publications, 2008.
3. Dr. K. Mukkanti, "A Text book of Environmental Studies", S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, "Text book of Municipal and Rural Sanitation", M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, "Environmental Pollution Control Engineering", New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, "Introduction to Remote Sensing", B S Publications, 2004.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*



16EC202 ELECTRONIC DEVICES AND CIRCUITS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	-	12	3	2

Course Description and Objectives:

This course is aimed at offering fundamental concepts of semiconductor devices and circuits. The objective of the course is to introduce the student to Junction Diode, Transistor, FET and other basic devices that are designed with semiconductor materials. As a first-level course in electronics, it forms the basis for the understanding of advanced electronic courses that are offered in subsequent semesters.

Course Outcomes:

The student will be able to:

- understand semiconductor devices through energy band diagrams.
- analyze characteristics of semiconductor junctions.
- differentiate between bipolar and unipolar conduction.
- understand physics of optical devices.
- understand the usefulness of semiconductor devices in circuit making.
- use these basic circuits to develop various useful applications.

SKILLS :

- ✓ *Identify a Semiconductor Diode for a specific application and power handling capacity.*
- ✓ *Identify the transistor type for a given application (switch/amplifier).*
- ✓ *Recognize the required specifications of the transistor.*
- ✓ *Identify the amplification factor of the given transistor.*
- ✓ *Test the working condition of the transistor.*

UNIT - 1 **L-9**

P-N JUNCTION DIODE: Formation of P-N junction, Energy band diagram of open circuited P-N junction, Operation of forward and reverse biased P-N junction diode, Volt-Ampere characteristics, Temperature dependence on V–I characteristic, Diode resistances and capacitances, Diode equation, Special diodes-Breakdown Mechanisms in a Semi Conductor Diode, Zener diode, V-I characteristics and zener diode as voltage regulator, Tunnel diode, Varactor diode, SCR, LED and photodiode.

UNIT - 2 **L-9**

DIODE APPLICATIONS: The P-N junction diode as a rectifier - Half wave rectifier, Full wave rectifier and bridge rectifier, Harmonic components in a rectifier circuit; Filters - Analysis and comparison of various filters, Inductor filter, Capacitor filter, L- section filter and ð-section filter in terms of ripple factor, A simple regulated power supply circuit; Clipping and clamping circuits - Elementary diode clippers and clamping circuits.

UNIT - 3 **L-9**

TRANSISTOR: Bipolar junction transistor (BJT) - Construction, Principle of operation of PNP and NPN transistors, Characteristics of transistor in common emitter, Common base and common collector configurations; Field effect transistor (FET)-Construction, Symbol and principle of operation of JFET, Pinch-off voltage, JFET characteristics, Comparison of BJT and FET; MOSFET - Construction, working and V-I characteristics of enhancement and depletion MOSFET.

UNIT - 4 **L-8**

BJT and FET BIASING: Transistor biasing and thermal stabilization, DC and AC load lines, Operating point, types of BJT biasing, Thermal runaway and thermal stability, Stabilization against variations in V_{BE}, â and I_{co} , Stability factors, Bias compensation using diodes and transistors **,** Biasing of FET.

UNIT - 5 **L-10**

SINGLE STAGE BJT AND FET AMPLIFIERS: Transistor as an amplifier, Two port network representation and h parameter model of a transistor, Exact and approximate analysis of CE small signal low frequency transistor model, Expressions for voltage gain, Current gain, Input impedance and output impedance using h-parameters, Comparison of transistor amplifier configurations in terms of A_I, R_i, A_V, R_o; FET amplifiers - FET small signal model, Analysis of FET amplifiers (CS, CD and CG configurations) at low frequencies, Expressions for voltage gain, Input impedance and output impedance.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

1. Understand the V-I characteristics of P-N junction diode and hence determine the diode forward, reverse currents, static and dynamic resistances.
2. Analyze the V-I characteristics of zener diode under reverse biased condition and observe the application as voltage regulator.
3. Calculate the efficiency and ripple factor of all rectifiers and analyze their performance with and without filter.
4. Understand the input and o/p characteristics of all BJT configurations in active region and determine its current amplification factors.
5. Understand the drain and transfer characteristics of FET and determine its amplification factor.
6. Understand the diode application as a clipper.

ACTIVITIES:

- *Choose a diode for a Cell-phone/ Laptop/ Tablet adapter/ for various ratings.*
- *Design voltage regulator using zener diode.*
- *Design three types of biasing circuits and determine the stability factors in each case.*
- *Transistor as an amplifier for the given specifications.*
- *Design a wideband amplifier with FET.*

LIST OF EXPERIMENTS Total hours-30

1. P-N Junction diode characteristics.
2. Zener diode characteristics and Zener diode as Voltage regulator.
3. To determine the ripple factor and efficiency of Half wave Rectifier with and without filter.
4. To determine the ripple factor and efficiency of Center tapped Full wave Rectifier with and without filter.
5. To determine the ripple factor and efficiency of Bridge Rectifier with and without filter.
6. Construction of various diode clipping circuits.
7. Transistor CB characteristics (Input and Output).
8. Transistor CE characteristics (Input and Output).
9. Transistor CC characteristics (Input and Output).
10. FET characteristics.

TEXT BOOKS:

1. J. Millman and C.C.Halkias, "Electronic Devices and Circuits", 9th edition, Tata Mc-Graw Hill, 2012.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", 9th edition, Pearson/ Prentice Hall, 2006.

REFERENCE BOOKS:

1. J. Taub and C.C. Halkias, "Electronic Circuits", 8th edition, Tata Mc-Graw Hill, 2015.
2. Salivahanan, Kumar and Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, 4th edition, 2008.
3. J. Millman and K Taub, "Electronic Circuits and Applications", 4th edition, Tata Mc-Graw Hill, 2011.
4. K Thomson, "Electronic Switching Circuits", 2nd edition, Oxford University Press, 2012.
5. K Satya Prasad, "Electronic Devices and Circuits", 2nd edition, VGS Publications, 2014.
6. K K Vara Prasad, "Electronic Devices and Applications", 2nd edition, Oxford University Press, 2014.

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	45	-	-	-	20	-	-

Course Description and Objectives :

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes :

The student will be able to:

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

✓ *Prepare wooden and metal furniture.*

✓ *Electrical wiring and power supply in residences.*

✓ *Make funnels, trays, locker, steel almirahs etc.*

✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*

✓ *CNC machines and various machining operations and processes.*

ACTIVITIES:

- o *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- o *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- o *Trials on electrical circuit connections.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin smithy and Black smithy.
4. House wiring.
5. Foundry and welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS:

1. S.K. Hazra Choudhury, "Elements of workshop Technology", 11^{th} edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice: Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S, "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

II

YEAR

INFORMATION TECHNOLOGY

B.Tech.

I SEMESTER

16HS202	-	Probability and Statistics
16MS201	-	Management Science
16IT201	-	Object Oriented Programming
16CS202	-	Data Structures
16CS203	-	Digital Logic Design
16CS302	-	Web Technologies
16EL102	-	Soft Skills Laboratory
	-	Employability and Life SkillsElective

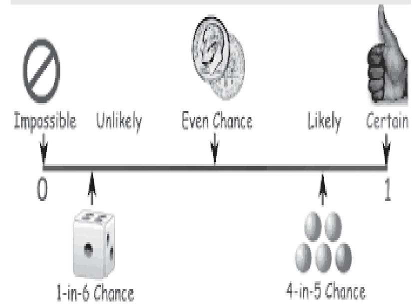
II SEMESTER

16CS205	-	Computer Organization and Architecture
16IT202	-	Advanced Data Structures
16CS201	-	Database Management Systems
16CS204	-	Discrete Mathematical Structures
16EL103	-	Professional Communications Laboratory
	-	Department Elective
	-	Department / Open Elective
	-	Employability and Life Skills Elective

COURSE CONTENTS

I SEM & II SEM

16HS202 PROBABILITY AND STATISTICS



Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation, regression, and their applications, probability, theoritical distributions and testing of hypothesis. The objective of this course is to enable the student to understand and apply statitical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L-12**

DESCRIPTIVE STATISTICS: Basic Definitions, Frequencies, Graphical Representation, Histogram, Ogive curves, Measures of Central tendency, Arithmetic mean, Median, Mode, Mean deviation, Standard Deviation, Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT - 2 **L-12**

CURVE FITTING, CORRELATION AND REGRESSION: Least squares method, Curve fitting (straight line and parabola only),Covariance, Correlation, Types, Pearson's Coefficient of correlation, Rank correlation, Spearman's rank correlation, Regression, Regression lines.

UNIT - 3 **L-12**

PROBABILITY: Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L-12**

DISTRIBUTIONS: Random variables, Discrete and Continuous variables, Introduction to Distributions.

BINOMIAL DISTRIBUTION: Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION: Definition, Mean and Standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION: Definition, Normal curve, Mean and Standard deviation, Median, Mode, Normal Distribution applications.

UNIT - 5 **L-12**

TESTING OF HYPOTHESIS: Population and Sampling, Parameters and Statistics, Types of sampling, Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion**,** t-distribution for small sample, Difference between means of small sample, Chi square test for goodness of fit, Chi-square test for test of independence.

TEXT BOOKS:

1. Miller and Freund, Probability and Statistics for engineers, 8th edition, Pearson publishers, 2013.
2. H. K. Dass and Er. Rajanish Verma, Higher Engineering Mathematics, S. Chand & Co., 3rd edition, 2014.

REFERENCE BOOK:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Co., New Delhi, 2005.

16MS201 MANAGEMENT SCIENCE

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	10	20	5	5	-	-

Course Description and Objectives:

This course provides an introduction to the evolution of management along with the framework of managerial functions related to organization structure, production, operations, marketing, human resource management, strategy etc. The objective of the course is to introduce the students and make them well versed with the operational functions of management.

Course Outcomes:

The student will be able to:

- understand the nature, importance and evolution of management.
- identify the significance of Operations Management.
- carry out production operations through work study.
- understand the markets, customers and competition.
- plan and control the HR function.

SKILLS:

✓ *Analyze and improve productivity.*

✓ *Analyze the customer needs, wants and demand.*

✓ *Recognize the need of different types/qualities of Human Resources.*

✓ *Analyze the reasons for the evolution of management.*

✓ *Analyze the philosophies of different management thinkers.*

ACTIVITIES:

- *Solve a test case to identify the various operational functions of management .*
- *Solve a test case to know the importance of marketing.*
- *Solve a test case to know the importance of human resources.*
- *Solve a test case to know the importance and evolution of management discipline.*

UNIT - 1 **L-9**

INTRODUCTION TO MANAGEMENT: Concepts of Management and organization, Nature, Importance and functions of management, Systems approach to management, Taylor's scientific management theory, Fayol's principles of management, Mayo's hawthorne experiments, Maslow's theory of human needs, Douglas McGregor's theory X and theory Y, Herzberg's two factor theory of motivation, Leadership styles, Social responsibilities of management.

UNIT - 2 **L-9**

OPERATIONS MANAGEMENT: Principles and types of plant layout, Methods of production (Job, Batch and mass production), Work study - Basic procedure involved in method study and work measurement

UNIT - 3 **L-9**

MATERIALS MANAGEMENT: Objectives, Need for inventory control, EOQ, ABC analysis, Purchase procedure, Stores management and stores records, Statistical Quality Control - Control charts for variables and attributes (simple Problems), Acceptance sampling.

UNIT - 4 **L-9**

HUMAN RESOURCES MANAGEMENT (HRM): Concepts of HRM, Basic functions of HR manager, Manpower planning, Recruitment, Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfer, Separation, Performance appraisal, Grievance handling and welfare administration, Job evaluation and merit rating.

UNIT - 5 **L-9**

MARKETING MANAGEMENT: Evolution of marketing, Functions of marketing selling Vs marketing, 4 P's of marketing, Product mix, Product life cycle, Place mix - Channels of distribution, Price mix – pricing methods, Promotion mix, Tools of promotions.

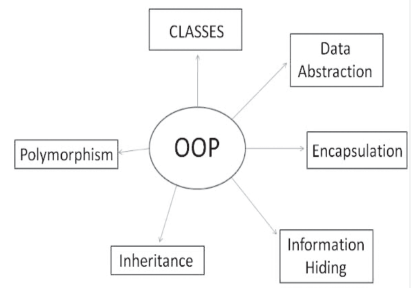
TEXT BOOKS:

1. P. Vijay Kumar, N. Appa Rao and Ashnab and Chnalill, "Introduction to Management Science", 6th edition, Cengage Learning India, 2012.
2. Stoner, Freeman and Gilbert, "Management", 6th edition, Pearson Education, 2004.

REFERENCE BOOKS:

1. Kotler Philip and Keller Kevin Lane, "Marketing Mangement", 12th edition, PHI, 2005.
2. Koontz and Weihrich, "Essentials of Management", 6th edition, TMH, 2005.

16IT201 OBJECT ORIENTED PROGRAMMING



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objective:

This course covers the principles of object oriented programming which includes defining class, creating objects, usage of abstraction, encapsulation, inheritance and polymorphism. Further, it offers concepts of multi-threading, applets, AWT and swings. The objective of this course is to enable the student to develop applications, graphical user interfaces and Internet programs using object oriented concepts.

Course Outcomes:

The student will be able to:

- distinguish between procedure oriented and object oriented concepts of programming.
- understand OOP concepts and features of Java programming.
- apply Object Oriented concepts in problem solving.
- identify requirements of Internet programming.
- develop Graphical User Interfaces (GUI).

SKILLS:

✓ *Create new packages and interfaces.*

✓ *Develop multi-threaded applications.*

✓ *Develop remote applets.*

✓ *Create web applications.*

ACTIVITIES:

- *Implement the concept of encapsulation.*
- *Develop a sample program which exhibits inheritance and polymorphism.*
- *Design and develop Internet programming using applets.*
- *Implement user interface using AWT and Swings.*

UNIT - 1 **L-10**

INTRODUCTION, CLASSES AND OBJECTS: Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP principles, Encapsulation, Inheritance and polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects, Class fundamentals, Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, This key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and inner classes, Exploring the string class.

UNIT - 2 **L-8**

INHERITANCE, PACKAGES AND INTERFACES: Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The object class, Defining, Creating and accessing a package, Understanding classpath, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and extending interfaces.

UNIT - 3 **L-9**

EXCEPTION HANDLING, MULTITHREADING: Concepts of exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and finally keywords, Built-in exceptions, Creating own exception, Sub classes, Concepts of multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, Deadlocks, Thread groups.

UNIT - 4 **L-9**

WINDOW PROGRAMMING: Applet class, Applet architecture, Applet skeleton, Applet initialization and termination, Overriding update( ), Simple applet, Display methods, Requesting repainting, A simple banner applet, Using the status window, The HTML applet tag, Passing parameters to applets, Applet context and show document. Event sources, Event classes, Action event, Adjustment event, Component event, Container event, Focus event, Input event, Item event, Key event and mouse event, Delegation event model, Event listeners, Handling mouse and keyboard events, Adapter classes.

UNIT - 5 **L-9**

AWT AND SWINGS: Concepts of components, Container, Panel, Window, Frame, Canvas, Font class, Color class and graphics, AWT Controls, Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout managers, Flow, Border, Grid, Card and grid bag .JApplet, JFrame and JComponent, Icons and labels, Handling threading issues, Text fields, Buttons, The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed panes, Scroll panes, Trees, and Tables.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS: Total Hrs: 30

1. Java program to read an integer and print all prime numbers upto that integer.
2. Java program that checks whether a given string is a palindrome or not.
3. Arrange given list of names in the ascending order.

4. Java Program that reads a line of integers and then displays each integer and the sum of all the integers (use StringTokenizer class).

5. Java program that reads a file and displays the file on the screen, with a line number before each line.

6. Display the number of characters, words and lines in a text file.

7. Develop Java program for creating multiple threads

   a) Using Thread class.

   b) Using Runnable interface.

8. Program that illustrates how a run time polymorphism is achieved.

9. Implement a Java program that illustrates the following

   a) Creation of simple package.

   b) Accessing a package.

   c) Implementing interfaces.

10. Write a Java program that illustrates the following

    a) Handling predefined exceptions.

    b) Handling user defined exceptions.

11. APPLETS - working with

    a) Frames and various controls.

    b) Dialogs and Menus.

    c) Panel and Layout.

    d) Graphics.

    e) Colors and fonts.

TEXT BOOKS:

1. Herbert Schildt, “The Complete Reference Java J2SE”, 9th edition, TMH Publishing Company Ltd, New Delhi, 2008.

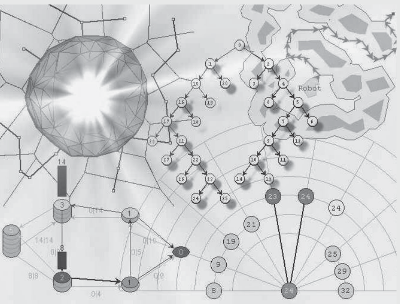
2. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd edition, TMH, 2009.

REFERENCE BOOKS:

1. Cay Horstmann, “Big Java”, 2nd edition, John Wiley and Sons, 2006.

2. O’Reilly, “Head First JAVA”, 2nd edition, O’Reilly Media Inc,2005

3. Herbert Schildt, “A Beginner’s Guide”, 6th edition, McGraw Hill Education, 2014.



16CS202 DATA STRUCTURES

Hours Per Week:

L	T	P	C
3	-	2	4

Total Hours:

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	8	5	-	-

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explain how to implement them. It begins with the basic concepts of data, data structures and then introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

Course Outcomes:

The student will be able to:

- apply advanced C programming techniques such as pointers, dynamic memory allocation, structures to develop solutions for particular problems.
- analyze characteristics of various data structures.
- differentiate between Graphs and Trees.
- derive the importance of sorting and applying it wherever useful.
- argue the usefulness of data structures in solving problems.

SKILLS:

✓ *Analyse the data structure required for various applications.*

✓ *Develop the sorting algorithm suitable for a given scenario.*

✓ *Implement array or linked list for a given problem.*

✓ *Describe Pros & Cons of each data structure.*

✓ *Usage of trees and graphs.*

UNIT - 1 **L-9**

SORTING AND SEARCHING: Introduction - Data, Data type, Data Structure, Primitive and Non-primitive - Data type, Data Structure; Storage structures - Sequential and Linked storage representations; Applications of Structures, Hashing.

SORTING: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort.

SEARCHING: Binary Search and Linear Search.

UNIT - 2 **L-9**

LINKED LISTS: Introduction, Types of Linked List - Singly Linked List, Doubly Linked List, Circular Linked List; Operations - Insertion, Deletion, Traverse forward/reverse order; Multi lists, Applications of Linked Lists.

UNIT - 3 **L-9**

STACKS AND QUEUES: Stacks - Introduction, Array and Linked representations, Implementation and their applications; Queues - Introduction, Array and Linked representations, Implementation and their applications, Types - Linear, Circular and Doubly ended queues; Applications.

UNIT - 4 **L-9**

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and Linked representations; Tree traversals and their Implementation, Expression trees, BST Definition and implementation; AVL Trees - Definition and Implementation.

UNIT - 5 **L-9**

GRAPHS: Introduction, Properties, Modeling problems as graphs representations - Adjacency matrix, Adjacency list; Traversals - Breath first search and Depth first search; Application of graphs.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to :

- understand the importance of structure, abstract data type and their basic usability in different applications through different programminglanguages.
- understand the linked implementation and its uses both in linear and non-linear data structure.
- understand various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
- decide a suitable data structure to solve a real world problem.

LIST OF EXPERIMENTS: Total hours: 30

1. Selection, Bubble, Insertion, Quick and Merge sorting algorithms.
2. Linear and Binary search algorithms.
3. Single linked list, doubly linked list, and circular linked list.
4. Stack using an array and linked list.
5. Queue using an array and linked list.
6. Tree using an array and linked list.
7. Check if given expression is fully parenthesis or not using stack.
8. Tree traversing techniques.
9. BST using an array and linked list.
10. Graph traversal techniques.

ACTIVITIES:

- *Design and Implement a School Management System.*
- *Design and Implement a Social Networking Site.*
- *Implement a project to find out the most common words in the articles.*
- *Design and Implement a Library Book Management System.*
- *Design and Implement a CricBuzz Application.*

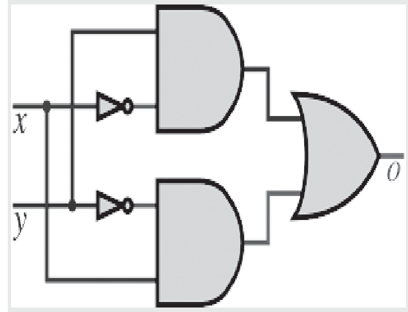
TEXT BOOK:

1. ReemaThareja, “Data Structures Using C”, 2nd edition, Oxford University Press, 2014.

REFERENCE BOOKS :

1. Richard F. Gilberg and Bhrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd edition, Cengage Learning, 2004.
2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd edition, Tata Mc-Graw Hill, 2004.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education, 2006..

16CS203 DIGITAL LOGIC DESIGN



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	7	8	2	2

Course Description and Objectives:

This course introduces the topics such as number systems, analysis and design of combinational and sequential circuits, digital circuit design optimization methods using multiplexers, decoders, registers, counters and programmable logic arrays. The objective of this course is to offer the knowledge and skill of conversions between different number systems, design of logical gates, minimization of switching functions, effective memory utilization and design of synchronous and asynchronous counters.

Course Outcomes:

The student will be able to:

- determine philosophy of number systems and codes.
- minimize switching functions using Boolean algebra, Karnaugh maps and tabular method.
- design combinational and sequential logic circuits using conventional gates.
- gain knowledge of the ROM, RAM, PROM, PLD etc.

SKILLS :

✓ *Perform number conversion.*

✓ *Synthesize boolean algebra.*

✓ *Construct combinational circuits like, decoders, encoders, multiplexers etc.*

✓ *Analyze counters, shift registers etc.*

✓ *Construction of PLA and PLD.*

ACTIVITIES:

- *Design of logical circuits using universal gates and basic gates.*
- *Reduction of Boolean function using K-maps.*
- *Construction of one stage ALU circuit.*
- *Design of the n-bit decoder and encoder.*
- *Design of combinational circuits using different types of flip-flops.*
- *Design of PLA for the given Boolean expression.*
- *Design of PLD for the given Bolean expression.*
- *Design of different types of counters.*

UNIT - 1 **L-9,T-3**

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Number system **-** Binary numbers, Number base conversions, Octal and hexadecimal numbers, Complements of numbers, Signed binary numbers, Binary codes, Binary logic. Boolean Algebra **-** Basic definitions, Basic theorems and properties of Boolean algebra.

UNIT - 2 **L-9,T-3**

LOGIC GATES AND GATE-LEVEL MINIMIZATION: Boolean functions, Canonical and standard forms, Digital logic gates, The map method, Four - variable k-map, Product-of-sums simplification, Don't-care conditions, NAND and NOR implementation, Other two-level implementations, Exclusive-or function.

UNIT -3 **L-9,T-3**

COMBINATIONAL LOGIC: Combinational circuits, Analysis and design procedure, Binary adder–subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Decoders, Encoders, Multiplexers, De-mutliplexers.

UNIT - 4 **L-9,T-3**

SEQUENTIAL LOGIC: Sequential circuits, Storage elements-Latches, Flip-flops, Analysis of clocked sequential circuits, Design procedure, Registers, Counters.

UNIT - 5 **L-9,T-3**

PROGRAMMABLE LOGIC DEVICES: Programmable logic, PLDs, ROM, Types of ROM, Combinational Programmable Devices, Programmable Logic Array, Programmable Read Only Memory.

TEXT BOOK:

1. M Morris Mano and Michael D. Ciletti, " Digital Design", 5th edition, Pearson Education, 2013.

REFERENCE BOOKS:

1. H Taub and D Schilling, "Digital Integrated Electronics", 2nd edition, TataMc Graw-Hill, 2004.
2. Z. Kohavi, "Switching and Finite Automata Theory", 2nd edition, Tata McGraw-Hill, 2008.

16CS302 WEB TECHNOLOGIES

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	30	5	40	5	8	5	2

Course Description and Objectives:

This course offers the basic concepts used to develop static web pages and it also provides knolwedge of Internet programming concepts, Web Servers and Web Application Servers, Design Methodologies with concentration on Object-Oriented concepts. The objective of this course is to build web applications using JSP and client side script technologies and also to build XML applications that span multiple domains.

Course Outcomes:

The student will be able to:

- develop a dynamic webpage using Java script and DHTML.
- write a well formed / valid XML document.
- connect a Java program to a DBMS and perform insert, update and delete operations on DBMS table.
- write a server side Java application called Servlet to catch form data sent from client, process it and store it in the database.
- write a server side Java application called JSP to catch form data sent from client and store it in the database.

SKILLS:

✓ *Perform client side validation using Java script.*

✓ *Store and retrieve data using JDBC.*

✓ *Generate dynamic contents using Servlets.*

✓ *Generate dynamic contents using JSPs.*

✓ *Overcome problems in Servlets and JSP using Struts Programs.*

✓ *Develop a working system of web application or web site.*

ACTIVITIES:

- *Choose a real time problem to develop a web application or web site.*
- *Identify number of web pages to be created.*
- *Choose a template for the web site.*
- *Develop each web page using the template and HTML, CSS languages.*
- *Install a web server like tomcat.*
- *Publish the developed web pages to the web server.*
- *Identify which pages from the above web site needs to be dynamically generated.*
- *Upgrade those pages to either servlets or JSP.*
- *Connect to DBMS.*

UNIT - 1 **L-9,T-3**

INTRODUCTION TO HTML AND JAVASCRIPT: HTML**-** HTML Common tags, Block level and inline Elements, Lists, Tables, Images, Forms, Frames, Cascading style sheets, CSS Properties; Java Script-Introduction to Java script, Objects in Java script, Dynamic HTML with Java script.

UNIT - 2 **L-9,T-3**

JDBC: Data base, Database schema, A brief overview of the JDBC process, JDBC driver types, JDBC Packages, Database connection, Associating the JDBC-ODBC bridge with database, Creating, Inserting, Updating and deleting data in database tables, Result set, Metadata.

UNIT - 3 **L-9,T-3**

WEB SERVERS AND SERVLETS: Tomcat web server, Introduction to Servlets, Advantage of servlets over "Traditional" CGI, Basic servlet structure, Simple servlet generating plain text, Compiling and installing the servlet, Invoking the servlet, Lifecycle of a servlet, The servlet API, Reading servlet parameters, Reading initialization parameters, Context parameters, Handling Http request & responses, Using cookies-session tracking, Servlet with JDBC.

UNIT - 4 **L-9,T-3**

INTRODUCTION TO JSP: The Problems with servlet, The anatomy of a JSP Page, JSP Processing, JSP application development, Generating dynamic content, Using scripting elements, Implicit JSP objects, Declaring variables and methods,Sharing data between JSP pages, Users passing control and data between pages, JSP application design with JDBC, JSP application design with MVC.

UNIT - 5 **L-9,T-3**

SEMANTIC WEB THE FUTURE OF THE INTERNET: Introduction, The syntactic web, The semantic web, How the semantic web will work, What the semantic web is not, What will be the side effects of the semantic web.

ONTOLOGY IN COMPUTER SCIENCE: Defining the term ontology, Differences among taxonomies, thesauri, ontologies, taxonomies versus ontologies, Thesauri versus ontologies, Classifying ontologies - according to a semantic spectrum, Classifying ontologies according to their generality, Classifying ontologies according to the information represented; Web ontology - description languages, Ontologies, Categories, Intelligence.

KNOWLEDGE REPRESENTATION IN DESCRIPTION LOGIC: Introduction, An informal example, The family of attributive languages, Concept descriptions; Terminologies - Assertions, Inference problems, Inference problems for concept descriptions inference problems for assertions.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- understand computers communication over network.
- send data to and from a server.
- create a web page and display it on browser.
- develop a web site.

List of Experiments: Total Hours: 30

1. Create a HTML page having four frames named
   a. top
   b. center
   c. bottom
   d. left

   The top frame should contain company logo and title. The bottom frame should contain copy right information. The left frame should contain various links like Home, Products, Services, Branches, About us, etc. When clicked on those links, the contents should appear in the display on to center frame.

2. Create a HTML document to demonstrate Form Elements that includes Form, input-text, password, radio, checkbox, hidden, button, submit, reset, label, text area, select, option, file upload.

3. Write a HTML program with at least two <h1>, two images, two buttons and appropriate CSS to display
   a. All <h1> with font-size 12pt, and bold in Verdana font using Inline CSS.
   b. All <img> with border color yellow, thickness 10px using Document Level CSS
   c. All <input type='button'> should change background color to red on mouse over them using External CSS.

4. Design a HTML page having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate java script function should be called to display the following:
   a. factorial of that number
   b. fibonacci series up to that number
   c. prime numbers up to that number
   d. is it palindrome or not?

5. Write Java script programs to demonstrate the following objects with atleast five methods:
   a. Math.
   b. String.
   c. Array.
   d. Date.

6. Write a Java script program to display message on OnBlur and OnFocus events.

7. Create an XML document where CSEBooks is the root tag, it consists of 5 books named as(book1, book2, book3, book4, book5) whose copies of books are 10 and provide the child tag such as author, title, pages, price for all books.

8. For the above program, provide an associate DTD.
9. Create an XML document where automobiles is the root tag, it consists of 5 vehicles named as (vehicle1, vehicle2, vehicle3, vehicle4, vehicle5) and use attributes type, model, engine number, color, cc.
10. For the above program, provide an associated Schema.
11. Write a Java program to connect to a database server using JDBC and insert 10 students information of user choice in to student table.
12. Write a Java program to display all records in the student table.
13. Develop a simple Servlet to display Welcome to Servlet.
14. Develop a Servlet to validate user name and password with the data stored in Servlet configuration file. Display authorized user if she/he is authorized else display unauthorized user.
15. Demonstrate Life cycle of Servlet.
16. Develop a Servlet to validate user name and password stored in the database. Display authorized user is she/he is authorized else display unauthorized user.
17. Write a Servlet program to store student details sent from registration form in to the database.
18. Write JSP Program to store student information sent from registration page into database.
19. Develop a program to validate username and password that are stored in database using JSP.
20. Write an appropriate JSP page to insert, update and delete data in student table in a single application with proper linking of JSP pages and session management.

TEXT BOOKS:

1. Jon Duckett, “Beginning Web Programming with HTML, XHTML, and CSS”, WROX, 2nd edition, 2008.
2. Marty Hall and Larry Brown, “Core Servlets and Java Server pages Vol. II”, 2nd edition, Pearson, 2007.
3. K K Breitman, M A Casanova and W Truszkowski, “Semantic Web: Concepts, Technologies and Applications”, Springer, 2009.

REFERENCE BOOKS:

1. Robert W Sebesta, “Programming the World Wide Web”, 4th edition, Pearson, 2006
2. Paul J Deitel, Harvey M Deitel and Abbey Deitel, “Internet and World Wide Web – How to program”, 5th edition, Deitel, 2009.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- identify and introspect on individual strengths and weaknesses.
- improve levels of self-awareness and self-worth for greater efficacy at workplace.

SKILLS:

✓ *Communicate and understand the difference between soft skills and hard skills.*

✓ *Professionalism and employability skills.*

✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*

✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*

✓ *Prepare resumé and learn how to face interview.*

✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

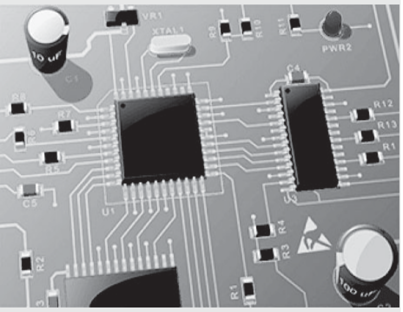
UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan and NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.



16CS205 COMPUTER ORGANIZATION AND ARCHITECTURE

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	7	8	2	2

Course Description and Objectives:

This course introduces Register Transfer Language, Computer Arithmetic, Basic Computer Organization and Design, Pipeline processing, Memory and Input Output Organizations. Further it helps to understand and analyze the functions and organizations of modern digital computers. It also offers students learning experience in the design and development of solutions and applications for modern digital computer systems using assembly language. The objective of the course is to enable the students to understand the basic structure and operation of a digital computer and also to know in detail the operation of the arithmetic unit, logical unit, control unit, different ways of communicating with I/O devices and the hierarchical memory system.

Course Outcomes:

The student will be able to:

- demonstrate the understanding of the basic principles of organization and operations of digital computers using assembly language.
- evaluate the technical issues of digital computer systems including arithmetic logic unit, control unit, communication with peripheral devices and interrupt handling.
- develop solutions related to the organization of digital computer systems.
- recognize and identify the developmental nature of technology related to modern digital computers.

SKILLS:

- ✓ *Writing assembly language programs that make use of various hardware resources.*
- ✓ *Perform fixed and floating point arithmetic operations.*
- ✓ *Identifying the types of memories and their uses.*
- ✓ *Perform data transfer mechanism in digital computer.*

UNIT - 1 **L-9,T-2**

INTRODUCTION &RTL: Organization and architecture, Block diagram of digital computer, Structure and function. Register transfer language – Register transfer bus and memory transfers.

UNIT - 2 **L-9,T-4**

COMPUTER ARITHMETIC: Arithmetic micro operations, Logic micro operations, Shift micro operations and Arithmetic logic shift unit. Addition and subtraction, Multiplication algorithms and Division algorithms, Floating point representation and its operations.

UNIT - 3 **L-9,T-4**

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer registers, Computer instructions, Instruction cycle, Memory–Reference instructions, Register reference instructions, Input-Output and Interrupt, Stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, Reduced instruction set computer.

UNIT - 4 **L-9,T-3**

PIPELINE PROCESSING & MEMORY ORGANIZATION: Pipeline processing-Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline, RISC pipeline. The memory organization - Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory**.**

UNIT - 5 **L-9,T-2**

INPUT- OUTPUT ORGANIZATION: Peripheral devices, Input-Output interface, Asynchronous data transfer, Modes of transfer, Priority interrupt, Direct memory access, Input-Output processor (IOP), Serial communication.

TEXT BOOKS:

1. M.Moris Mano, “Computer Systems Architecture”, 3rd edition, Pearson/Prentice Hall India, 2007.
2. William Stallings, “Computer Organization and Architecture”, 7th edition, Pearson/Prentice Hall India , 2007.

REFERENCE BOOKS:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th edition, Tata McGraw Hill, 2007.
2. Vincent P. Heuring and Harry F Jordan, ”Computer Systems Design and Architecture”, 2nd edition, Pearson/Prentice Hall India, 2004.
3. David A Patterso and John L Hennessy, “Computer Organization and Design - The Hardware/ Software Interface, ARM edition”, 5th edition, Elsevier, 2009.

ACTIVITIES:

- *development of assembly language programs that levarage the underlying hardware resources efficiently.*

16IT202 ADVACED DATA STRUCTURES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
3	50	4	6	3	2

Course Description and Objective:

This course focuses on study and implementation of advanced data structures such as hash tables, priority queues, balanced search trees and graphs. In addition, it covers analysis of different sorting algorithms and file structures. The objective of this course is to provide the student to the implementation of dictionaries, non-linear data structures and permanent storage structures.

Course Outcomes:

The student will be able to:

- identify the procedure to balance the tree structures.
- design and implement abstract data types such as dictionaries, balanced tree and graphs.
- choose appropriate abstract data types for a given application.
- apply relevant sorting algorithm to a given problem.
- understand and implement persistant storage structures.

SKILLS:

- ✓ *Identify the usage of indexing in searching applications.*
- ✓ *Pros and cons of balanced tree structures.*
- ✓ *Find the shortest path between cities and test the electronic circuits.*
- ✓ *Analyze the storage space and time complexity of sorting algorithms.*
- ✓ *Identify the need of persistant storage structures in real time applications.*

UNIT - 1 **L-10**

DICTIONARIES: Sets, Dictionaries, Hash tables, Open hashing, Closed hashing (rehashing methods), Hashing functions(division method, multiplication method, universal hashing), Analysis of closed hashing result (unsuccessful search, Insertion, Successful search, Deletion), Hash table restructuring, Skip lists, Analysis of skip lists.

UNIT - 2 **L-9**

BALANCED TREES: AVL trees,Maximum height of an AVL tree, Insertions and deletions, 2-3 trees, Insertion, Deletion, Priority queues, Binary heaps, Implementation of insert and delete minimum, Creating heap, Binomial queues, Binomial queue operations, Binomial amortized analysis, Lazy binomial queues.

UNIT - 3 **L-9**

GRAPHS: Operations on graphs vertex insertion, Vertex deletion, Find vertex, Edge addition, Edge deletion, Graph traversals, Depth first search and breadth first search, Graph storage representation, Adjacency matrix, Adjacency lists.

GRAPH ALGORITHMS: Minimum cost spanning trees, Prim's algorithm, Kruskal's algorithm, Shortest path algorithms, Dijkstra's algorithm, All pairs shortest paths problem, Floyd's algorithm, Warshall's algorithm.

UNIT - 4 **L-9**

SORTING METHODS: Order statistics, Lower bound on complexity for sorting methods, Lower bound on worst case complexity, Lower bound on average case complexity, Heap sort, Quick sort, Radix sorting, Merge sort.

UNIT - 5 **L-8**

PATTERN MATCHING AND TRIES: Pattern matching algorithms, The Boyer–Moore algorithm, The Knuth-Morris-Pratt algorithm, Tries, Definitions and concepts of digital search tree, Binary trie, patricia, Multi-way tries, File structures, Fundamental file processing operations, Opening files, Closing files, Reading and writing file contents, Special characters in files, Field and record organization, Managing fixed-length, Fixed-field buffers.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS: Total hrs: 30

1. Dictionary using hashing (division method, multiplication method, universal hashing).
2. Insertion and deletion on AVL trees.
3. Insertion and deletion on 2-3 trees.
4. Operations on binary heap.
5. Implement operations on graphs

   i) vertex insertion.

   ii) Vertex deletion.

   iii) finding vertex.

   iv) edge addition and deletion.

ACTIVITIES:

- *Implementation of dictionaries using hash tables.*
- *Optimization of various searching algorithms using balanced trees.*
- *Explore the time complexity and space complexity of data structures.*
- *Case study on applications of file structures.*

6. Depth first search for a graph nonrecursively.
7. Breadth first search for a graph nonrecursively.
8. Prim's algorithm to generate a minimum cost spanning tree.
9. Krushkal's algorithm to generate a minimum cost spanning tree.
10. Dijkstra's algorithm to find shortest path in the graph.
11. Pattern matching using Boyer-Moore algorithm.
12. Knuth-Morris-Pratt algorithm for pattern matching.

TEXT BOOK:

1. Richard F Gilberg and Behrouz A Forouzan, "Data Structure and pseudocode Approach", 2^{nd} edition, Cengage Learning, 2015.

REFERENCE BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4^{th} edition, Pearson Education, 2013.
2. AhoHopcroft Ullman, "Data Structures and Algorithms", 2^{nd} edition, Pearson Education, 2002.
3. Tanenbaum A S, Langram Y and AugestienM J, "Data Structures using C & C++", 3^{rd} edition, Prentice Hall of India, 2002.

16CS201 DATABASE MANAGEMENT SYSTEMS

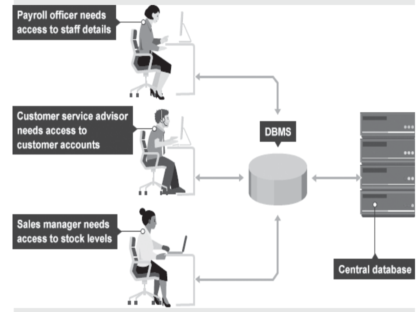
Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	2



Course Description and Objectives:

This course presents an introduction to database management systems with an emphasis on how to organize, maintain and retrieve data efficiently and effectively from a database. It concentrates on requirements gathering and conceptual, logical, physical database design. The objective of the course is to make the student to understand database management concepts such as database design, transaction processing and query optimization.

Course Outcomes:

The student will be able to:

- understand the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- design Entity Relationship(ER) models to represent simple database application scenarios.
- convert the ER-model to relational tables, populate relational database and formulate SQL queries.
- construct simple and complex queries using Structured Query Language (SQL).
- improve the database design by normalization.
- familiarise with basic database storage structures and access techniques.

SKILLS:

✓ *Design a conceptual database using ER-Model.*

✓ *Convert ER- Model to RDBMS.*

✓ *Formulate database queries using* Structured Query Language (SQL).

✓ *Build and run DDL and DML commands.*

✓ Design and implement normalized databases.

✓ Construct B+ Trees.

ACTIVITIES:

- *Design of ER diagram for the development of web applications.*
- *Transformation of ER diagram into a relational schema.*
- *Creation of relations with entity and referential integrity constraints for a given relational schema*
- *Representation of queries using Relational Algebra.*
- *Formulation of queries using SQL.*
- *Design of relational database using normalization techniques.*
- *Development of relational schema for enterprise level web applications.*

UNIT - 1 **L-9,T-3**

INTRODUCTION TO DATABASES: Characteristics of the Database Approach, People who work with databases, Advantages of using the DBMS approach, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs.

UNIT - 2 **L-9,T-3**

CONCEPTUAL DESIGN AND DATABASE DESIGN: High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the Company Database, ER Diagrams, Naming Conventions and Design Issues, Subclasses, Super classes and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization Hierarchies, Modeling of UNION Types Using Categories.

UNIT - 3 **L-9,T-3**

RELATIONAL DATA MODEL AND SQL: Relational Database Design Using ER-to-Relational Mapping, Mapping EER Model Constructs to Relations, Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations, SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE and UPDATE Statements in SQL, Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables) in SQL, Relational Algebra.

UNIT - 4 **L-9,T-3**

DATABASE DESIGN THEORY AND NORMALIZATION: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Properties of Relational Decompositions.

UNIT - 5 **L-9,T-3**

TRANSACTION PROCESSING, CONCURRENCY CONTROL AND RECOVERY: Transaction and System Concepts, Desirable Properties of Transactions, Two-Phase Locking Techniques, Timestamp Ordering, Recovery Concepts, The ARIES Recovery Algorithm, Recovery in Multi-database Systems, Primary File Organizations, Single level and Multilevel indexes, Dynamic Multilevel Indexes Using B+ Trees.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- ✓ understand, analyze, and apply common SQL Statements including DDL, DML and DCL statements to perform different operations.
- ✓ apply PL/SQL blocks using Cursors and Triggers.
- ✓ design and implement a database for a given problem.

List of experiments Total Hours 30

1. ER Design tool (ex. TOAD)
2. MYSQL RDBMS

3. Table Creation, Constraints, Insert, Select Commands, Update and Delete Commands.
4. Nested Queries and Join Queries.
5. Views.
6. Design and development of database using MYSQL.
7. High level programming language extensions (Control structures, Procedures and Functions).
8. Front end Tools.
9. Forms.
10. Triggers.
11. Menu Design.
12. Reports.

TEXT BOOK:

1. Ramez Elmasri and Shamkant B Navathe, “Fundamentals of Data base Systems”, 6th edition, Pearson Education, 2010.

REFERENCE BOOKS :

1. Raghu Rama Krishnan and Johannes Gehrke, “Database Management Systems”, 3rd edition, Tata McGraw Hill, 2013.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, “Database System Concepts”, 6th edition, Tata McGraw Hill, 2010.
3. Peter Rob and Carlos Coronel, “Database System Design, Implementation and Management”, 7th edition, Cengage Learning, 2007.

16CS204 DISCRETE MATHEMATICAL STRUCTURES

Hours Per Week:

L	T	P	C
3	-	-	3

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	40	3	8	5	2

Course Description and Objectives:

This course deals with the analysis of computational processes using analytical and combinatorial methods such as propositional logic, predicate logic, set theory, relations, functions, recurrence relations and graph theory. The objective of this course is to make the students to familiarize with required mathematical foundations of Computer Science.

Course Outcomes:

The student will be able to:

- use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, recurrence relations and graph theory applications.
- evaluate elementary mathematical arguments, identify erroneous reasoning, combine induction hypotheses and simple induction proofs.
- prove elementary properties of modular arithmetic and explain their applications in Computer Science.

SKILLS:

✓ *Design of logical gates using propositions.*

✓ *Prove the basic mathematical theorems through direct or indirect proofs.*

✓ *Solving various types of problems on sets & relations to understand some basic properties of trees, graphs and related discrete structures.*

✓ *Solving a problem in recursive manner and estimation of time complexity.*

UNIT - 1 **L-9**

MATHEMATICAL LOGIC: Propositions, Negation, Disjunction and Conjunction, Well-formed formulas, Truth tables, Tautology, Implication and Equivalence, Normal forms – DNF, CNF, PDNF, PCNF.

UNIT - 2 **L-9**

PREDICATES AND QUANTIFIERS: Natural Deduction, Rules of Inference, Methods of proofs, Mathematical Induction.

UNIT - 3 **L-9**

SET THEORY: Set, Properties, Relation, Properties of Binary Relations, Equivalence, Compatibility and partial ordering relations, Hasse diagram, Lattice and its properties, Peano postulates, Pigeon hole principles and its application.

UNIT - 4 **L-9**

RECURRENCE RELATION: Generating Functions, Function of Sequences, Calculating Coefficient of generating function, Recurrence relations, Recurrence relation by substitution and Generating functions, Characteristics, roots solution of Non-homogeneous recurrence relation.

UNIT - 5 **L-9**

GRAPH THEORY: Introduction, Graphs, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic numbers, Euler graph, Hamiltonian path, Trees, Tree traversals, Spanning trees, Minimal spanning trees**.**

TEXT BOOKS:

1. Trembly J.P. and Manohar, "Discrete Mathematical Structures with applications to computer science", 6th edition, Tata Mc-Graw Hill, 2006.
2. Ralph and P.Grimaldi, "Discrete and Combinational Mathematics- an Applied Introduction", 5th edition, Pearson Education, 2014.

REFERENCE BOOKS:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata Mc-Graw Hill, 2012.
2. Thomas Koshy, "Discrete Mathematics with Applications", 1st edition, Elsevier, 2003.
3. Bernand Kolman, Roberty C. Busby and Sharn Cutter Ross, "Discrete Mathematical Structures", 2nd edition, Pearson Education/Prentice Hall India, 2013.
4. Garry Haggard, "Discrete Mathematics for Computer science", 1st edition, Thomson, 2007.
5. J.L. Mott, A. Kandel and T.P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", 2nd edition, Prentice Hall India, 2009.
6. Grass Man and Trembley, "Logic and Discrete Mathematics", 2nd edition, Pearson Education/ Prentice Hall India, 2013.

ACTIVITIES:

- *Construction of Logical circuits using Truth tables.*
- *Gates minimization using Normal forms.*
- *Finding shortest path in graphs using different algorithms.*
- *Study on Pigeonhole principle.*
- *Finding solutions to non homogeneous linear equations.*
- *Study on different tree traversals.*
- *Checking logical equivalences.*

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

The student will be able to :

- clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- stand out both in the professional setting as well as for further pursuits in the academic world.
- succeed confidently in all four critical components of communication - LSRW (listening, speaking, reading and writing).

SKILLS:

✓ *Grammar rules in writing sentences, paragraphs and paraphrasing.*

✓ *Compose business emails, memos, letters, reports and proposals.*

✓ *Comprehend business articles and documents.*

✓ *Use of expressions in professional context and acquire presentation skills like one minute talk and pair discussion.*

✓ *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT - 1 **Learning-3 Hrs+ Practice -3Hrs =06 Hrs**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage) **Elements of Technical Writing**- Sentence structure, reducing verbosity, arranging ideas logically, building coherence, paragraph level and document level, topic sentence, cohesive devices, transitional words, paraphrasing and précis-writing.

Mechanics of Writing- Stylistic elements, the rapporteur, the purpose, the reader's viewpoint (audience), elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, weak links in business correspondence, ethical concerns in business writing, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication.

UNIT - 2 **Learning-3 Hrs+ Practice -3Hrs =06 Hrs**

BUSINESS CORRESPONDENCE: E-mail- nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and minutes of the meeting, notice, circular and memo.

Letter Writing - Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiring, claim letter, letter of apology etc]; Introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts of a report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusions, recommendations, citations, references and appendices).

UNIT - 3 **Learning-3 Hrs+ Practice -3Hrs =06 Hrs**

SPEAKING: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), features of a good power point presentation (making the PPT), delivering the presentation effectively, telephone etiquettes, delivering seminar/proposal/ report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations.

UNIT - 4 **Learning-3 Hrs+ Practice -3Hrs =06 Hrs**

READING: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **Learning-3 Hrs+ Practice -3Hrs =06 Hrs**

LISTENING: Specific information in business context, listening to telephonic conversations/messages and understanding the correct intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion and enable active listening.

TEXT BOOKS: BEC

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

ONLINE REFERENCES:

1. http://www.cambridgeenglish.org/exams/business-certificates/business vantage/ preparation/
2. https://www.youtube.com/watch?v=qxFtn9pGaTI.

ACTIVITIES:

- *Basic grammar practice, framing paragraphs on topics allocated.*
- *Paraphrasing an article or a video in your own words. Finding topic sentences in newspaper articles.*
- *Finding out new words from a professional viewpoint. Understanding the meaning and its usage.*
- *Perusing samples of well prepared proposals and reports.*
- *Draft different proposals/reports on topics assigned.*
- *Watching videos/ listening to audios of business presentations.*
- *Classroom activities of team and individual presentations.*
- *Using PPTs, mock exercises for BEC speaking.*
- *Presenting (speaking) the written components completed in Unit 1.*
- *Hand-outs; matching the statements with texts.*
- *Finding missing appropriate sentence in the text from multiple choice, multiple choices.*
- *Using right vocabulary as per the given context and editing a paragraph.*

VFSTR UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

III Year B.Tech. IT I - Semester

L	T	P	To	C
4	-	-	4	4

CS234 WEB TECHNOLOGIES

Course Description and Objectives:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers. Students will be able to use a variety of strategies and tools to create websites and also integrate with IDE's for fast development of web applications.

Course Outcomes:

- *Students are able to develop a dynamic webpage by the use of java script and DHTML.*
- *Students will be able to write a well formed / valid XML document.*
- *Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.*
- *Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.*
- *Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.*

UNIT I - Introduction to Tier Architecture & **HTML**

Client/Server Architecture**,** J2EE Multi Tier Architecture. HTML Common tags-Block Level and Inline Elements, Lists, Tables, Images, Forms, Frames; Cascading Style sheets, CSS Properties;

UNIT II - Java Script & XML

Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script.

The Need for XML, SGML and XML, Well-Formed XML, Valid XML, Displaying XML, XML Application Languages, Document type definition, XML Schema.

UNIT III - JDBC

Data Base, Database Schema, A Brief Overview Of The JDBC Process, JDBC Driver Types, JDBC Packages, Database Connection, Associating The JDBC-ODBC Bridge With Database, Creating, Inserting, Updating And Deleting Data In Database Tables, Result Set, Metadata.

UNIT IV - Web Servers and Servlets

Tomcat web server, Introduction to Servlets: Servlets, the Advantage of Servlets over “Traditional” CGI, Basic Servlet Structure, Simple Servlet Generating Plain Text, Compiling and Installing the Servlet, Invoking the Servlet, Lifecycle of a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Context Parameters, Handling Http Request & Responses, Using Cookies-Session Tracking, Servlet with JDBC.

UNIT V - Introduction to JSP

The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods , Sharing Data Between JSP pages, Users Passing Control and Data between Pages, JSP application design with JDBC, JSP Application Design with MVC.

TEXT BOOKS:

1. Beginning Web Programming-Jon Duckett, WROX, 2008.
2. Core Servlets and Java Server pages Vol. 1: Core Technologies By Marty Hall and Larry Brown Pearson, 2006.

REFERENCE BOOKS:

1. Programming world wide web-Sebesta,Pearson, 2015.
2. Internet and World Wide Web – How to program by Dietel and Nieto PHI/ Pearson Education Asia, 2011.
3. Jakarta Struts Cookbook, Bill Siggelkow, S P D O’Reilly, 2015
4. Murach’s beginning JAVA JDK 5, Murach, SPD, 2005.
5. An Introduction to web Design and Programming –Wang-Thomson, 2011.

III Year B.Tech. IT I - Semester

L	T	P	To	C
4	-	-	4	4

CS313 COMPUTER NETWORKS

Course Description and Objectives:

This course will focus on imparting knowledge about the aspects of data communication and computer network systems with the required basic principles behind them. This course provides essential knowledge about the OSI model and TCP/IP model. It creates a good foundation covering the physical, data link, network, transport, and application layers.

Course Outcomes:

- *To understand the communication basics.*
- *To have the knowledge of different networks.*
- *To know about different protocols.*
- *To understand how to find the routes by using different routing algorithms.*
- *To understand the basics of Internet.*

UNIT I - Introduction

Use of computer networks, network hardware, network software, reference models, example networks.

UNIT II - Physical layer, Data link layer & Medium access control sublayer

Guided Transmission Media.

Design issues, Error detection & correction, Elementary data link protocols, Sliding window protocols.

The channel allocation problem, multiple access protocols.

UNIT III - Network Layer

Design issues, Routing algorithms, Congestion control algorithms, Quality of Service (QOS), Internetworking, the network layer in the Internet.

UNIT IV - Transport layer

The transport service, elements of transport protocols, the internet transport protocols: UDP & TCP.

UNIT V - Application Layer
DNS-Domain Name System. The World Wide Web, Multimedia.

TEXT BOOK:

1. Andrew S Tanenbaum, “Computer Networks”, 4th ed., Pearson Education, 2003.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, “Data communications and Networking”, 3rd ed.,TMH, 2003.
2. William Stallings, “Data and Computer Communications”, 7th ed., Pearson Education, 2004.
3. J.F. Kurose and K . W. Ross, “Computer Networking-A Top-Down Approach Featuring Internet,” 3rd ed., Perason Education, 2005.

III Year B.Tech. IT I - Semester

L	T	P	To	C
4	-	-	4	4

CS315 OPERATING SYSTEMS

Course Description and Objectives:

In this course students should understand how the operating system effectively manages system resources.

Course Outcomes:

- õ *To understand the types of Operating systems and analyze the process scheduling Algorithms and Case study on processing Scheduling.*
- õ *To understand the resource sharing among the processes in the system.*
- õ *To understand how to manage the memory during the process execution (Memory Management) and File Management system.*

UNIT I - Introduction
What Operating System do, Operating System structure. Process Concept: Overview, Process scheduling, Operations on process, Inter process communication. Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Case Study: Process scheduling in Linux.

UNIT II - Process Synchronization
The Critical-Section Problem, Peterson’s Solution, Synchronization Hardware, Semaphores, Monitors, Classical problems of synchronization, Case Study : Process Synchronization in Linux.

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UNIT III - Deadlocks
Deadlock Characterization, Methods of Handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock Detection and Recovery.

UNIT IV - Memory Management
Continuous memory allocation, paging, structure of the page table, segmentation, demand paging, page replacement algorithms.

UNIT V - File System

File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File-System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management. Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, RAID Structure.

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Principles”, 7th edition, John Wiley & Sons Inc, 2006.

REFERENCE BOOKS:

1. William Stallings, “Operating Systems – Operating System: Internals and Design Principles”, 6th edition, , Prentice Hall, 2005.
2. Andrew S Tanenbaum ,”Modern Operating Systems”, 3rd edition, , Prentice Hall, 2007.

III Year B.Tech. IT I - Semester

L	T	P	To	C
4	-	-	4	4

CS317 COMPILER DESIGN

Course Description & Objectives:

To understand, design and implement a lexical analyzer , parser and code generation schemes. To understand optimization of codes and runtime environments.

Course Outcomes:

On completion of the course the student will:

- *Be able to prove an understanding of a program language structure and its translation to executable code by constructing and demonstrating a compiler for a language defined by a certain grammar.*
- *Prove knowledge of ongoing events when executing programs written in high level language. This is done by explaining and demonstrating these events while running a simple program translated by a personally designed compiler.*
- *Know how to design a compiler for a regular high level language.*

UNIT I - Introduction to Compiling

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens, data structures in compilation – LEX lexical analyzer generator

UNIT II - Syntax Analysis

Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing –Recursive Descent Parsing – Predictive Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser ,YACC – automatic parser generator.

UNIT III - Semantic analysis

Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Conversion of popular Programming languages language Constructs into Intermediate code forms, Declarations – Assignment Statements –Boolean Expressions.

UNIT IV - Code optimization and Run Time Environments

Introduction– Principal Sources of Optimization –Optimization of basic Blocks – Introduction to Global Data Flow Analysis - Basic blocks, Flow graphs, data flow equation, global optimization, data flow analysis for structured Programs.

UNIT V - Code Generation

Issues in the design of code generator – The target machine – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.

TEXT BOOK :

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", 1st ed., Pearson Education Asia, 2003.

REFERENCE BOOKS :

1. Allen I. Holub "Compiler Design in C", 1st ed., Prentice Hall of India, 2003.
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", 1st ed., Benjamin Cummings, 2003.
3. J.P. Bennet, "Introduction to Compiler Techniques", 2nd ed., Tata McGraw-Hill, 2003.
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", 3rd ed., PHI, 2001.
5. Kenneth C. Louden, "Compiler Construction: Principles and Practice", 1st ed., Thompson Learning, 2003.

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IT303 DIGITAL IMAGE PROCESSING
(Elective-I)

Course Description and Objectives:

To introduce to students the analytical tools and methods, which are currently used in digital image processing as applied to image information for human viewing. Students will learn to apply these tools in the laboratory in image restoration, enhancement, compression and segmentation.

Course Outcomes:

- *Understand how images are formed, sampled, quantized and represented digitally.*
- *Understand how image are processed by discrete, linear, time-invariant systems*
- *Understand how color is represented*
- *Understand how image information can be modeled analytically*
- *Understand the principles of image compression*

UNIT I - Digital Image Fundamentals

Elements of visual perception, Image sensing and acquisition, Image sampling and quantization Basic relationship between pixels, Basic geometric transformations, Introduction to Fourier Transform and DFT, Properties of 2D Fourier Transform, FFT Separable Image Transforms, Walsh, Hadamard, Discrete Cosine Transform, Haar Transform, Slant Transform and Hotelling Transform.

UNIT II - Enhancement

Spatial Domain methods**,** Basic grey level transformation, Histogram equalization, Image subtraction, Image averaging, Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters: Smoothing, Sharpening filters, Homomorphic filtering.

UNIT III - Restoration

Model of Image Degradation/restoration process, Noise models, Inverse filtering, Least mean square filtering, Constrained least square filtering, Blind image restoration, Pseudo inverse, Singular value decomposition.

UNIT IV - Compression

Fundamentals of image compression, image compression models, lossless compression**,** Variable length coding, LZW coding, Bit plane coding, predictive coding, DPCM. Lossy Compression: Transform coding, Wavelet coding, Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization.

UNIT V - Segmentation

Detection of discontinuities, Thresholding , Region Based segmentation.

TEXT BOOKS :

1. Rafael C Gonzalez, Richard E Woods , "Digital Image Processing", 2nd ed., Pearson Education, 2003
2. A.K. Jain, "Fundamentals of Digital Image Processing", 1st ed., PHI, 2004.

REFERENCE BOOKS :

1. Millman Sonka, Vaclav hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", 1st ed., Thompson Learning, 1999.
2. Chanda Dutta Majumdar, "Digital Image Processing and Applications", 1st ed., Prentice Hall of India, 2000.
3. Rafael C Gonzalez, "Digital Image Processing using MATLAB", 1st ed., Pearson Education, 2002.

III Year B.Tech. IT I - Semester

L	T	P	To	C
4	-	-	4	4

CS332 ARTIFICIAL INTELLIGENCE

(Elective-II)

Course Description and Objectives:

Provide knowledge of ideas and techniques underlying the design of intelligent computer systems. Develop problem solving skills in students. Provide knowledge of the tools and applications of AI. Lay the foundation for research areas like Natural language Processing(NLP) and Machine learning(ML).

Course Outcomes:

- *Basic knowledge of AI principles, techniques, Expert Systems*
- *Applications of basic AI techniques for problem solving.*
- *Knowledge representation and new knowledge deduction in intelligent systems.*
- *A brief idea of NLP, and Machine learning techniques.*

UNIT I - Introduction to Intelligent Systems

Introduction- What is AI? Examples of AI systems, Brief history of AI. Intelligent Agent- Agents and environments, The concept of rationality, The nature of environments, Structure of agents, stimulus-response agents (simple reflex agents), Model based agents, Goal based agents, Utility based agents, Learning agents.

UNIT II - Problem Solving

Searching: Solving problems by searching, A* algorithm, AO* algorithm, Heuristic functions, Hill climbing. Searching game trees (Adversarial search): Games, Optimal decisions in games, Minimax procedure, Alpha-beta pruning.

UNIT III - Knowledge Representation and Reasoning & First order logic

Propositional logic: Logical agents, reasoning patterns in propositional logic, Inference in propositional logic i.e. Resolution, Forward chaining, Backward chaining.

Reasoning patterns in First order logic, Inference in First order logic i.e. Resolution, Forward chaining, Backward chaining.

UNIT IV - Planning

The planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, analysis with planning approaches.

UNIT V - Learning

Forms of learning, Inductive learning, Learning Decision Trees, Ensemble Learning, Why learning works. Natural Language Processing(NLP): Introduction, Understanding, Perception, Machine learning.

TEXT BOOK:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence”, Second Edition, Pearson Education, 2003.

REFERENCE BOOKS:

1. G.Luger, W.A. Stubblefield, “Artificial Intelligence”, Third Edition, Addison-Wesley Longman, 1998.
2. N.J. Nilsson, “Principles of Artificial Intelligence”, Narosa Publishing House, 1980.

III Year B.Tech. IT I - Semester

L	T	P	To	C
4	-	-	4	4

CS334 PRINCIPLES OF PROGRAMMING LANGUAGES
(Elective-I)

Course Description and Objectives:

After the completion of this course Student should be able to understand how to design a new Programming Language. Know the differences between Structured and unstructured programming constructs.

Course Outcomes:

On completion of the course the student will:

- ***U**nderstand the concepts in programming languages*
- *The way of using those constructs in different programming languages.*
- *Familiar with the design of a new programming language.*

UNIT I - Syntax and Semantics of Programming Languages

Reasons for studying concepts of programming languages, Programming domains, Language Evaluation Criteria, Von Neuman Architecture, Language categories, Implementation Methods, Programming environments, General Problem of describing Syntax – Language. Recognizers and Language Generators, Formal methods of describing syntax – BNF, EBNF , Attribute grammars, Dynamic Semantics – Axiomatic , Operational and Denotational semantics.

UNIT II - Variables and Data Types

Names, Variables, Concept of binding, Type checking, Strong typing, Type compatibility, Named constants, Variable initialization, Data types – Primitive, Character, User defined, Array, Associative Arrays, Record, Union, Pointer and Reference types, Design and implementation uses related to these data types.

UNIT III - Expressions and Statements

Arithmetic, Relational and Boolean expressions, Short circuit evaluation, Mixed mode assignment, Assignment Statements, Statement-Level Control structures – Introduction, Selection and Iteration statements, Unconditional branching, Guarded commands.

UNIT IV - Subprograms, Blocks, Abstraction and OOP

Fundamentals of sub-programs, Static and Dynamic, Scope and lifetime of variable, Design issues of subprograms, Local referencing environments, Parameter passing methods, Overloaded sub-programs, Generic sub-programs, Parameters that are sub-program names, Design issues for functions, User defined overloaded operators, Co routines.

UNIT V - Concurrency and Exception Handling

Subprogram level concurrency, Introduction to Exception Handling, Exception Handling in Ada, C++ and Java, Functional Programming languages-Haskell, LISP

TEXT BOOKS:

1. Robert .W. Sebesta,"Concepts of Programming Languages", 8th ed., Pearson Education, 2009.
2. Ellis Horowitz, "Fundamentals of Programming Languages", 2nd ed., Computer Science Press, 2003.

REFERENCE BOOKS:

1. Pratt and Zelkowitz," Programming Languages Design and Implementation", 4th ed., PHI/Pearson Education,2002.
2. Watt, "Programming Languages", 4th ed., Wiley Dreamtech, 2002.
3. H.M.Dietel and P.J.Dietel, "Java How to Program", 6th ed., Pearson Education/PH

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		4	-	-	4	4

IT305 ADVANCED COMPUTER ARCHITECTURE

(Elective – I)

Course Description & Objectives :

The course focuses on processor design, pipelining, superscalar, out-of order execution, caches (memory hierarchies), virtual memory, storage systems, and simulation techniques. Advanced topics include a survey of parallel architectures and future directions in computer architecture

Course Outcomes:

At the end of this course students should:

- *Understand pipelining, instruction set architectures, memory addressing.*
- *Understand the performance metrics of microprocessors, memory, networks, and disks*
- *Understand the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges.*
- *Understand exploiting ILP using dynamic scheduling, multiple issue, and speculation.*
- *Understand multithreading by using ILP and supporting thread-level parallelism (TLP).*

UNIT I - Fundamentals of Computer design

Technology trends - cost- measuring and reporting performance quantitative principles of computer design. Instruction set principles and examples- classifying instruction set- memory addressing- type and size of operands- addressing modes for signal processing-operations in the instruction set- instructions for control flow- encoding an instruction set.-the role of compiler

UNIT II - Instruction level parallelism (ILP)

Over coming data hazards- reducing branch costs –high performance instruction delivery- hardware based speculation- limitation of ILP ILP software approach- compiler techniques- static branch protection - VLIW approach - H.W support for more ILP at compile time- H.W verses S.W Solutions

UNIT III - Memory hierarchy design

Cache performance- reducing cache misses penalty and miss rate – virtual memory- protection and examples of VM.

Multiprocessors and thread level parallelism- symmetric shared memory architectures- distributed shared memory- Synchronization- multi threading.

UNIT IV - Storage systems

Types – Buses - RAID- errors and failures- bench marking a storage device- designing a I/O system.

UNIT V - Inter connection networks and clusters

Interconnection network media – practical issues in interconnecting networks- examples – clusters- designing a cluster.

TEXT BOOK :

1. L. Hennessy & David A. Patterson “Computer Architecture A quantitative approach”, 3rd ed., Morgan Kufmann (An Imprint of Elsevier), 2002.

REFERENCE BOOKS :

1. Kai Hwang and A.Briggs “Computer Architecture and parallel Processing”, 1st ed., International Edition, McGraw-Hill,1984.
2. Dezso Sima, Terence Fountain, Peter Kacsuk” Advanced Computer Architectures”, 7th ed., Pearson Educatiob,2009.
3. David E. Culler, Jaswinder Pal singh with Anoop Gupta “Parallel Computer Architecture, A Hardware / Software Approach”, 1st ed., Morgan Kufmann (An Imprint of Elsevier) 1999.

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III Year B.Tech. IT I - Semester

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-	-	3	3	2

CS236 WEB TECHNOLOGIES LAB

Course Description & Objectives:

To create fully functional website with MVC architecture.

Course Outcomes:

- õ *Understand the various steps in designing a creative and dynamic website.*
- õ *They will able to write html, JavaScript, CSS and applet codes.*
- õ *They will have clear understanding of hierarchy of objects in HTML and XML.*
- õ *Finally they can create good, effective and customized websites.*
- õ *Know regarding internet related technologies. Systematic way of developing a website.*

List of Experiments:

Lab Cycle – 1

1. Create an HTML page having Four frames named
   a. Top
   b. Center
   c. Bottom
   d. Left

   The Top frame should contain company logo and title. The bottom frame should contain copy right information. The Left frame should contain various links like Home, Products, Services, Branches, about us, etc. When we click on those links, the contents should come in to Center Frame.
2. Create a HTML document to demonstrate Form Elements that includes Form, input-text, password, radio, checkbox, hidden, button, submit, reset, label, text area, select, option, file upload.
3. Write a HTML program with at least two <h1>, two images, two buttons and appropriate CSS to display

   a. All <h1> with font-size 12pt, and bold in Verdana font using Inline CSS.
   b. All <img> with border color yellow, thickness 10px using Document Level CSS
   c. All <input type='button'> should change background color to red on mouse over them using External CSS.
4. Design an HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate java script function should be called to display
   a. Factorial of that number
   b. Fibonacci series up to that number
   c. Prime numbers up to that number
   d. Is it palindrome or not
5. Write java script programs to demonstrate
   a. Math Object with at least five methods.
   b. String Object with at least five methods.
   c. Array Object with at least five methods.
   d. Date Object with at least five methods.
6. Write a java script program to display message on OnBlur and OnFocus events.
7. Create an XML document where CSEBooks is the root tag, it consists of 5 books named as(book1, book2, book3, book4, book5) whose copies of books are 10 and provide the child tag such as author, title, pages, price for all books.
8. For the above program, provide an associate DTD.
9. Create an XML document where automobiles is the root tag, it consists of 5 vehicles named as (vehicle1, vehicle2, vehicle3, vehicle4, vehicle5) and use attributes type, model, engine no, color, cc.
10. For the above program, provide an associated Schema.

Lab Cycle – 2

1. Write a java program to connect to a database server using JDBC and insert 10 students information of user choice in to student table.
2. Write a java program to display all records in the student table.

3. Develop a simple Servlet to display Welcome to Servlet.
4. Develop a Servlet to validate user name and password with the data stored in Servlet configuration file. Display authorized user if she/he is authorized else display unauthorized user.
5. Demonstrate Life cycle of Servlet
6. Develop a Servlet to validate user name and password stored in database. Display authorized user is she/he is authorized else display unauthorized user.
7. Write a Servlet program to store student details sent from registration form in to database table.
8. Write JSP Program to store student information sent from registration page into database table.
9. Develop a program to validate username and password that are stored in Database table using JSP.
10. Write appropriate JSP pages to insert, update and delete data in student table in a single application with proper linking of JSP pages and session management.

REFERENCE BOOKS:

1. ChrisBates,"Webprogramming-BuildingInternet Applications", 2nded.,WileyPublishers,2006.
2. DietelandNieto,"InternetandWorldWideWeb-Howtoprogram", 4th ed., PHI/PearsonEducation Asia,2007.
3. Marty Hall, "Core Servlets and Java Server Pages", 1st ed., Prentice Hall PTR, 2000.
4. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH, 1999.

III Year B.Tech. IT I - Semester

L	T	P	To	C
-	-	3	3	2

CS329 COMPUTER NETWORKS LAB

Course Description & Objectives:

Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP.Able to explain, configure, verify, and troubleshoot complex computer networks problem. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

Course Outcomes:

- *After completing the course, students will be able to:*
- *Understand the structure and organization of computer networks; including the division into network layers, role of each layer, and relationships between the layers.*
- *Understand the basic concepts of application layer protocol design; including client/server models, peer to peer models, and network naming.*
- *In depth understanding of transport layer concepts and protocol design; including connection oriented and connection-less models, techniques to provide reliable data delivery and algorithms for congestion control and flow control.*
- *In depth understanding of network layer concepts and protocol design; including virtual circuit and datagram network designs, datagram forwarding, routing algorithms, and network interconnections.*

List of experiments:

1. Study of Network devices in detail
2. Connect the computers in Local Area Network
3. Implementation of Data Link Framing method - Character Count.
4. Implementation of Data link framing method - Bit stuffing and De stuffing.

5. Implementation of Error detection method - even and odd parity.
6. Implementation of Error detection method - CRC Polynomials.
7. Implementation of Data Link protocols - Unrestricted simplex protocol
8. Implementation of data link protocols - Stop and Wait protocol
9. Implementation of routing algorithms - Dijkstra's algorithm
10. Study of Network IP Addressing
11. Study of sockets in detail
12. Design TCP client and server application to transfer file
13. Design UDP client and server application to transfer file
14. Working on Network Protocol Analyzer Tool (Ethereal/Wireshark) Working on NMAP Tool for Port scanning.

III Year B.Tech. IT   I - Semester

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CS331 OPERATING SYSTEMS LAB

Course Description & Objectives:

To provide an understanding of the design aspects of operating system

Course Outcomes:

- *Programs on process creation and synchronization,*
- *Inter process communication including shared memory, pipes and messages*
- *Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing)*
- *Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention*
- *Program for FIFO, LRU, and OPTIMAL page replacement algorithm.*

(Implement the following on LINUX or other UNIX like platform. Use C for high level language Implementation)

Write programs using the following system calls of UNIX operating system:

1. fork, exec, getpid, exit, wait, close, stat, opendir, readdir
2. Write programs using the I/O System calls of UNIX operating system. (open, read, write, etc)
3. Write C programs to simulate UNIX commands like ls, grep, etc.
4. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
5. Given the list of processes, their CPU burst times and arrival times. Display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
6. Develop Application using Inter-Process-Communication (Using shared memory, pipes or message queues).
7. Implement the Producer-Consumer problem using semaphores (Using UNIX system calls)

8. Implement some Memory management schemes like Paging and Segmentation.
9. Implement some Memory management schemes like FIRST FIT, BEST FIT & WORST FIT.
10. Implement any file allocation techniques (Contiguous, Linked or Indexed)

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Principles", 7th edition, John Wiley & Sons Inc, 2006.
2. Richard. Stevens, "Advanced Programming in the Unix Environment", Addison-Wesley, 2nd edition, 1992

III Year B.Tech. IT   II - Semester

L	T	P	To	C
4	-	-	4	4

CS322 OBJECT ORIENTED ANALYSIS & DESIGN

Course Description and Objectives:

This course explains how a software design may be represented as a set of interacting objects that manage their own state and operations. It describes the activities in the object - oriented design process and introduces various models that can be used to describe an object-oriented design.

Course Outcomes:

- õ *To understand the fundamental principles of Object Oriented programming.*
- õ *To master key principles in Object Oriented analysis, design, and development.*
- õ *Be familiar with the application of the Unified Modelling Language (UML) towards analysis and design.*
- õ *To know common patterns in Object Oriented design and implement them.*
- õ *To be familiar with alternative development processes.*

UNIT I - Introduction to UML

Importance of Modeling, Principles of Modeling, Object Oriented Modeling, Conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II - Basic Structural Modeling & Basic Behavioral Modeling

Classes, Relationships, Common Mechanisms, and Diagrams. Use cases, Use case Diagrams, Interactions, Interaction Diagrams, Activity Diagrams.

UNIT III - Class & Object Diagrams

Terms, Concepts, Modeling Techniques for Class & Object Diagrams.

UNIT IV - Advanced Structural Modeling & Advanced Behavioral Modeling

Advanced Classes, Advanced Relationships, Interfaces, Types and Roles, Packages.

Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.

UNIT V - Architectural Modeling

Component, Deployment, Component Diagrams and Deployment Diagrams.

TEXT BOOKS:

1. Booch G., Rumbaugh J. & Jacobsons I., “The Unified Modeling Language User Guide”, Addison Wesley, 2002.

REFERENCE BOOKS:

1. Meilir Page-Jones, “Fundamentals of Object Oriented Design in UML”, 4th ed., Pearson Education, 2008.
2. Pascal Roques, “Modeling Software Systems Using UML2”, 2nd ed., WILEY- Dreamtech India Pvt. Ltd, 2004.
3. Atul Kahate, “Object Oriented Analysis & Design”, 1st ed., The McGraw-Hill Companies, 2008.
4. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, “UML 2 Toolkit”, 1st ed., WILEYDreamtech India Pvt. Ltd., 2003.

III Year B.Tech. IT II - Semester

L	T	P	To	C
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CS324 MIDDLEWARE TECHNOLOGIES

Course Description and Objectives:

The main objective of this course is to get on awareness of a the various technologies which can help in the implementation of the various live project

Course Outcomes:

Upon completion of the subject, students will be able to:

- *Understand the basic structure of distributed systems;*
- *Understand the motivation of using middleware;*
- *Understand the basic concepts underlying the ASP.net and C#.net;*
- *Learn to make judgment in choosing a suitable middleware for application problems;*
- *Understand the basic concepts of Web Services and EJB.*

UNIT I - Emergence of Middleware

Introduction,Objects, Web Services,Middleware Elements, Vendor Architecture, interoperability,Middleware in distributed applications, Types of Middleware,RMI, JDBC,Client/Server CORBA Style.

UNIT II - ASP.NET

Introduction,Lifecycle,ServerControls,Basic Controls,Directives,Validators, Database Access,ADO.Net,File Uploading, Data Sources, Data Binding,Custom Controls,Security,Data Caching,Multithreading, Deployment.

UNIT III - Fundamentals of C#& .NET platform

Comprehensive .NET Assemblies.OOPs with C#, Attributes, Reflection, Properties, Indexers ,Delegates ,Events,Collections, Generics,Anonymous Methods, Unsafe Codes and Multithreading

UNIT IV - Web Services

Introduction,Architecture, Components,Security,XML Web Service Standards,Creating Web Services,Extending Web Services, Messaging Protocol,describing,discovering,securing

UNIT V - EJB

Java Bean Component Model,EJB Architecture,Session Bean,Java Message Service,Message Driven Bean,Entity Bean

TEXT BOOKS:

1. WortgangEmmerichJohn,"Engineering Distributed Objects", Wiley, 2000.
2. Mesbah Ahmed, Chris Garrett, Jeremy Faircloth, Chris Payne, DotThatCom.com, "ASP.net web developer guide",Wei Meng Lee (Series Editor),Jonothon Ortiz (Technical Editor),Syngress Publications, 2001.

REFERENCE BOOKS:

1. Andrew Troelsen, "C# and the .NET Platform",Apress Wiley-dreamtech, India Pvt.Ltd, 2011.
2. ".NET Web Services-Architecture and Implementation", Keith Ballinger, Pearson Education, 2002.

III Year B.Tech. IT II - Semester

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IT308 MICROPROCESSORS & MICROCONTROLLERS

Course description and Objectives:

To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

Course Outcomes:

- õ *The student will learn the internal organization of some popular microprocessors /microcontrollers.*
- õ *The student will learn hardware and software interaction and integration.*
- õ *The students will learn the design of microprocessors/ microcontrollers-based systems.*

UNIT I - Introduction to Microprocessor

An over view of 8085 - Architecture of 8086 Microprocessor - Signal descriptions of 8086 – Physical memory organization – general bus operation - Special processor activities – Minimum mode 8086 system and timings - Minimum mode 8086 system and timings – Comparison between 8086 and 8088.

UNIT II - Assembly Language Programming

Machine Language instruction formats – Addressing modes of 8086 – instruction set of 8086 – Assembler directives and operators – Assembly language programming – interrupts and interrupt service routines – Macros.

UNIT III - Interfacing

Semiconductor memory interfacing – Interfacing I/O ports – PIO 8255 – modes of operation of 8255 – interfacing analog to digital converters – interfacing digital to analog converters – stepper motor interfacing.

UNIT IV - Advanced Processors

Introduction to 80286, Salient Features of 80386, Real and Protected Mode Segmentation & Paging, Salient Features of Pentium, Branch Prediction, Overview of RISC Processors.

UNIT V - 8051 Microcontroller

Overview of 8051 microcontroller Architecture - I/O Ports - Memory organization - addressing modes and instruction set of 8051 - simple programs.

TEXT BOOKS :

1. Advanced microprocessor and Peripherals - A.K.Ray and K.M.Bhurchandi, TMH, 2000.
2. 8051 Micro Controller Architecture, Programming and Applications by Kenneth J.Ayala, 2009.

REFERENCE BOOKS:

1. Micro Processors & Interfacing – Douglas U. Hall, 2007.
2. The 8088 and 8086 Micro Processors – PHI, 4th Edition, 2003.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - By Liu and GA Gibson, 2010.
4. Yu-cheng Liu, Glenn A. Gibson, “Microcomputer systems: The 8086 /8088 Family architecture, Programming and Design”, Second edition, Prentice Hall of India, 2003.

III Year B.Tech. IT II - Semester

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CS435 SOFTWARE TESTING METHODOLOGIES

Course Description and Objectives:

Software testing is a subject where the student will learn and apply basic skills needed to create and automate the test plan of a software project. It aims to describe principles and strategies for generating system test cases and to understand the essential characteristics of tools used for test automation.

Course Outcomes:

Students who have completed this course would have learned

- õ *Various test processes and continuous quality improvement*
- õ *Types of errors and fault models*
- õ *Methods of test generation from requirements*
- õ *Behavior modeling using UML: Finite state machines (FSM)*
- õ *Test adequacy assessment using: control flow, data flow, and program mutations*

UNIT I - Introduction

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II - Transaction Flow Testing & Domain Testing

Transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT III - Paths, Path products and Regular expressions

Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

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UNIT IV - Logic Based Testing & State, State Graphs and Transition testing

Overview, decision tables, path expressions, kv charts, specifications.
State graphs, good & bad state graphs, state testing, Testability tips.

UNIT V - Graph Matrices and Application

Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Winrunner tools for functional / Regression testing (Ref Text book2).

TEXT BOOKS:

1. Boris Beizer, “Software Testing Techniques”, 2nd ed., Dreamtech, 2006.
2. Dr.K.V.K.K.Prasad, “Software Testing Tools”, 1st ed., Dreamtech. 2008.

REFERENCE BOOKS:

1. Brian Marick, “The craft of software testing”, 2nd ed., Pearson Education, 2007.
2. Edward Kit, “Software Testing in the Real World “, 2nd ed., Pearson Education, 2008.

III Year B.Tech. IT II - Semester

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IT310 SOFT COMPUTING

(Elective-II)

Course Description and Objectives:

To know about the components and building block hypothesis of Genetic algorithm. To understand the features of neural network and its applications and to study the fuzzy logic components

Course Outcomes:

- *Implement machine learning through neural networks.*
- *Gain Knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.*
- *Understand fuzzy concepts and develop a Fuzzy expert system to derive decisions.*
- *Able to Model Neuro Fuzzy system for data clustering and classification.*

UNIT I - Neural Networks

History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta.

UNIT II - Fuzzy Logic

Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation.

UNIT III- Operations on Fuzzy Sets & Fuzzy Arithmetic

Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

UNIT IV - Fuzzy Logic

Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Uncertainty based Information : Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

UNIT V - Application of Fuzzy Logic & Genetic Algorithm

Introduction of Neuro - Fuzzy Systems, Architecture of Neuro Fuzzy Networks. Medicine, Economics etc. An Overview, GA in problem solving, Implementation of GA

TEXT BOOKS:

1. AI & Expert system, Janki Raman ,MacMillen,2003
2. Artificial Intelligence, Knight ,TMH,1991.

REFERENCE BOOKS:

1. Artificial Intelligence, G.F luger,Pearson education,2003
2. Artificial Intelligence, Patricks henry ,Winston,Pearson education,2001
3. Artificial Intelligence, Nilsson , Morgon, Kufmann 1998.
4. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.

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IV Year - B.Tech

SYLLABUS

I SEM & II SEM

IV Year B.Tech. IT I - Semester

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CS425 DATAWAREHOUSING & DATAMINING

Course Description and Objectives:

This course is about knowing of how to make use of historical data so that high end business decision can be taken for the growth of an organization. The main objective of this course is to designing the intelligent machines which can take risk business decisions behalf of humans using the datamining techniques like classification, clustering, outlier detection, association rule mining.

Course Outcomes:

Students are able to

- *Learn the basic concepts of Database Technology Evaluation steps and also understood the need of data mining and its functionalities*
- *Explore the efficient and effective maintenance of Data Warehouses.*
- *Apply the data mining functionalities like Clustering, Classification, Association Analysis to real world data.*
- *Discover interesting patterns and association rules from huge volume of data used to do classifications and predictions.*
- *Gain knowledge on developing areas like Web Mining, Text Mining, and Spatial Mining.*

UNIT I - Introduction & Data Warehousing and Online Analytical Processing

Why Data Mining, What is Data Mining, Kinds of Data, Kinds of Patterns, and Technologies used, Kinds of applications adopted, Major issues in Data Mining.

Basic Concepts, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction

UNIT II - About Data & Data Preprocessing

Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT III - Data Cube Technology, Mining Frequent Patterns, Associations, and Correlations & Advanced Pattern Mining

Preliminary Concepts, Data Cube Computation Methods, Processing Advanced Kinds of Queries by Exploring Cube Technology, Multidimensional Data Analysis in Cube Space

Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods

Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining

UNIT IV - Classification & Advanced Classification

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy

Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Classification Using Frequent Patterns, Lazy Learners, Other Classification Methods

UNIT V - Cluster Analysis & Advanced Cluster Analysis

Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering

Probabilistic Model-Based Clustering, Clustering High-Dimensional Data

TEXT BOOKS:

1. Jiawei Han Micheline Kamber – "Data Mining Concepts & Techniques", Third Edition, Morgan Kaufmann Publishers, 2012.

REFERENCE BOOKS :

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", First Edition,2012.
2. Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit", first edition John Wiley and Sons Inc., 2002.
3. Alex Berson, Stephen Smith, Kurt Thearling, "Building Data Mining Applications for CRM", first edition, Tata McGraw Hill, 2000.
4. Margaret Dunham, "Data Mining: Introductory and Advanced Topics", first edition, Prentice Hall, 2002.
5. Paulraj Ponnaiah, "Data Warehousing Fundamentals", first edition, Wiley Publishers, 2001.

IV Year B.Tech. IT I - Semester

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CS427 CRYPTOGRAPHY AND NETWORK SECURITY

Course Description and Objectives:

This Course focuses towards the introduction of network security using various cryptographic algorithms and understanding network security applications. It also focuses on the practical applications that have been implemented and are in use to provide email and web security.

Course Outcomes:

On successful completion of this course, the students

- *Will have knowledge and understanding of: Classical encryption techniques, Block ciphers and the Data Encryption Standard, Basics of finite fields, Advanced Encryption Standard, Contemporary symmetric ciphers, Confidentiality using symmetric encryption, Basics of number theory, Key management, Public key cryptosystems, Message authentication, Hash functions and algorithms, Digital signatures and authentication protocols, Network security practice, Applications, E-Mail, IP and web security, System security, Intruders, Malicious software, Firewalls.*
- *Will develop their skills in: the programming of symmetric and/or asymmetric ciphers and their use in the networks.*
- *Will learn protocols used in Web Security and Transport layer Security*

UNIT I - NETWORK SECURITY INTRODUCTION

Security attacks – Security services – Security Mechanisms – A Model for Network Security Model Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography

UNIT II - BLOCK CIPHERS AND DATA ENCRYPTION STANDARD

Block Cipher Principles – Data Encryption Standard – Strength of DES – Differential and Linear Cryptanalysis - Block Cipher Design Principles.- Advanced Encryption Standard – Evaluation Criteria of AES – AES Cipher – More on Symmetric Ciphers – Multiple encryption and Triple DES – Block Cipher Modes of Operation – RC4.

UNIT III - PUBLIC-KEY ENCRYPTION AND HASH FUNCITONS

Principles of Public –Key Cryptosystems – RSA Algorithm – Key Management – Message Authentication and Hash Functions – Authentication Requirements – Authentication Functions – Message Authentication – Hash Functions – Security of Hash Functions and MACs- Digital Signatures - Authentication Protocols – Digital Signature Standard.

UNIT IV - NETWORK SECURITY APPLICATIONS

Kerberos – X.509 Authentication Service – Public Key Infrastructure – Pretty Good Privacy – S/MIME- IP Security Overview – IP Security architecture- Authentication Header – Encapsulating Security Payload – Combining Security associations – Key Management

UNIT V - Web Security

Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction. SYSTEM SECURITY Intruders – Intrusion Detection – Password Management – Malicious Software - Firewalls – Trusted Systems.

TEXT BOOKS :

1. William Stallings, “Cryptography and Network security”, 4th ed., Pearson Education, 2010.
2. William Stallings “Network Security Essentials Applications and Standards”, 2nd ed.,Pearson Education, 2009.

REFERENCE BOOKS :

1. Eric Malwald, “Fundamentals of Network Security “, 4th ed., Pearson Education, 2010.
2. Charlie Kaufman, “Radis Perlman and Mike Speciner ,Network Security – Private Communication in a Public World”, 1st ed., Pearson Education,2009 .
3. Buchmann, Springer ,”Introduction to Cryptography”, 2nd ed., Pearson Education, 2009.
4. William Stallings,”Cryptography and Network security”, 1st ed., Pearson Education, 2008.
5. Lorrie Faith Cranor, Simson Garfinkel, “Security & Usability”, 2nd ed., SPD OREILLY Publications, 2005.
6. Chris Frj & Martin Nystrom “Security Monitoring”, 1st ed., SPD OREILLY Publications, 2009.

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CS443 BIG DATA ANALYTICS

Course Description and Objectives:

The main objectives of this course is to enable the students with basic data analytic skills like regression analysis, classification techniques, clustering techniques, association rule mining. Further, this course also enables the students how to scale the above algorithms with different data environments like massive amount of data, streaming data, distributed data and provides hands on experience on real world problems using above theoretical background.

Course Outcomes

- *Necessary theory background for processing analytics.*
- *Processing analytics on small scale data.*
- *Mining from massive datasets.*
- *Mining from distributed datasets.*

UNIT I - Introduction To Big Data

Introduction to BigData Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II - Data Analysis

Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning

UNIT III - Advanced Learning And Introduction To Streaming

Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data – Fuzzy c-Means- Stochastic Search Methods. Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams

UNIT IV - Frequent Itemsets And Clustering

Mining Frequent Itemsets - Market Based Model – Apriori Algorithm, FP-Growth, Dynamic Item set Algorithm – Clustering Techniques – Hierarchical – K-Means, K-medoid, CURE- Clustering High Dimensional Data – CLIQUE– Clustering in Non-Euclidean Space – Clustering for Streams and Parallelism.

UNIT V - Frameworks And Visualization

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed

File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications.

TEXT BOOKS:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

REFERENCE BOOKS:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007
3. Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
4. Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

IV Year B.Tech. IT I - Semester

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CS439 SOFTWARE PROJECT MANAGEMENT
(Elective-III)

Course Description and Objectives:

Students will be introduced to the following aspects of project management related to managing small software development and To describe activities of SPM highlights and train in the planning and implementation of project management. It brings a specific project to complete on time and on budget.

Course Outcomes:

- *identify and describe the impact different project contexts will have upon all aspects of a software development project, including an understanding of the role professional ethics plays in the conduct of successful software development*
- *identify and describe the key phases of project management and the key skills associated with each*
- *determine an appropriate project management approach through an evaluation of the business context and project scope and knowledge of agile and traditional project management approaches*
- *demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule; governance including progress reporting, risk and quality management*
- *as part of a small team research and produce a concise piece of writing suitable for presentation to senior management demonstrate an ability to present their ideas both formally and informally to a group of their peers.*

UNIT I - Conventional Software Management & Improving Software Economics

The waterfall model, conventional software Management performance. Evolution of Software Economics : Software Economics, pragmatic software cost estimation.

Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II - The old way and the new & Life cycle phases

The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT III - Artifacts of the process

The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures : A Management perspective and technical perspective.

UNIT IV - Iterative Process Planning & Project Organizations and Responsibilities

Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation : Automation Building blocks, The Project Environment.

UNIT V - Project Control and Process instrumentation & Future Software Project Management

The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Modern Project Profiles, Next generation Software economics, modern process transitions.

TEXT BOOK :

1. Walker Royce ,"Software Project Management", 1st ed., Pearson Education, 2005.

REFERENCES BOOKS :

1. Bob Hughes and Mike Cotterell, "Software Project Management", 3rd ed.,Tata McGraw - Hill Edition, 2005.
2. Joel Henry, "Software Project Management", 1st ed., Pearson Education, 2006.
3. Pankaj Jalote, "Software Project Management in practice", 1st ed., Pearson Education, 2005.

IV Year B.Tech. IT I - Semester

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CS426 HUMAN COMPUTER INTERACTION

(Elective-III)

Course Description and Objectives:

The student will learn how interaction with computers takes place at user interface, which comprises both hardware and software. To facilitate communication between students of psychology, design, and computer science on user interface development projects. To facilitate communication between students of psychology, design, and computer science on user interface development projects.

Course Outcomes:

- *The student will learn, The importance of User Interface and interaction with computers using a Graphical User Interface and Keyboard and function keys along with video drivers*
- *To provide the future user interface designer with concepts and strategies for making design decisions.*
- *To expose the future user interface designer to tools, techniques, and ideas for interface design.*
- *To introduce the student to the literature of human-computer interaction.*

UNIT I - Introduction

Importance of user Interface - definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface - popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user - Interface popularity, characteristics- Principles of user interface.

UNIT II - Design process

Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.

UNIT III - Screen Designing

Design goals - Screen planning and purpose, organizing screen elements, ordering of screen data and content - screen navigation and flow - Visually pleasing composition - amount of information - focus and emphasis - presentation information simply and meaningfully – information Screen Designing:- Design goals - Screen planning and purpose, organizing screen elements, ordering of screen data and content - screen navigation and flow - Visually pleasing composition - amount of information - focus and emphasis - presentation information simply and meaningfully - information retrieval on web - statistical graphics - Technological consideration in interface design.

UNIT IV - Windows

New and Navigation schemes selection of window, selection of devices based and screen based controls. Components - text and messages, Icons and increases - Multimedia, colors, uses problems, choosing colors.

UNIT V - Software tools

Specification methods, interface - Building Tools. Interaction Devices - Keyboard and function keys - pointing devices - speech recognition digitization and generation - image and video displays - drivers.

TEXT BOOKS:

1. Wilbert O Galitz “The essential guide to user interface design”, Wiley Computer publishing 2nd edition.
2. Ben Shneidermann,Catherina Plaisant “Designing the user interface”, Pearson Education Asia. 3rd Edition 2007,

REFERENCE BOOKS:

1. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg “Human - Computer Interaction” Pearson Education
2. Rogers, Sharps “Interaction Design Prece”, Wiley Dreamtech,

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CS434 MULTIMEDIA SYSTEMS
(Elective-III)

Course Description and Objectives:

Understand the characteristics of multimedia systems and how to address issues Be aware of the differences among multimedia authoring systems. Be familiar with the software development process as practiced in a multimedia development environment Be able to design, write, document, debug and evaluate a non trivial multimedia system. Appreciate and understand the legal and ethical issues associated with developing multimedia systems, particularly in regard to use of media clips developed by others.

Course Outcomes:

- õ *Write action script for a particular problem.*
- õ *Design and Draw customized GUI components.*
- õ *Apply Transformations on Components.*
- õ *To make use of fundamental concepts and formulate best practices*

UNIT I

Introduction to Multimedia, Media and Data Streams, Sound/Audio, Images and Graphics, Video and Animation.

UNIT II

Data Compression, Optical Storage Media; Computer Technology, Multimedia Operating Systems.

UNIT III

Networking Systems, Multimedia Communication Systems; Database Systems.

UNIT IV

Multimedia Architecture; Multimedia Documents, Hypertext and MHEG.

UNIT V

User Interfaces, Synchronization, Abstractions for Programming; Multimedia Application Development; Virtual Reality; Future Directions.

TEXT BOOKS:

1. Ralf Steinmetz, Klara Nahrstedt "Multimedia: Computing Communications & Applications" Pearson Education (2004)
2. Parekh Ranjan "Principles of Multimedia" Tata McGraw-Hill (2007)

REFERENCE BOOKS:

1. John E Koegal, Buford "Multimedia Systems" IIBK. (1994)
2. John Vince "Virtual Reality Systems" ACM Press (1995)

VFSTR UNIVERSITY

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IT407 DISTRIBUTED COMPUTING
(Elective-III)

Course Description and Objectives:

To list the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions. Course Objective Should be in single paragraph

To build distributed system software using basic OS mechanisms as well as higher-level Middleware and languages.

Course Outcomes:

To be able to:

- *Distinguish the theoretical and conceptual foundations of distributed computing.*
- *Recognize the inherent difficulties that arise due to distributed-ness of computing resources.*
- *Recognize the feasibilities and the impossibilities in managing resources.*
- *Identify the problems in developing distributed applications.*

UNIT I - Basic Distributed System Concepts

Introduction, Distributed Computing Models, Software Concepts, Issues in Designing Distributed Systems, Client–Server Model.

UNIT II - Network & Inter Process Communication

LAN and WAN Technologies, Protocols for Network Systems, Protocols for Distributed Systems, Message Passing, Group Communication, API for Internet Protocol, RPC Communication

UNIT III - Synchronization

Clock Synchronization, Logical Clocks, Global State, Mutual Exclusion, Election Algorithms, Deadlocks in Distributed Systems

UNIT IV - Distributed System Management

Load-balancing Approach, Load-sharing Approach, Threads, Fault Tolerance, Basic Concepts of DSM, File Models in DFS

UNIT V - Emerging Trends in Distributed Computing

Grid Computing, SOA, Cloud Computing, The Future of Emerging Trends.

TEXT BOOKS:

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani & Mukesh Singhal, Cambrigde, rp 2010

REFERENCE BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

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CS336 SIMULATION AND MODELING
(Elective-IV)

Course Description and Objectives:

The objective of this course is to teach students methods for modeling of systems using discrete event simulation. Emphasis of the course will be on modeling and on the use of simulation software. The students are expected to understand the importance of simulation in IT sector, manufacturing, telecommunication, and service industries etc. By the end of the course students will be able to formulate simulation model for a given problem, implement the model in software and perform simulation analysis of the system.

Course outcomes:

- *Students will be enable to understand the types of system models.*
- *Students will be able to generate random variables and random numbers.*
- *Students can verify and validate simulation models.*

UNIT I - The concepts of a system,system modeling,types of models &System studies

Static physical models,dynamic physical models,static mathematical models,dynamic mathematical models,principles used in modeling.

A corporate model:Environment segment,production segment,management segment. Types of system study.

UNIT II - Mathematical and Statistical Models

Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers.

UNIT III - Analysis of simulation data Input modeling & Verification and validation of simulation models

Data collection,identifying the distribution with data, parameter estimation, goodness of fit test,fitting a non stationary Poisson process, selecting input models with out data,multivariate and time series input models.

Model building,verification and validation ,verification of simulation models,calibration and validation of models.

UNIT IV

Experiments-Simulation of different systems, Analysis, validation and verification of input and output simulated data, study of alternate techniques.

UNIT V - Simulation of manufacturing and material handling systems & Manufacturing example

Manufacturing and material handling simulation,goals and performance measures,issues in manufacturing and material handling simulations,case studies of the simulation of manufacturing and material handling systems. A job shop analysis,simualtion of computer systems:simulation tools,model input,high level computer system simulation,memory simulation.

TEXT BOOKS:

1. Geoffrey Gordon, "System Simulation", Second edition, Prentice Hall, India, 2002[unit I]
2. Jerry Banks and John S.Carson, Barry L.Nelson, David M.Nicol, "Discrete Event System Simulation", fourth edition, Prentice Hall, India, 2002[unit II,III,IV,V]

REFERENCE BOOKS:

1. Robert E.Shannon, "System Simulation The art and science", Prentice Hall, New Jersey, 1995.
2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2000

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CS319 OPEN SYSTEMS FOR WEB TECHNOLOGIES
(Elective-IV)

Course Description and Objectives:

It makes familiar of Open Source technologies like LINUX, MySQL, CGI, PHP, Webserver and various tools which are used to develop web programming.

Course Outcomes:

- *Students can develop web pages using HTML*
- *Can write dynamic web pages*
- *Can write server programs handling database connection*
- *Can generate responses accordingly*

UNIT I - Introduction & Open Source Operating Systems

Nature of Open sources –Maturity Model- Design Strategy-Support Models-Advantages – Application of Open Sources.

General Overview - Case Study: Linux - Files and Directories - Intermediate File Management - Process Management-Memory Addressing - Process Scheduling - Signals – Virtual File System- Page Cache- Program Execution.

UNIT II - Open source Database

General Overview- Case Study: MySQL -Introduction – MySQL Basic- Directory Structure-Creating Users and Super Users- Designing a Relational Database-Managing Databases, Tables and Indexes-Operators-functions-Transaction Management

UNIT III - Open source programming languages

General Overview - Case Study: PHP -Introduction – Basics of PHP- functions-Error Handling- Interaction between PHP and MySQL Database using Forms-Using PHP to manipulate and Retrieve Data in MySQL.

UNIT IV - Open source web server

General Overview of Web Server - Case Study: Apache Web server – Working with Web Server – Configuring and using Apache Web services-Case Study Apache Tomcat.

UNIT V - Open source tools and technologies

Open Source IDE-Modeling Tools- Mozilla Firefox- Wikipedia- Eclipse

TEXT BOOKS:

1. Dan Woods and Gautam Guliani,"Open Source for the Enterprise: Managing Risks, Reaping Rewards", O'Reilly, Shroff Publishers and Distributors, 2005.
2. Daniel.P.Bovet and Marco Cesati," Understanding the Linux Kernel ", O, Reilly, 2007.

REFERENCE BOOKS:

1. Ivan Bayross and Sharanam Shah,"MySQL 5 for Professionals", Shroff Publishers and Distributors, 2007
2. Ivan Bayross and Sharanam Shah," PHP 5.1 for Beginners", Shroff Publishers and Distributors, 2006
3. Vivek Chopra, Sing Li, Jeff genender, "Professional Apache Tomcat 6", Wiley India, 2007

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CS433 EMBEDDED SYSTEMS
(Elective-IV)

Course Description and Objectives:

Emphasis on Comprehensive treatment of Embedded Hardware and Real Time Operating systems along with case studies in tune with the requirements of Industry. The example-driven approach will put students on a fast track to understanding embedded-system programming and applying what they learn to their projects.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- õ *Understand what is a embedded system and microcontroller.*
- õ *Understand different components of a microcontroller and their interactions.*
- õ *Become familiar with programming environment used to develop embedded systems*
- õ *Understand key concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices*

UNIT I - Introduction to Embedded Systems

Definition, Applications of ES, Examples of Embedded Systems, Embedded Hardware Units and Devices, Embedded Software, Design Metrics in ES, Challenges in ES Design.

UNIT II - Architecture of 8051

8051 Micro Controller Hardware, Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT III - Programming Model of 8051

Data Transfer and Logical Instructions , Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, Further Details on Interrupts.

UNIT IV - Real Time Operating Systems

Introduction, Tasks and Task States, Tasks and Data, Reentrancy, Semaphores and Shared Data, Basic Design Principles, Inter Process Communication: Message Queues, Mailboxes and Pipes.

UNIT V - Embedded Software Development

Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment, Host and Target Machines, Linker/Locator for Embedded Software, getting Embedded Software into the Target System.

TEXT BOOKS:

1. Raj Kamal, “Embedded Systems”, 2nd ed., TMH, 2009.
2. Kenneth J. Ayala, Thomson, “The 8051 Microcontroller”, 3rd ed., 2008.

REFERENCE BOOKS :

1. David E. Simon, “An Embedded Software Primer”, 1st ed., Pearson Education, 2008
2. Wayne Wolf, “Computers as Components-principles of Embedded Computer system Design”, 1st ed.,Elseveir, 2009.
3. Labrosse “Embedding system building blocks”, 2nd ed., CMP Publishers, 2007.
4. Ajay V Deshmukhi,” Micro Controllers”, 1st ed., TMH, 2008.
5. Frank Vahid, Tony Givargis, John Wiley, “Embedded System Design”, Microcontrollers, 3rd ed.,Pearson Education, 2008.

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IT409 ROBOTICS
(Elective-IV)

Course Description and Objectives:

To study the concepts relevant in designing robots controlled by microcontrollers.

Course Outcomes:

To study microcontroller operations for robotics.

- *To study how different interfaces are actually implemented in a microcontroller.*
- *To learn how Microchip PIC micro PIC16F627 can be erased and reprogrammed.*
- *To learn how different sensors, outputs, and peripherals can be wired to a microcontroller to work cooperatively and create a high-level control program.*
- *To design robots in a real time environment.*

UNIT I - MICROCONTROLLER IN ROBOTS

Support components - Memory and device programming – Interrupts - Built in peripherals - Interfacing the controller to robots.

UNIT II - SOFTWARE DEVELOPMENT

Source files, object files, libraries, linkers and hex files – Assemblers – Interpreters – Compilers - Simulators and Emulators - Integrated development environments.

UNIT III - THE MICROCHIP PIC micro (R) MICROCONTROLLER

Different PIC micro MCU devices and features - Application development tools - Basic circuit requirements - The PIC16F627 - EL cheapo PIC micro programmer circuit.

UNIT IV - THE MICROCONTROLLER CONNECTIONS

Hardware interface sequencing- Robot C programming template – Protyping with the PIC micro microcontroller – Intercomputer communications- RS232 - HyperTerminal RS 232 terminal emulator- RS 232 interface example between PC and PIC micro MCU – Bidirectional synchronous interfaces – Output devices – LEDS – PWM power level control – Sensors – Whiskers for physical object detection – iR collision detection sensors- IR remote controls- Ultrasonic distance measurement- Light level sensors- Sound sensors- Odometry for motor control and navigation – Radio control servos.

UNIT V - BRINGING ROBOTS TO LIFE

Real time operating system (RTOS) – Example application running in an RTOS – State machines – Randomly moving a robot application with IR remote control - Behavioral programming - Neural networks and Artificial intelligence.

TEXT BOOKS:

1. Myke Predko, "Programming Robot Controllers" – McGrawHill, 1st edition, 2003.
2. Siegwart R and Nourbakhsh I.R, "Introduction to Autonomous mobile Robots", Prentice Hall India, 2005.

REFERENCE BOOKS:

1. Michael slater, "Microprocessor – based design: A comprehensive Guide to Effective Hardware Design", Prentice Hall, 1989.
2. Myke Predko, "Programming and customizing the 8051- micro-controller", Tata McGraw-Hill, New Delhi, 2000.
3. Kenneth J. Ayala, "The 8051 micro-controller architecture, programming and applications", Penram International publishers, Mumbai, 1996.
4. Murphy Robin R," Introduction to AI Robotics", MIT Press, 2000.

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CS447 DATA WAREHOUSE AND DATA MINING LAB

Course Description and Objectives:

The main objective of this lab is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. At the end to compare and contrast different conceptions of data mining.

Course Outcomes:

Students can able

- *To evaluate the different models of OLAP and data preprocessing.*
- *To enlist various algorithms used in information analysis of Data Mining Techniques.*
- *To demonstrate the knowledge retrieved through solving problems*

List of Experiments

1. Explore various commands given in PL/SQL in Oracle 8.0
2. Execute multi-dimensional data model using SQL queries.
3. Implement various OLAP operations such as slice, dice, roll up, drill up, pivot etc.
4. Implementation of Text Mining on the data warehouse
5. Explore the correlation-ship analysis between the data set
6. Evaluate attribute relevance analysis on a weather data warehouse
7. Evaluate Information Gain of an attribute in the student database
8. Experiment to predict the class using the Bayesian classification
9. Find out a weight & bias updating using the Back Propagation Neural Network
10. To perform various data mining algorithms on the give data base using WEKA

REFERENCE BOOKS:

1. Jiawei Han, Micheline Kamber " Data Mining: Concepts and Techniques" 3rd edition, Morgan Kaufmann, 2012
2. Ramesh Sharda, Dursun Delen, David King Business Intelligence, 2/E; Efraim Publisher Turban,pearson Education, 2011
3. Berry, Gordon S. Linoff, "Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management", John Wiley & Sons Inc publishers, 3rd Edition, 2011.

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CS449 CRYPTOGRAPHY & NETWORK SECURITY LAB

Course Description and Objectives:

After the success full completion of this course the student is enable towards learning and overcome security attacks in future.

Course Outcomes:

- õ *Understand computer security principles and discuss ethical issues for theft of information. Identify threat models and common computer network security goals*
- õ *Explain various encryption algorithms, hashing functions, one-way authentication and public key cryptology*
- õ *Analyze firewalls, DOS attacks and defense types. Dramatize example scenarios in DNS and IPSec applications*

List of Experiments

1. Write program for Ceaser cipher encryption and decryption
2. Write program for Mono alphabetic cipher encryption and decryption
3. Implementation of Play Fair cipher
4. Implementation of Vigenere cipher (Polyalphabetic substitution)
5. Implementation of Hill cipher
6. Implementation of Rail Fence cipher
7. Implementation of S-DES algorithm for data encryption
8. Implement RSA asymmetric (public key and private key)-Encryption
9. Implement Euclidean and Extended Euclidean algorithm for calculating the GCD
10. Working with PGP

REFERENCE BOOKS:

1. Cryptography and Network security by William Stallings, Pearson Education, Fourth Edition
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education, Second Edition
3. Fundamentals of Network Security by Eric Malwald (Dreamtech press)
4. Network Security – Private Communication in a Public World by Charlie Kaufman, Radis Perlman and Mike Speciner,Pearson Education
5. Introduction to Cryptography Buchmann, Springer
6. Problem solving with C++, The OOP, 4th ed, W.Savitch, Pearson education.

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IT407 FREE OPEN SOURCE SOFTWARE (FOSS) LAB

Course Description and Objectives:

To expose students to FOSS environment and introduce them to use open source packages.

Course Outcomes:

- Ability to Install, Configure and Program in Linux
- Provide and manage services in Linux
- Ability to Network using Linux with security

1. **Kernel configuration, compilation and installation :** Download / access The latest kernel source code from kernel.org,compile the kernel and install it in the local system.Try to view the source code of the kernel

2. **Virtualisation environment** (e.g., xen, kqemu or lguest) to test an applications,new kernels and isolate applications. It could also be used to expose students to other alternate OSs like *BSD

3. **Compiling from source :** learn about the various build systems used like the auto* family, cmake, ant etc. instead of just running the commands. This could involve the full process like fetching from a cvs and also include autoconf,automake etc.,

4. **Introduction to packet management system** : Given a set of RPM or DEB, how to build and maintain, serve packages over http or ftp. and also how do you configure client systems to access the package repository.

5. **Installing various software packages** Either the package is yet to be installed or an older version is existing. The student can practice installing the latest version. Of course, this might need internet access
   5.1Install samba and share files to windows
   5.2 Install Common Unix Printing System (CUPS)

6. **Write userspace drivers using fuse** — easier to debug and less dangerous to the system (Writing full-fledged drivers is difficult at student level)
7. **GUI programming** : a sample programme – using Gambas since the students have VB knowledge. However, one should try using GTK or QT
8. **Version Control System** setup and usage using RCS, CVS, SVN
9. **Text processing with Perl**: simple programs, connecting with database e.g., MYSQL
10. **Running PHP** : simple applications like login forms after setting up a LAMP stack
11. **Running Python** : some simple exercise – e.g. Connecting with MySql database tables, etc.,

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CS330 NETWORK PROGRAMMING
(Elective – V)

Course Description and Objectives:

The main objectives of this course is to provide hands on experience on the usage of the multiprocessing systems like UNIX for basic communication needs among processes and further, how the basic communication between two computers can be enabled using socket programming.

Course Outcomes:

- *demonstrate advanced knowledge of networking*
- *make use of various solutions to perform inter-process communications*
- *demonstrate knowledge of protocols and languages used in Web and multimedia delivery*
- *demonstrate advanced knowledge of programming for network communications*
- *describe major technologies used in network communications*

UNIT I - Introduction to Network Programming

OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services.

Inter Process Communication - Pipes, FIFOs

UNIT II - Elementary Sockets & Elementary TCP sockets

Address structures, value – result arguments, Byte ordering and manipulation function and related functions.

Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT III - TCP client server

Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination.

UNIT IV - I/O Multiplexing and socket options

I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server. Socket Options getsockopt and setsockopt functions. Socket states, Generic socket option.

UNIT IV - Elementary UDP sockets

Introduction UDP Echo server function, lost datagram. Elementary name and Address conversions - DNS-Resource Records, Resolver and name servers.

TEXT BOOK :

1. W.Richard Stevens,"UNIX Network Programming Sockets API", Vol. I, 3rd ed., PHI, 2011.

REFERNCE BOOKS :

1. T CHAN ,"UNIX Systems Programming Using C++",1st ed., PHI, 2005.
2. GRAHAM GLASS, KING ABLES ,"UNIX for programmers and Users", 3rd ed., Pearson Education,2008.
3. M J Rochkind, "Advanced UNIX programming", 2nd ed., Pearson education, 2007.
4. W.Richard Stevens, "UNIX Network Programming",1st ed., PHI, 2005.

IV Year B.Tech. IT II - Semester

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IT414 BIOMETRICS

(Elective – V)

Course Description and Objectives:

To understand the state-of-the-art in biometric technologies. To survey the currently available biometric systems. To explore ways to improve some of the current techniques. To learn and implement some of the biometrics authentication and to explore new techniques

Course Outcomes:

This course is to provide an understanding of:

- *The types of biological data*
- *The computational problems that arise while analyzing biological data*
- *A set of algorithms that have important applications in computational biology, but which have key applications outside of biology as well.*
- *Core set of widely used algorithms in computational biology*

UNIT I - Introduction

Benefits of biometric security – Verification and identification – Basic working of biometric matching – Accuracy – False match rate – False non-match rate – Failure to enroll rate – Derived metrics – Layered biometric solutions.

UNIT II

Finger scan – Features – Components – Operation (Steps) – Competing finger Scan technologies – Strength and weakness. Types of algorithms used for interpretation.

Facial Scan - Features – Components – Operation (Steps) – Competing facial Scan technologies – Strength and weakness.

UNIT III

Iris Scan - Features – Components – Operation (Steps) – Competing iris Scan technologies – Strength and weakness.

UNIT IV

Voice Scan - Features – Components – Operation (Steps) – Competing voice Scan (facial) technologies – Strength and weakness.

Other physiological biometrics – Hand scan – Retina scan – AFIS (Automatic Finger Print Identification Systems) – Behavioral Biometrics – Signature scan-keystroke scan.

UNIT V

Biometrics Application – Biometric Solution Matrix – Bio privacy – Comparison of privacy factor in different biometrics technologies – Designing privacy sympathetic biometric systems. Biometric standards – (BioAPI , BAPI) – Biometric middleware

Biometrics for Network Security. Statistical measures of Biometrics. Biometric Transactions.

TEXT BOOKS:

1. Biometrics – Identity Verification in a Networked World – Samir Nanavati, Michael Thieme, Raj Nanavati, WILEY
2. Biometrics for Network Security- Paul Reid, 1/e, Pearson Education.

REFERENCE BOOK:

1. Biometrics- The Ultimate Reference- John D. Woodward, Wiley

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IT416 DESIGN PATTERNS
(Elective-V)

Course Description and Objectives:

Contrast different implementations of a pattern. Contrast the difference in intentions between structurally similar patterns. Demonstrate the use of patterns in isolated software subsystems. Apply appropriate patterns in the design of a small software system

Course Outcomes:

- *Analyze the design of a software system to identify logical components*
- *Select appropriate design patterns to refractor an existing design*
- *Compare design tradeoffs between different patterns and/or different implementations of the same pattern*
- *Compare the benefit of pattern usage versus non usage*

UNIT I - Introduction To Design Patterns

What is a Design Pattern, Design pattern in Smalltalk MVC, Describing the design patterns, How design pattern solve Design problems ,how to select a design pattern and how to use a design pattern

UNIT II - Architectural Patterns

Procedural, Layered, Object Oriented, Data Flow, Implicit Invocation, Black Board, FSM, Feedback Control System MVC

UNIT III - Creational Patterns

Singleton Pattern, Prototype Pattern, Builder Pattern, Factory Method Pattern, Abstract Factory Pattern

UNIT IV - Structural Patterns

Adapter Pattern, Flyweight Pattern, Bridge Pattern, Proxy Pattern, Composite Pattern, Facade Pattern, Decorator Pattern

UNIT V - Behavioral Pattern

Memento Pattern, Observer Pattern, State Pattern, Template Pattern, Strategy Pattern , Iterator Pattern, Interpreter Pattern, Chain of Responsibility Pattern, Visitor Pattern, Command Patter, Mediator Pattern

TEXT BOOKS:

1. Design patterns : Elements of Reusable Object-Oriented Software- Erich Gamma,Richard Helm, Ralph, Addison-Wesley.
2. Design Patterns Explained: A New Perspective on Object-Oriented Design (2nd Edition) Pearson Education – Alan Shalloway

REFERENCE BOOK:

1. Eric Freeman – "Head First Design Patterns " 1st edition Oreilly –spd 2004

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IT418 J2EE
(Elective-V)

Course Description and Objectives:

To understand the developments of enterprise applications using 'Java 2 Platform, Enterprise Edition (J2EE)'.EJB technology enables rapid and simplified development of distributed, transactional, secure and portable applications based on Java technology. After the course completion, student will be able to read, compose, and send electronic messages using 'Java Mail API'. It also enables XML-based protocol to let applications exchange information over HTTP.

Course Outcomes:

- *Understand MVC pattern*
- *Master static web development technology, e.g. HTML and JS etc.*
- *Be familiar with Servlet grammar and programming technology*
- *Know and master the JSP grammar and programming skills*
- *Develop simple Web system using J2EE*
- *Be familiar with related Web test technology*

UNIT I - Introduction

J2EE,J2EE Overview, Why J2EE?,J2EE Architecture, the birth of J2EE,distributivesystems,the tier,J2EE multitier architecture, client tier architecture, web tier implementation, EJB tier implementation, enterprise information systems tier implementation, myths of using inheritance, maintainable classes.

UNIT II - J2EE database concepts

Data, data base, tables, database schema, the art of indexing, jdbc objects, the concept of jdbc, jdbc driver types, jdbc packages, a brief overview of the jdbc process, database connection, associating the jdbc-odbc bridge with database, result set, transaction processing, metadata, data types, exceptions.

UNIT III - JDBC and Embedded SQL

Model programs, tables, indexing, inserting data into tables, selecting data from a table, metadata, updating tables, deleting data from a table, joining tables, calculating data, grouping and bordering data, sub-queries, view. Struts Framework: What is Struts? Struts Architecture.

UNIT IV - RMI

Java mail API, java interface definition language and cobra, java RMI (remote method invocation) java msg service, security RMI overview, RMI architecture, example demonstrating RMI.

UNIT V - Electronic business XML

Java API for XML registries (JAXR), web services description languages (WSDL).

TEXT-BOOK:

1. Jim Keogh "The complete reference J2EE", 2nd ed., Tata McGraw Hill publishers, 2007.

REFERENCE BOOKS:

1. Herebert schildt" Java 2 complete reference"5th ed., TMH, 2008.
2. Black "Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008.
3. Kathy walrath" The J2EE tutorial", 1st ed., Addison Wesley Publishers, 2005.

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IT420 ENTERPRISE RESOURCE PLANNING
(Elective-VI)

Course Description and Objectives:

This subject provides students with the basic concepts of ERP systems for manufacturing or service companies, and the differences among MRP, MRP II, and ERP systems and in-depth knowledge of major ERP components, including material requirements planning, master production scheduling, and capacity requirements planning.

Course Outcomes:

Upon completion of the subject, students will be able to

- *Examine systematically the planning mechanisms in an enterprise, and identify all components in an ERP system and the relationships among the components;*
- *Understand production planning in an ERP system, and systematically develop plans for an enterprise;*
- *Use methods to determine the correct purchasing quantity and right time to buy an item, and apply these methods to material management;*
- *Understand the difficulties of a manufacturing execution system, select a suitable performance measure for different objectives, and apply priority rules to shop floor control.*

UNIT I - Introduction to ERP

ERP Introduction, Benefits, Origin, Evolution and Structure**:** Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT II - ERP Technologies

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain management.

UNIT III - ERP Modules

ERP Marketplace and Marketplace Dynamics**:** Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT IV - ERP Implementation

Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.

UNIT V - ERP & E-Commerce

Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study

TEXT BOOKS:

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill
2. Rahul V. Altekar “Enterprise Resource Planning”, Tata McGraw Hill

REFERENCE BOOKS:

1. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI
2. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology
3. Mary Summer, “Enterprise Resource Planning”- Pearson Education

VFSTR UNIVERSITY

IV Year B.Tech. IT	II - Semester	L	T	P	To	C
		4	-	-	4	4

IT422 M – COMMERCE
(Elective-VI)

Course Description and Objectives:

To understand the E – commerce strategies and value chains. To understand M-commerce services, M – commerce infrastructure and applications. To apply mobile commerce in business-to-business application.

Course Outcomes:

- *Able to apply E – commerce principles in market place.*
- *Able to apply M – commerce principles to various business domains*
- *Understand the theory and applications of M-commerce in business domain*
- *Able to build M – commerce business models.*

UNIT I - Electronic Commerce

Traditional commerce and E-commerce, Internet and WWW, Role of WWW, Value Chains, Strategic Business And Industry Value Chains, Role of E-commerce, Packet Switched Networks, TCP/IP Protocol Script, Internet Utility Programmes, SGML, HTML And XML, Web Client and Servers, Web Client/ Server Architecture, Intranet and Extranets, Web Based Tools for E-commerce, Security.

UNIT II - Mobile Commerce

Introduction, Infrastructure of M–Commerce, Types of Mobile Commerce Services, Technologies of Wireless Business, Benefits and Limitations, Support, Mobile Marketing & Advertisement, Non–Internet Applications in M–Commerce, Wireless/Wired Commerce Comparisons.

UNIT III - Mobile Commerce Technology

A Framework for the Study of Mobile Commerce, NTT DOCOMO’s I-Mode, Wireless Devices for Mobile Commerce, Towards a Classification Framework for Mobile Location Based Services, Wireless Personal and Local Area Networks,The Impact of Technology, Advances on Strategy Formulation in Mobile Communications Networks.

UNITIV - Mobile Commerce Theory and Applications:

The Ecology of Mobile Commerce, The Wireless Application Protocol, Mobile Business Services, Mobile Portal, Factors Influencing the Adoption of Mobile Gaming Services, Mobile Data Technologies and Small Business Adoption and Diffusion, E–commerce in the Automotive Industry, Location–Based Services, Criteria for Adoption and Solution Deployment, The Role of Mobile Advertising in Building a Brand, M–commerce Business Models.

UNIT V - Business To Business Mobile E- Commerce

Enterprise Enablement, Email and Messaging, Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare), Field Sales Support (Content Access, Inventory), Asset Tracking and Maintenance/Management, Remote IT Support, Customer Retention (B2C Services, Financial, Special Deals), Warehouse Automation, Security.

TEXT BOOKS:

1. E.BrianMennecke, J.TroyStrader, “Mobile Commerce: Technology,Theory and Applications”, Idea Group Inc., IRM press, 2003.
2. Ravi Kalakota, B.AndrewWhinston, “Frontiers of Electronic Commerce”, Pearson Education, 2003.

REFERENCE BOOKS:

1. P. J. Louis, “M-Commerce Crash Course”, McGraw-Hill Companies February 2001.
2. Paul May, “Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business” Cambridge University Press March 2001.

IV Year B.Tech. IT II - Semester	L	T	P	To	C
	4	-	-	4	4

IT424 ETHICAL PRACTICES IN IT

(Elective-VI)

Course Description and Objectives:

To create an awareness on Engineering Ethics and Human Values. To instill Moral and Social Values and Loyalty. To appreciate the workplace rights of Others, responsibilities and Safety of others.

Course Outcomes:

- *Locate, describe, and apply the content of at least one example of a law (state, national, or international) dealing with engineering ethics.*
- *Locate, describe, and apply the content of the code of ethics/conduct of at least one professional society.*
- *Prepare, describe, and defend their own personal definition of what makes for an ethical engineer.*

UNIT I - ENGINEERING ETHICS

Senses of ‘Engineering Ethics’ – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II - ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III - ENGINEER’S RESPONSIBILITY FOR SAFETY

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator’s Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV - RESPONSIBILITIES AND RIGHTS

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V - GLOBAL ISSUES

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York,2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Thompson Learning, 2000.

REFERENCE BOOKS:

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.
2. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, 2004.

IV Year B.Tech. IT II - Semester

L	T	P	To	C
4	-	-	4	4

CS441 BUSINESS INTELLIGENCE
(Elective-VI)

Course Description and Objective:

The study of Web technologies course is fundamental to Computer Science and Engineering. This course enables students to understand web page site planning, management and maintenance. The main objective behind introduction of this course is also to develop web sites which are secure and dynamic in nature and writing scripts which get executed on server as well.

Course outcomes:

On successful completion of this course students should be able to obtain:

- *Understand the principles of business intelligence*
- *Understand the data warehousing principles*
- *Understand reporting and visualisation techniques*
- *Understand data mining techniques*

UNIT I - Introduction to Business Intelligence

Introduction to digital data and its types – structured, semistructuredand unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions &Concepts, BI Framework, Data Warehousing concepts and its role in BI, BI Infrastructure Components – BIProcess, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices

UNIT II - Basics of Data Integration

Concepts of data integration, needs and advantages of using data integration,introduction to common data integration approaches, Meta data - types and sources.

UNIT III - Introduction of Extraction Transformation Loading

Introduction to data quality, data profiling conceptsand applications, introduction to ETL using Pentaho data Integration (formerly Kettle).

UNIT IV - Introduction to Multi-Dimensional Data Modeling

Introduction to data and dimension modeling,multidimensional data model, ER Modeling vs multi dimensional modeling, concepts of dimensions, facts,cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creatingcubes using Microsoft Excel.

UNIT V - Basics of Enterprise Reporting

A typical enterprise, Malcolm Baldrige - quality performance framework, balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise dashboard, enterprisereporting using MS Access / MS Excel, best practices in the design of enterprise dashboards

TEXT BOOKS :

1. Mike Biere, "Business Intelligence for the Enterprise", 1st ed., IBM Press, 2009.

REFERENCE BOOKS :

1. Larissa Terpeluk Moss, Shaku Atre, "Business intelligence roadmap", 2nd ed., Addison-Wesley Longman Publishing Co., Inc. Boston, 2003.
2. Swain Scheps, "Business Intelligence For Dummies", 2nd ed.,Wiley Publishing inc, 2004.
3. Chuck Ballard, Daniel M.Farrell, Amith Gupta, Carlos Mazuela, Stanislav Vohnik, "Dimensional Modelling in a Business Intelligence Environment", 2nd ed., OREILLY Publications, 2006.

I

Y E A R

B.Tech.

MECHANICAL ENGINEERING

I SEMESTER

4	16HS103	-	Engineering Mathematics - I
4	16HS102	-	Engineering Physics
4	16HS105	-	Technical English Communication
4	16CS101	-	Basics of Computers and Internet
4	16CS102	-	Computer Programming
4	16EE101	-	Basics of Engineering Products
4	16HS104	-	English Proficiency and Communication Skills
4	16HS110	-	Engineering Physics Laboratory

II SEMESTER

4	16HS108	-	Engineering Mathematics - II
4	16HS107	-	Engineering Chemistry
4	16ME101	-	Engineering Graphics
4	16EE102	-	Basics of Electrical and Electronics Engg.
4	16HS111	-	Engineering Chemistry Laboratory
4	16ME102	-	Engineering Mechanics
4	16CH104	-	Materials Science and Technology
4	16ME103	-	Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of Matlab related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

ü *Solve given differential equation by suitable method.*

ü *Compute numerical solutions of differential equation by apt method.*

ü *Compute maxima/minima of given function.*

ü *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with Matlab output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*

UNIT - 1 **L- 9**

FIRST ORDER DIFFERENTIAL EQUATIONS : Variable separable, homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9**

SECOND ORDER DIFFERENTIAL EQUATIONS : Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form : e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS : Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS : Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES : Review of partial differentiation: Partial derivatives, Partial derivatives of higher order, Homogeneous function, Euler's theorem, Total differential coefficient. Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions

UNIT - 5 **L- 9**

PARTIAL DIFFERENTIAL EQUATIONS : Formation of Partial Differential Equations, Linear (Lagrange) Equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method.Second order linear equations with constant coefficients only, classifications, rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours: 30

1. Basic mathematical operations using MatLab
2. Solving simple expressions
3. Limits
4. Continuity
5. Symbolic differentiation
6. Symbolic integration
7. Plotting of curves
8. Plotting of surfaces
9. Maxima & minima of functions of one variable
10. Maxima & minima of functions of two variable
11. Solving first order O.D.E.
12. Euler's Method and R-K Method

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd revised edition, S. Chand & Co., 2014
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MatLab", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill Education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	45	30	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibres, Photonics, Nano and funcational materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to :

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fibre which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

ü *Determine the velocity of ultrasonics in a given liquid using interferometer.*

ü *Study the wavelengths of light sources and lasers.*

ü *Estimate the efficiency of a given solar cell.*

ü *Learn about the type of the optical fibre and their ability to propagate light waves from its numerical aperture.*

ü *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L- 9**

ULTRASONICS : Introduction – production of ultrasonic waves – piezoelectric method – Properties of ultrasonic waves – Types of ultrasonic waves – Determination of Velocity of ultrasonic waves in solids and liquids – SONAR - Medical Applications.

NDT: Introduction - Types-visual inspection-liquid penetrate testing – Ultrasonic Testing Systems – X - Ray Radiography.

UNIT - 2 **L- 9**

LASERS : Characteristics of Laser light – Spontaneous and Stimulated emission of radiation – He-Ne Laser – CO_2 Laser – Semiconductor laser - Applications.

HOLOGRAPHY: Holography and Applications.

FIBER OPTICS : Principle of optical fibre – Acceptance angle – Numerical Aperture – Types of fibres – Dispersion and Attenuation in optical fibres – Optical fibre communication system - Fibre Optic sensors.

UNIT - 3 **L- 9**

QUANTUM MECHANICS : Introduction- Matter waves - Schroedinger's time independent wave equation - Physical significance of the wave function - Particle in one dimensional potential well – Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS : Introduction – Classical free electron theory – Electrical conductivity of metal – Quantum free electron theory - Fermi - Dirac distribution function and its variation with temperature

PARTICLE ACCELERATORS: Introduction- Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L- 9**

SOLAR ENERGY: Solar radiation – Photovoltaic effect – Solar cells – Efficiency of solar cell – Solar thermal energy conversion systems.

PHOTONICS: LED – LCD – Photo conducting materials – Photo detectors –Photonic crystals - Non-linear optical behaviour of materials - Applications.

UNIT - 5 **L- 9**

NANO MATERIALS: Introduction – Fabrication of nano materials – Ball milling - Sol-Gel – Physical and chemical properties of nano materials – Applications.

FUNCTIONAL MATERIALS: Smart materials – Shape memory alloys – Chromic materials (Thermo, Photo and electro) – Metallic glasses – Advanced ceramics – Composites, Fiber reinforced plastics / metals – Biomaterials.

TEXT BOOKS:

1. V.Rajendran, *"Engineering Physics"*, 7th edition, TMH Publications, 2014
2. D.K. Bhattacharya and Poonam Tandon, *"Engineering Physics"*, Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd, 1992.
3. Sukhatme S.P, "Solar Energy", 2nd edition, TMH publication, 2005.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Finding height of a room using laser.*
- *Identifying the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measuring temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The teaching efforts in this course will be directed towards making students develop their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to :

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

ü *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

ü *Apply different sub skills like top down, bottoms up approachs to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

ü *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

ü *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

ü *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **Environmental Consciousness**
  (Climate Change – Green Cover – Pollution - Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles – Prepositions – Sentence Types and Construction
- Vocabulary : Root – Prefixes - Suffixes
- Composition : Paragraph Writing (Descriptive and Narrative)
- Laboratory Practice : Introduction to Phonetics
  (Organs of Speech; Consonants, Vowels & Diphthongs; Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **Emerging Technologies**
  (Solar Power – Cloud Computing – Nanotechnology- Wind energy (to be covered from Energy unit))
- Grammar : Time and Tense (Present-Past-Future; Helping Verbs; Modals)
- Vocabulary : Synonyms – Antonyms
- Composition : Letter Writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **Travel and Tourism**
  (Advantages and Disadvantages of Travel-Tourism – Atithi Devo bhava – Tourism in India)
- Grammar : Subject-Verb Agreement - Sentence Construction
- Vocabulary : Idioms & Phrases
- Composition : Letter Writing (Formal)
- Laboratory Practice : Situational Conversations – Role-Plays
  (Introducing; Greeting; Enquiring; Informing; Requesting; Inviting)

UNIT - 4 **L-9**

- Text : **Engineering Ethics**
  (Challenger Disaster – Biotechnology – Genetic Engineering – Protection from Natural Calamities- How pertinent is the nuclear option? An Environment of Energy (from Energy unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence Transformation (Degrees, Voice, Speech & Synthesis)
- Vocabulary : Phrasal Verbs
- Composition : Note-making – Text - Nandan Nilekani's In search of our energy solutions (from Energy Unit)
  Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational Conversations – Role-Plays (Emotions; Directions;

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD & CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

Descriptions; Agreements; Refusals; Suggestions)

UNIT - 5 **L-9**

- Text : **Media Matters**
  (History of Media – Language and Media – Milestones in Media – Manipulation by Media – Thousands march against nuclear power in Tokyo (from Energy Unit) - Entertainment Media – Interviews)
- Grammar : Common Errors
- Vocabulary : One-word Substitutes
- Composition : E-mail – Short Message Service (SMS) - Writing Advertisements, Reporting, Social Media: Blogging, Facebook, Twitter (acceptable & non acceptable content)
- Laboratory Practice : Group Discussions – (Topics from Energy unit) – Dumping of nuclear wastes, Exploration of eco-friendly energy options- lifting of subsidies on Petrol, Diesel, LPG etc)

TEXT BOOK:

1 *"Mindscapes - English for Technologists and Engineers"*, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, *"Strengthen Your Writing",* 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, *"The Most Common Mistakes in English Usage",* 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, *"A Textbook of English Phonetics for Indian Students"*, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. *"Spoken English: A Self-Learning Guide to Conversation Practice",* 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, "Examine your English", 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to :

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

ü *Assemble and disassemble the personal computer system.*

ü *Install different desktop operating systems.*

ü *Use the basic text processing, simple data analysis and data presentation tools.*

ü *Configure network parameters.*

ü *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L- 10**

COMPUTING SYSTEMS : Introduction to computer, computers for individuals, importance of computers, parts of computer system, memory devices, input and out devices, types of monitors, types of printers, number systems, bits and bytes, text codes and types of processors.

UNIT - 2 **L- 10**

OPERATING SYSTEMS : Types of operating systems, user interfaces, PC operating systems, network operating systems, types of software, programming languages, compiler and interpreter, program control flow and algorithm.

UNIT - 3 **L- 08**

NETWORKS & DATABASES : Networking basics, uses of network, types of networks, network hardware, introduction to data bases and database management systems.

UNIT - 4 **L- 8**

INTERNET AND WWW : Internet's services, world wide web, browser setups, using search engine, email and other internet applications.

UNIT - 5 **L- 9**

CYBER SECURITY : The need of computer security, basic security concepts, threats of users, online spying tools, threats to data, cybercrime, protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS

Total hours: 30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, *"Introduction to Computers"*, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, *"Introduction to Computer Science"*, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, "*Fundamentals of Network Security*", 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a ‘C’ program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in ‘C’ language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

ü *Identify suitable data types for an application.*

ü *Apply control statements for decision making problems.*

ü *Use multidimension array for matrix application.*

ü *Design a program to calculate average of a class.*

ü *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L- 10**

INTRODUCTION TO C PROGRAMMING : Structure of C program: comments, processor statement, function header statement, variable declaration statement and executable statement; C character set: constants, identifiers, operators, punctuations, keywords, modifiers, identifiers, variables, c scopes, basic data types, type qualifiers, storage classes, reading and writing characters, formatted I/O.

UNIT - 2 **L- 10**

OPERATORS AND CONTROL STATEMENTS : Operators: assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, size of, dot, arrow, and parentheses operators; expressions precedence of operators, associative rules; control statements: category of statements, selection, iteration, jump, label, expression and block.

UNIT - 3 **L- 10**

FUNCTIONS AND ARRAYS : Function: declaration, prototype, definition, calling by value and call by address, standard library functions and recursive functions; Array: declaration, initialization, reading, writing, accessing and passing as a parameter to functions, 2D-arrays, multidimensional arrays.

UNIT - 4 **L- 9**

STRINGS AND POINTERS : Strings: declaration, string library functions, array of strings, command line arguments; pointers: declaration, initializing pointers, multiple indirection, relationship between arrays and pointers; scaling up: array of arrays, array of pointers, pointer to a pointer, pointer to an array; pointer to functions, dynamic memory allocation functions.

UNIT - 5 **L- 9**

STRUCTURES AND FILES : Structures - declaration, initialization and accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, types and enumerations; Files - I/O and processing operations on text and binary files; pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- choose programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours: 30

1. Compute the factors of a number.
2. Compute the average of 'n' numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.

ACTIVITIES:

- o *Implement matrix operations.*
- o *Implement malloc and calloc functions.*
- o *Copy the content of one file into the other.*
- o *Implement string manipulations functions.*

11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

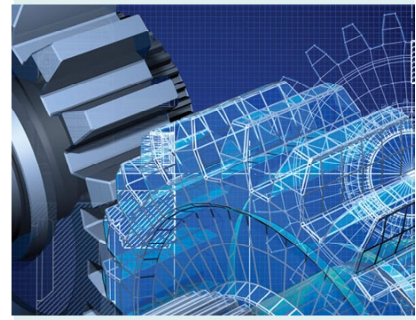
TEXT BOOK:

1. Ajay Mittal, *"Programming in C - A practical Approach"*, Pearson Education, India, 2015

REFERENCE BOOKS:

1. Reema Thareja, *"Introduction to C Programming"*, 2nd edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, *"The Complete Reference"*, 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, *"Programming in ANSI C"*, 4th edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

ü *Identify UPS requirements for a given load.*

ü *Provide a Lighting scheme for specific working environment.*

ü *Design a composition of Heating element for a particular application.*

ü *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

ü *Provide an earthing for Domestic Outlet.*

ü *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembling and Assembling of Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Providing Earthing for Domestic Outlet.*
- *Designing Electric Wiring system for a prototype house.*
- *Designing UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L- 9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air-conditioner and Refrigerator- components, assembly and disassembly, Working principle of Centrifugal and Reciprocating pumps: Types, parts and applications, working principle of Screw jack and its components. Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L- 10**

BRICKS : General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks.

Timber: Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS : Types and composition of Cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES : Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel.

Simple layout design, paints, tiles,fittings, ventilation, furniture and green house aspects.

UNIT - 3 **L- 08**

ELECTRIC ENERGY SYSTEMS : Overview of Power System Structure, Conventional and Non Conventional Generations - Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems

Methods of Electrical Wiring Systems - Wiring procedure and calculations – Wiring methods.

Un-Interruptible Power Supply (UPS), Components in UPS, its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT : Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT : Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and Applications.

MOTOR : Electric Motors, Classification, Construction and Working principles of motors used in Domestic Applications, Mixer Grinder, Ceiling and Exhaust Fan, Hair Dryer, Washing Machine, Water Pump, Air Coolers, Vacum Cleaner, Computer Cooling Motor, Electric Bike.

UNIT - 5 **L- 8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of Television, Radio, Remote Control, Telephone, Microwave Oven, Cell phone, PA system, Induction Stove, WiFi Router and DTH.

LABORATORY EXPERIMENTS

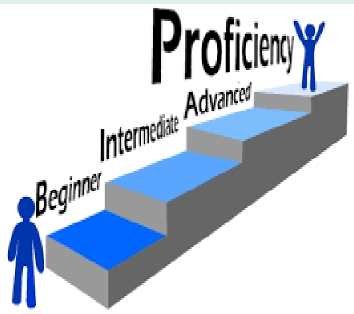
LIST OF EXPERIMENTS Total hours: 30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box.
13. Ceiling Fan and Mixer.
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, “Concrete Technology”, 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition., Charotar Publishing House, Anad, 2009.
3. Govindasamy, A Ramesh et al, “Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, “Electrical engineering - Electrical machines and Appliances Theory”, 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, “How Stuff Works”, 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, “Basic Mechanical Engineering”, 1 st edition, Pearson Publishers, 2013.



16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. Students will strengthen their comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to :

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

- *Ability to use appropriate words in right order for effective sentence formation, and writing short texts.*
- *Ability to read and extract information from different texts & draw inferences by understanding elements like tone and transitional words.*
- *Ability to understand short and long spoken discourses through analysis of elements like stress and intonation.*
- *Ability to articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

Functions : Introducing Self/others; Expressing needs/feelings/opinions (SWOT Analysis)

Skill Focus:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, intonation and accent

Speaking – Articulating syllables clearly, speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, use of nouns, adjectives, verbs, prepositions in the sentence structure

Practice: Objective PET Units 1 - 6

UNIT - 2 **P-6**

Functions : Defining; Describing People, Places, Things, Process.

Skill Focus:

Reading – Inferences from sentences and short messages – True or False

Writing – Rewording – Sentence transformation - Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, short conversations

Vocabulary / Grammar – Use of adjectives/adverbs, Comparatives and Superlatives

Practice : Objective PET Units 7 – 12

UNIT - 3 **P-6**

Functions : Describing Spatial and Temporal Relations; Giving Directions/Instructions

Skill Focus :

Reading – Reading between the lines – Inferences – True/False

Writing – Developing hints - Writing short messages/paragraphs

Listening – Searching for factual information - Gap filling

Speaking – Snap talks, JAM, Elocution

Vocabulary / Grammar – Prepositions; Phrasal Verbs; PET word list

Practice: Objective PET Units 13 - 18

UNIT - 4 **P-6**

Functions : Narrating; Predicting; Negotiating; Planning

Skill Focus:

Reading – Reading for evaluation and appreciation - Comprehension

Writing – Letters – e-mails – 7 C's

Listening – Following long conversations / interviews

Speaking – Discussions – Debate - Descriptions

Vocabulary / Grammar – Modals – Conditionals - verb forms (Time and Tense)

Practice: Objective PET Units 19 – 24

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

UNIT - 5 **P-6**

Functions: Requesting; Denying; Suggesting; persuading

Skill Focus:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements - Presentations

Vocabulary / Grammar – Punctuation – Cloze tests

Practice: Objective PET Units 25 – 30

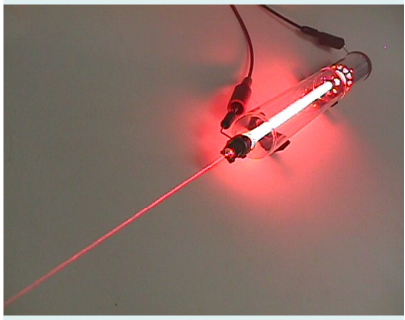
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, *“Objective PET”*, Student’s Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8
2. Annette Capel and Rosemary Nixon, *“Introduction to PET”*, Oxford University Press,

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the following experiments.The students have to perform at least 10 experiments from the list of experiments.

Course Outcomes:

The student will be able to:

- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory, thermal conductivity by conducting experiments of field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect.

REFERENCE BOOKS :

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.

16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration, to make the student to use different mathematical tools of Mat lab related to above concepts.

Course Outcomes:

The student will be able to :

· carry out the basic operations of matrix algebra.

· use row operations to reduce a matrix to echelon form, normal form.

· determine consistency of a system linear equations.

· compute eigen values and eigen vectors.

· evaluate double integrals and triple integrals.

· evaluate double integrals in polar coordinates.

· utilize Cartesian and polar coordinates to find area.

· understand the concept of gradient, divergance and curl.

· apply vector integral theorems in finding surface and volume integrals.

SKILLS:

ü *Appreciate various methods to find the rank of a matrix.*

ü *Solve given system of linear equations.*

ü *Compute Eigen values and Eigen vectors of a matrix.*

ü *Compute the power of a matrix by suitable method.*

ü *Evaluate Multiple integrals.*

ü *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from; Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L- 9**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, diagonalisation of a matrix.

UNIT - 3 **L- 9**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in Polar coordinates, Change of order of integration, Change of variables, Applications to Area in Cartesian coordinates and polar coordinates; Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L- 9**

VECTOR DIFFERENTIATION: Vector Function, Differentiation, Scalar and Vector point function, Gradient, Normal, Divergence, Directional Derivative, Curl, Vector identities.

UNIT - 5 **L- 9**

VECTOR INTEGRATION: Line Integral, Surface Integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Matrix Algebra.
2. Rank of a matrix
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc.).
13. Interpolation.

TEXT BOOKS :

1. H. K. Dass and Er. Rajanish Verma, *"Higher Engineering Mathematics"*, 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, *"Higher Engineering Mathematics"*, Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, *"Getting started with Matlab"*, Oxford University Press, 2009.

REFERENCE BOOKS :

1. Srimanta Pal and Subodh C. Bhunia, *"Engineering Mathematics"*, Oxford Publications, 2015.
2. B. V. Ramana, *"Advanced Engineering Mathematics"*, 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, *"Advanced Engineering Mathematics"*, 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, *"Advanced Engineering Mathematics"*, 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with Matlab output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with Matlab output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with Matlab output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to :

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

ü *Analyse the total hardness of water sample.*

ü *Understand the basic principles involved in various batteries.*

ü *Understand the mechanisms of corrosion and various controlling methods.*

ü *Synthesize various polymers.*

ü *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L- 9**

WATER TECHNOLOGY : Introduction, WHO, BIS standards of water, Hardness of water - Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water-Scales and Sludges - Caustic embrittlement - Boiler Corrosion - Priming and Foaming; Softening Methods - Zeolite process, Ion Exchange process; Desalination of Brackish water-Reverse Osmosis, Electrodialysis.

UNIT - 2 **L- 9**

ELECTRO CHEMISTRY: Electrode Potential, Electrochemical Series, Nernst Equation, Reference Electrodes - Calomel and Standard Hydrogen Electrode, Ion Selective Electrode, Glass Electrode; Determination of pH by pH meter, Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cell - Hydrogen Oxygen, Methanol Oxygen.

UNIT - 3 **L- 9**

SCIENCE OF CORROSION : Introduction, Dry corrosion, Wet corrosion - Mechanisms of wet corrosion; Bimetallic corrosion - Concentration cell corrosion; Factors influencing the rate of corrosion, Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L- 9**

POLYMERS: Introduction, Types of Polymerization - Preparation, Properties and applications of Polyethylene, PVC, Teflon, Bakelite, Urea Formaldehyde, Silicones, Rubber – Vulcanization; Synthetic Rubbers - Buna-S, Buna-N, Neoprene; Introduction to Conducting polymers - Poly thiophene.

UNIT - 5 **L- 9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV - Visible Spectroscopy- Beer - Lambert's law - Qualitative and Quantitative Analysis; Block diagram of UV- Visible Spectrophotometer ; IR Spectroscopy - Types of Vibrations - Block diagram of IR Spectrophotometer.

TEXT BOOKS :

1. P.C Jain and Monica Jain, *"Engineering Chemistry"*, 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "*A Text book of Engineering Chemistry Engineering Materials and Applications"*, 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, *"Engineering Chemistry"*, 1st edition, Pearson publication, 2015.
2. M.R. Senapati, *"Advanced Engineering Chemistry"* 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, *"Instrumental methods of Analysis"*, 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, *"Instrumental Methods of Analysis"*, 5th edition, Himalaya Publications, 2007.
5. J.D. Bares, M.Thomas, B. Siva Sankar,J.Mendham, R.C Denney, *"Vogel's Text book of qualitative Chemical Analysis"*, 6th edition, Pearson Publications, 2009.
6. Dr.Sunita Rattan, *"Experiments in Applied Chemistry"* by S.K. Kataria & Sons

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an "International language of Engineers". It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to :

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

ü *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*

ü *Draw geometrical objects like polygons, solids of different types.*

ü *Visualize the objects in real time situations.*

ü *Develop 3D views (isometric views).*

UNIT – 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Introduction to Engineering Drawing: Types of lines, lettering, dimensioning Construction of polygon and Conics (Ellipse, Parabola and Hyperbola by general method), ellipse by oblong method.

UNIT – 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection-Planes of projections; Projections of points; Projection of straight lines; Inclined to one plane and both the planes; Projections of planes; Simple planes, Planes inclined to one reference planes.

UNIT – 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, pyramids, cylinders, cones, solid axis inclined to one plane.

UNIT – 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: - Isometric drawing of simple objects- Isometric view of prisms; Pyramids; Cone and cylinder – Simple orthographic views into isometric views through AutoCAD.

UNIT – 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: - Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS :

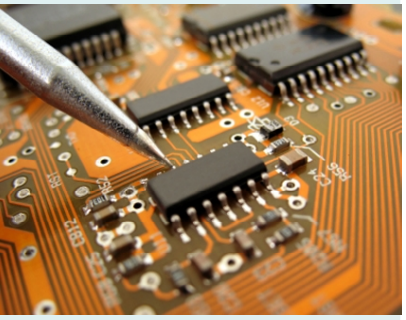
1. N.D.Bhatt, “Engineering Drawing”, 53rd edition., Charotar Publication, 2014.
2. Basant Agrawal , C.M.Agrawal “Engineering Drawing” , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS :

1. J. hole, *“Engineering Drawing”*, 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, *“Engineering drawing”*, 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC. AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of Semiconductor devices and their operation.

SKILLS:

- ü *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ü *Develop a simple loop generator.*
- ü *Design a voltage regulator using Zener diode.*
- ü *Design a half wave rectifier using PN junction diode.*
- ü *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law; Kirchhoff's Laws: Application to simple series, parallel circuits, Mesh and nodal analysis of simple resistive circuits.(Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - frequency, average value, R.M.S. value, form factor, peak factor for sinusoidal only; Phasor representation of alternating quantities; Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, reluctance, flux and flux density, concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine; D.C. Generator; Principle of operation; EMF equation; types of D.C. generators (simple numerical problems).

D.C. Motor: Principle of operation, Torque equation, types of D.C. motors (simple numerical problems)

A.C MACHINES: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory; Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, "Basic Electrical and Electronics Engineering", 1st edition., TMH, New Delhi, 2014.

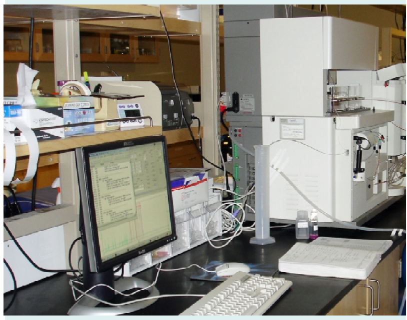
REFERENCE BOOKS:

1. Millman & Halkias, "Integrated Electronics", McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, "Electrical Technology", Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, "Basic Electrical Engineering", 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http://nptel.ac.in/courses/108108076/
2. https://books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to :

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS :

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas & B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I 2009.
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16ME102 ENGINEERING MECHANICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	-	5	-	5

Course Description and Objectives:

Engineering Mechanics applies principles of mechanics to solve common engineering problems. The goal of this course is to expose students to problems in mechanics as applied to real-world scenarios.

The course uses the Laws of Mechanics to predict forces in machines and structures. This course is prerequisite for courses like Mechanics of Machines, Stress Analysis, Design of Mechanical Systems and others.

Course Outcomes:

The student will be able to:

- use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- apply basic knowledge of mathematics and physics to solve real-world problems such as dams, bridges, fly overs, buildings, large structures etc.,

SKILLS:

ü *Solving classical mechanics problems involving system of forces*

ü *In-depth understanding of rigid bodies.*

ü *Applying principles of centre of gravity and moment of inertia*

UNIT - 1 **L-10; T-3**

GENERAL PRINCIPLES: Introduction to engineering mechanics; idealization in mechanic's basic concepts; vectors and scalar quantity; laws of mechanics.
FORCE SYSTEM AND RESULTANT: Concept of force; representation of force; system of forces; resolution of forces using rectangular components.
MOMENTS AND COUPLES: Introduction; moment of force; varignon's theorem; resultant of parallel forces; couple and moment of couple; characteristic of couple.

UNIT - 2 **L-8; T-3**

EQUILIBRIUM OF BODIES: Conditions of equilibrium for a coplanar force system and coplanar non parallel non concurrent force system; principle of equilibrium (two ; three ; force principle) ; Lami's theorem
TRUSS: Introduction; classification of truss; fundamental of truss; analysis of truss (method of joints and method of section)

UNIT - 3 **L-10; T-3**

FRICTION: Introduction ; classification of friction ; coefficient of friction ; laws of friction ; angle of friction ; angle of repose ; cone of friction ; ladder friction ; wedge friction

UNIT - 4 **L-10; T-3**

CENTROID: Introduction; centroid of lines; centroid of surfaces; determine of centroid of simple figures; centroid of composite figures; centroid of a parabolic spandrel
CENTER OF GRAVITY: Introduction; center of gravity; location of center of gravity - right circular cone and solid hemisphere; center of mass; theorem of Pappus.

UNIT - 5 **L-10; T-3**

MOMENT OF INERTIA: Moment of inertia of plane areas ; polar moment of an area ; radius of gyration of area; parallel axis theorem ;perpendicular axis theorem; moment of inertia of composite areas. Mass moment of inertia; introduction; radius of gyration of mass; mass moment of inertia of rod; rectangular plate ; right circular cylinder ; circular ring ; circular plate.

TEXTBOOKS:

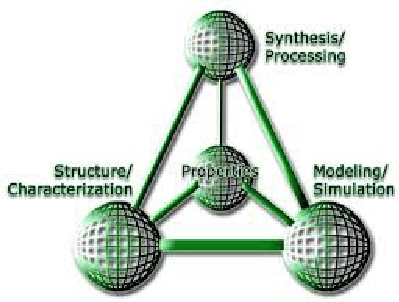
1. A K Dhiman, P Dhiman. And D. C Kulshreshtha, "Engineering Mechanics: Statics and Dynamics", Mc Graw Hill ,2015
2. Basudeb Bhattacharyya, "Engineering Mechanics", 2nd Edition, Oxford University Press 2014.

REFERENCE BOOKS:

1. N H Dubey" Engineering Mechanics : statics and dynamics",1st Edition, Mc Graw Hill,2015.
2. S SBhavikatti, "Engineering Mechanics", 1st edition, New age International, reprint 2015.
3. J. L. Meriam, L. G. Kraige, "Engineering Mechanics: Statics", 8th Edition d., John Wiley and sons, 2015.

URL:

1. https://www.youtube.com/user/mySeriesEM
2. https://www.youtube.com/channel/UCSeYfmhG5Z25uvm9C7gdrWw
3. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-engineering-mechanics-i-fall-2007/index.htm



16CH104 MATERIALS SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
8	60	-	10	-	-

Course Description and Objectives:

This course will emphasize the structure-property relationships of engineering materials. The objective of this course is to provide knowledge in basic principles of material science and also to study structure of materials at all length scales.

Course Outcomes:

The student will be able to:

- understand crystal structure of various materials and techniques used for structure determination.
- understand the influence of defects on the properties of materials
- understand the fundamentals of equilibrium phase diagrams.
- gain knowledge on various fabrication techniques used for manufacturing common engineering materials.

SKILLS:

- ü *Identify the type of material: ceramic, polymer, metal or composite.*
- ü *Select materials with suitable properties for a given application.*
- ü *Predict the type of fracture/failure in a material.*
- ü *Read and draw conclusion from binary phase diagrams.*
- ü *Suggest manufacturing methods for metals, ceramics and polymeric materials.*
- ü *Determine basic mechanical properties of materials using universal testing machine.*

UNIT - 1 **L- 09**

BONDING IN SOLIDS: Inter atomic forces and potential energy, Types of bonds: primary and secondary, Variation in bonding character and resulting properties

CRYSTAL STRUCTURE : Classification of crystal systems – SC, BCC, FCC & HCP crystal structures with examples, Atomic packing factor, coordination number, determination of miller indices of planes & directions of cubic and hexagonal crystals, linear and planar densities, separation between successive planes, Crystal structure determination: Bragg law, powder method.

UNIT - 2 **L- 10**

CRYSTAL DEFECTS: Point defects, Dislocations: edge, screw and mixed, burgers vectors, energy of dislocation, motion of dislocation, dislocation density. Grain boundary, stacking faults and twin boundary.

PHASE DIAGRAMS: Gibb's phase rule & terms involved – Reduced phase rule, tie line and lever rules, Two component systems–invariant reactions – Eutectic system & Iron-Carbon system.

UNIT - 3 **L- 09**

MATERIALS FABRICATION TECHNIQUES: Fabrication of Metals: forming operations, casting, Fabrication of Ceramics: particulate forming processes, cementation. Forming techniques of Plastics: compression, transfer and injection molding, extrusion, blow molding.

MECHANICAL PROPERTIES: Stress-strain relations of various solids – Elastic, Anelastic, Visco-elastic and plastic deformations in solids, creep and fatigue, fracture: Brittle and Ductile, fracture toughness, ductile to brittle transitions.

UNIT - 4 **L- 08**

ELECTRICAL & SEMICONDUCTING PROPERTIES: Ohm's Law, Electrical Conductivity, Electronic and Ionic Conduction, Energy Band Structures in Solids, Classification of solids based on band models, Electron Mobility, Electrical Resistivity of Metals, Intrinsic Semiconduction, Extrinsic Semiconduction, The temperature dependence of Carrier Concentration, Factors That Affect Carrier Mobility.

UNIT - 5 **L- 08**

DIELECTRIC AND MAGNETIC PROPERTIES: Dielectric behavior: capacitance, polarization, frequency dependence of dielectric constant, dielectric strength. Types of magnetism, Ferromagnetism-Domain theory-hystersis behavior, ferrimagnetism, soft and hard magnets – application of magnetic materials.

TEXT BOOKS:

1. W. D. Callister, "Materials Science and Engineering: An Introduction," 8th edition, John Wiley & Sons Inc, 2009.
2. V.Raghavan, "Materials Science and Engineering:A First Course", 5th edition, PHI Learing Pvt. Ltd., 2013.

ACTIVITIES:

- o *Testing the type of failures.*
- o *"Gee Whiz": Wonder presentations.*
- o *Analysis of load test results.*
- o *Study of micro structures of materials.*
- o *Segregation of the given materials.*
- o *Identification of phases in the given phase diagram.*

REFERENCE BOOKS:

1. L. H. VanVlack, Elements of Materials Science and Engineering, 6th edition, Addison Wesley, 1989.

2. W.F. Smith and J. Hashemi, Foundations of Materials Science and Engineering, 4th edition, McGraw_Hill, 2005.

3. D. R. Askeland, Science and Engineering of Materials, 5th edition, Thomson Engineering, 2005.

4. J.F. Shackelford, Introduction to Materials Science for Engineers, 6th edition, Prentice Hall, 2004.

5. Kelly, G. W. Groves, and P. Kidd, Crystallography and Crystal Defects, Wiley, 2002.

6. N.W. Dowling, Mechanical Behavior of Materials, 3rd edition, Prentice_Hall, 2006.

7. P. Haasen and B. L. Mordike, Physical Metallurgy, 3rd edition, Cambridge University Press, 1996.

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	20	-	-

Course Description and Objectives:

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes:

The student will be able to :

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

- *Prepare wooden and metal furniture.*
- *Electrical wiring and power supply in residences.*
- *Make funnels, trays, locker, steel almirahs etc.*
- *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*
- *CNC machines and various machining operations and processes.*

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin Smithy and Black smithy.
4. House wiring.
5. Foundry and Welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS :

1. S.K. Hazra Choudhury, “Elements of workshop Technology”, 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., “A first course on workshop practice: Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S., “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai, 1999.

II

YEAR

MECHANICAL ENGINEERING

B.Tech.

I SEMESTER

4	16ME201	-	Manufacturing Technolgy
4	16ME202	-	Material Science and Metallurgy
4	16ME203	-	Mechanics of Solids
4	16ME204	-	Thermodynamics
4	16ME205	-	Computer Aided Machine Drawing
4	16MS201	-	Management Science
4	16HS301	-	Professional Ethics
4		-	Employability and Life Skills

II SEMESTER

4	16ME206	-	Fluid Mechanics and Hydraulic Machines
4	16ME207	-	Kinematics of Machines
4	16ME208	-	Metal Cutting and Machine Tools
4	16ME209	-	Prime Movers
4	16EL102	-	Soft Skills Laboratory
4		-	Department Elective
4		-	Department / Open Elective
4		-	Employability and Life Skills

COURSE CONTENTS

I SEM & II SEM

16ME201 MANUFACTURING TECHNOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	6	-	2

Course Description and Objective:

This course offers basic theoretical concepts of operations and applications of manufacturing processes. The objective of this course is to explore basic manufacturing processes such as casting, metal forming, welding and sheet metal processes.

Course Outcomes:

The student will be able to:

- understand various types of manufacturing processes.
- select the processes which are used for manufacturing a particular product.
- identify the advantages and disadvantages of various manufacturing processes.
- differentiate between the hot and cold working processes of metals.

SKILLS:

ü *Identify processes that are suitable for manufacturing different products.*

ü *Design mould cavities for casting of different shapes.*

ü *Distinguish bulk and sheet metal forming.*

ü *Perform welding and other joining operations.*

ACTIVITIES:

- *Design patterns with allowances for a few sample products.*
- *Gating system design and product development using two piece pattern.*
- *Analysis of foundry defects for quality improvement of sand casting.*
- *Joining of metals using TIG and spot resistance welding.*
- *Fabrication of few sample products by using sheet metal operations.*

UNIT - 1 **L-9**

CASTING: Casting terminology sand-moulding process; types of moulding sands;moulding sand composition and its properties Patterns; pattern materials; types of patterns; Pattern allowances; and simple problems on allowances; Cores elements of gating system; types of gates; Design of Gating system and simple problems on Riser and sprue design.

UNIT - 2 **L-9**

SPECIAL CASTING PROCESSES: Investment casting – die casting - centrifugal casting; – shell moulding - continuous casting; stir casting; casting defects; Metal Melting: Cupola; crucible furnaces-Electric resistance furnace.

UNIT - 3 **L-9**

METAL FORMING PROCESS: Hot; cold and warm working – workability-work hardening – recrystallization – annealing. Rolling; theory of rolling; roll mills; simple problems on Maximum draft possible; Contact length; Defects of Rolling Forging – smith forging – drop forging – press and machine forging – forging defects – power hammers. Extrusion: Hot and cold extrusion – direct and indirect extrusion – hydrostatic extrusion – impact extrusion.

UNIT - 4 **L-9**

SHEET METAL OPERATIONS: Shearing – blanking – piercing and problems on energy requirement for shearing operations considering shear.Spinning – drawing – bending. Dies: Progressive dies; combination dies; compound dies - coining; embossing; stretch forming Drawing: Deep drawing; wire drawing; tube drawing. Bending: Theory of bending and types of bending.

UNIT - 5 **L-9**

WELDING: Classification of welding; Gas welding – types of flames welding techniques –arc welding –types- manual metal arc welding-submerged arc welding ;TIG and MIG welding – Thermit welding - Resistance welding-spot; butt; projection; and seam welding; Welding defects .Introduction to soldering and brazing.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. METAL CASTING:

a) Pattern Design and making - for one casting drawing
b) Testing of sand - Properties
c) Moulding; Melting and Casting - Single piece
d) Moulding; Melting and Casting - Two piece pattern
e) Stir-Casting

2. WELDING:

a) ARC Welding Lap and Butt Joint.
b) Spot Welding
c) TIG welding
d) Brazing
e) Gas welding

3. **METAL FORMING:**

   a) Blanking and Piercing operation and study of simple; compound and progressive press tool

   b) Hydraulic Press: Deep drawing and extrusion

   c) Roll Mill

4. **PROCESSING OF PLASTICS**

   a) Injection moulding

   b) Blow moulding

TEXT BOOKS:

1. P.N. Rao, “Manufacturing Technology”, 2nd edition, Tata McGrahill, 2008.
2. S.K. Hajra Chowdary, “Elements of Workshop Technology”, 11th edition, Media Promotors, 1997.

REFERENCE BOOKS:

1. R.K. Jain, “Production Technology”, 6th edition, Khanna Publishers,New Delhi, 2005.
2. Sarma P.C, “Production Technology”, 3rd edition, S.Chand and Co, 2008.

16ME202 MATERIAL SCIENCE AND METALLURGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
30	60	-	10	-	10

Course Description and Objective:

This course offers fundamentals of crystallography, metallurgy, heat treatment, powder metallurgy, strengthening mechanisms, ceramics and composites. The objective of this course is to impart basic knowledge on various classes of materials, structures and its properties.

Course Outcomes:

The student will be able to:

- understand the various aspects of materials and metallurgical engineering.
- explain iron-iron carbide phase diagram with isomorphous reactions.
- apply any heat treatment process for any specific application and requirement.
- describe powder production methods for different metals.
- identify suitable strengthening mechanisms for metals and alloys.
- understand various structures of ceramic materials and their governing rules .
- recognize composites and its types based on their matrix and reinforcing agents.

SKILLS:

ü *Specify carbon compositions in cast iron and steels.*

ü *Identify the effects of alloying elements on properties of cast iron and steels.*

ü *Recognize series of heat treatment processes to achieve desired properties for a specific application.*

ü *Use various powder production and compacting techniques for intricate parts.*

ü *Classify ceramic materials on the basis of bonding and structures.*

ü *Differentiate composites based on its constituent materials.*

UNIT - 1 **L-9**

IRON -IRON CARBIDE DIAGRAM; CONSTITUTION; MICROSTRUCTURES AND PROPERTIES:

CAST IRON AND STEELS: Constitution and properties of gray, white, malleable andspherodial graphite cast irons; Effect of Silicon, Manganese, Sulphur; Phosphorous and other elements on the properties of Cast Iron. Effect of alloying elements such as Manganese, Nickel, Chromium, Molybdenum, Vanadium, Tungsten, Cobalt and Boron on steels; Plain Carbon Steels; Stainless Steel.

UNIT - 2 **L-9**

HEAT TREATMENT OF STEEL: Annealing, Normalizing, Hardening, Carburizing, Nitriding, Cyaniding, Induction hardening, Flame hardening, Aging, Age hardening, Hardenability; Controlled atmosphere in heat treatments; TTT and CCT Diagrams.

UNIT - 3 **L-9**

STRENGTHENING MECHANISMS: strengthening by grain-size reduction; solid solution strengthening; strain hardening; Recovery; recrystallization and grain growth; dispersion hardening.

POWDER METALLURGY: Introduction to powder metallurgy; advantages of powder metallurgy; manufacturing processes; production of metal powders, compacting, sintering, products of powder metallurgy.

UNIT - 4 **L-9**

CERAMICS: Ceramics as a class of material; classification of ceramics; bonding and structure of various ceramic materials-AX, $A_m x_p$, $A_m B_n X_p$ types crystal structures; Rules: Pauling, Zachariasen Stanworth; structure of silicates; defects in ceramics.

UNIT - 5 **L-9**

COMPOSITES: Introduction, types of composites based on matrix, reinforcement; influence of fiber length; concentration and orientation; mechanical properties of FRP; Manufacturing methods for composites: MMCs; liquid-metal infiltration, stir casting PMCs: hand layup, extrusion, injection moulding, compression moulding.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours:30

1. Microstructure of mild steels; low carbon steels; high – C steels.
2. Microstructures of cast Irons.
3. Microstructures of heat treated steels.
4. Hardenability of steels by Jominy end quench test.
5. Hardness of various treated and untreated steels.
6. Fiber reinforced composites
7. Microstructure and hardness of plastically deformed materials

TEXT BOOKS:

1. Avner, "Introduction to Physical Metallurgy", 2nd edition, McGraw Hill International Book Company, 1997.
2. William D. Callister, "Materials Science and Engineering an Introduction",2nd edition, John Wiley and Sons, 2014.

REFERENCE BOOKS :

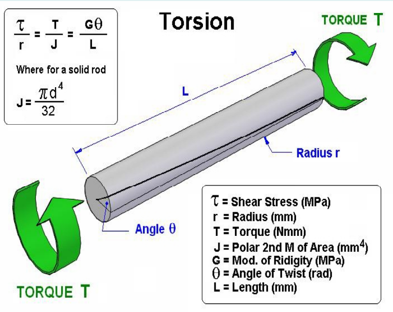
1. Kodgire UD, "Material Science and Metallurgy", 37th edition, Everest Publishing House, 2015.
2. Raghavan, V., "Materials Science and Engineering ", 6th edition, Prentice Hall of India Pvt.Ltd., 2015.

WEB LINKS:

1. http://nptel.ac.in/course.php?disciplineId=113
2. http://www.learnerstv.com/Free-engineering-Video-lectures-ltv180-Page1.htm
3. http://freevideolectures.com/Course/2266/Material-Science#
4. http://ocw.mit.edu/courses/materials-science-and-engineering/3-012-fundamentals-of materials-science-fall-2005/lecture-notes/

ACTIVITIES:

- o *Sample preparation for morphological analysis.*
- o *Manufactu -ring of a few intricate parts using metal powders and testing their properties.*
- o *Strengthen-ing of materials using severe plastic deformation and testing their properties.*
- o *Fabrication of fiber reinforced polymer composites and testing their properties.*



16ME203 MECHANICS OF SOLIDS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	-	5	5	5

Course Description and Objective:

This course deals with the fundamental concepts of mechanics of deformable solids, static equilibrium, stress analysis of pressure vessels and geometry of deformation. The objective of this course is to enable the students to solve problems in solid mechanics and design various types of structural members subjected to different types of loads.

Course Outcomes:

The student will be able to:

- understand the concepts of stress-strain for homogenous and isotropic materials.
- draw shear force and bending moment diagrams for beams subjected to different boundary and loading conditions.
- derive flexural formula and calculate shear stress variation for various cross sections.
- calculate stresses and strains for thin walls of spherical and cylindrical pressure vessels.
- determine the deflections and slopes produced by axial, torsional, and flexural loads.

SKILLS:

ü *Plot stress-strain curves for various engineering materials.*

ü *Calculate axial deflection for various boundary conditions.*

ü *Analyze thermal stresses for statically determinate and indeterminate structures.*

ü *Identify shear stress distribution for different cross sections.*

ü *Calculate torsion of circular shafts fixed at both the ends.*

ü *Understand the concepts of columns and struts for different end conditions.*

UNIT - 1 **L-9**

SIMPLE STRESSES AND STRAINS: Types of Stresses and Strains,Hooke's law-Stress strain diagram for ductile and Brittle materials; Elastic Constants – relations; Stress analysis of simple and compound bars; Thermal Stresses stress on an inclined plane; principle stresses – Mohr circle.

UNIT - 2 **L-9**

SHEAR FORCE AND BENDING MOMENT: Types of loads and beams,Shear force and bending moment diagrams of Cantilever, Simply supported and over-hanging beams subjected to different types of loads; Point of contra flexure.
DEFLECTION OF BEAMS: deflection equation for elastic curve of a beam,deflection and slope for cantilever and simply supported beams for different types of loads using double integration, Macaulay's and Area moment methods.

UNIT - 3 **L-9**

FLEXURE AND SHEAR STRESSES: Assumptions in theory of simple bending,derivation of flexural formula,Bending stresses for various cross sections in beams. Variation of shear stress in beams and shear stress distribution for various cross sections.

UNIT - 4 **L-9**

TORSION: Assumption and derivation of torsion equation; shear stress distribution for circular shafts , percentage of weight reduction (solid and hollow) fixed at both the ends.

UNIT - 5 **L-9**

THIN SHELLS: Introduction, hoop and longitudinal stresses-strains
COLUMNS AND STRUCTS: Euler's Formula for critical load of columns for different end conditions; Limitations of Euler's theory; Rankines formula; Simple Numerical problems

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours:30

1. Tensile test on mild steel
2. Deflection test on
   a) Simply supported beam.
   b) Cantilever beam.
3. Torsion test on solid circular shaft.
4. Brinell and Rockwell hardness test.
5. Impact test.

TEXT BOOKS:

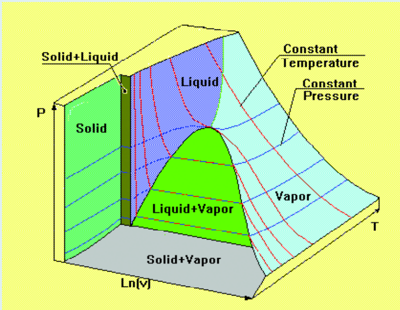
1. S.S.Bhavikatti, "Strength of Materials", 3rd edition, New Age International Publishers, 1998.
2. Gere & Timoshenko, "Strength of Materials", 2nd edition, CBS Publishers, 2006.

REFERENCE BOOKS:

1. Egor P. Popov, "Engineering Mechanics of Solids", 3rd edition, Prentice Hall of India, 1997.
2. Arthur P. Borsei, "Advanced Mechanics of Materials", 6th edition, John Wiley and Sons, 2003.

ACTIVITIES:

- o *Tensile test on mild steel and indicate the principal plane on which the crack appears.*
- o *Torsion test for a solid circular shaft.*
- o *Impact test on V-notch.*
- o *Deflection of beams under transverse loading.*
- o *Write a program for assessing deflection of beams for various support conditions.*



16ME204 THERMODYNAMICS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
60	-	-	15	40	-	-	-	-

Course Description and Objective:

This course offers a basic understanding of heat and work interactions for various thermodynamic processes. The objective of this course is to recognize different forms of energy and restrictions imposed by the first and second law of Thermodynamics on conversion from one form to another.

Course Outcomes:

The student will be able to:

- distinguish various temperature scales.
- understand the fundamentals of the first and second laws of thermodynamics.
- apply steady flow energy equation for various thermodynamic devices.
- identify the possibility of a proposed process.
- evaluate steam properties at various regions on a thermodynamic plot.
- calculate apparent molecular weight and gas constant for a given mixture.
- differentiate air standard cycles from actual cycles.

SKILLS:

- *Classify thermodynamic systems based on mass and energy interactions.*
- *Apply thermodynamic laws to analyze performance of various devices and cycles.*
- *Evaluate properties of steam for subcooled, super heated and wet steams.*
- *Obtain the thermodynamic property data from various property tables and charts.*
- *Calculate efficiencies of various air standard cycles and compare it with ideal efficiency.*

UNIT - 1 **L-12**

BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS: Concept of Continuum; Thermodynamic equilibrium; system, boundary and surroundings; State, Property, Process, Cycle, Reversibility, Quasi–static Process, Irreversible Process, Causes of Irreversibility; Work and Heat; Point and Path function; Zeroth Law of Thermodynamics; Concept of quality of Temperature; PMM-I Joule's Experiments; First law of Thermodynamics; Corollaries, First law applied to a Process, applied to a flow system, Steady Flow Energy Equation.

UNIT - 2 **L-12**

SECOND LAW OF THERMODYNAMICS; ENTROPY AND AVAILABILITY: Limitations of the First Law; Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance; Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements - Corollaries; PMM-II; Carnot's principle; Carnot cycle; Clausius Inequality.

ENTROPY: Principle of Entropy Increase; Availability and Irreversibility; Thermodynamic Potentials; Gibbs and Helmholtz Functions; Elementary Treatment of the Third Law of Thermodynamics.

UNIT - 3 **L-12**

PROPERTIES OF PURE SUBSTANCES: Pure Substances; p-V-T- surfaces; T-S and h-s diagrams; Phase - Transformations; Triple point at critical state properties during change of phase; Dryness Fraction Mollier charts; Various Thermodynamic processes and energy Transfer.

UNIT - 4 **L-12**

IDEAL AND REAL GASES; GAS MIXTURES: Perfect Gas Law, Equation of State, specific and Universal Gas constants; Vander Waals Equation of State –Compressibility charts variable specific Heats – Gas Tables; Gas mixtures – Avagadro'slaw, Dalton's law of partial pressure; T-dS relations; Maxwell relations; Clausius Clapeyron equations; Joule Thomson Coefficient.

UNIT - 5 **L-12**

POWER CYCLES: Otto, Diesel, Dual cycles; Ericsson, Stirling, Carnot Cycles–Description and representation on P–V and T-S diagram; Thermal Efficiency; Mean Effective Pressures on Air standard basis – comparison of Cycles.

TEXT BOOKS:

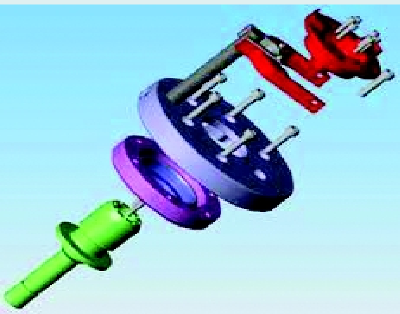
1. P.K Nag, "Engineering Thermodynamics", 3rd edition, Tata McGraw Hill, 2015.
2. Yunus A. Cengel and Micheal A. Boles, "Thermodynamics- An Engineering Approach", 7th edition, Tata McGraw Hill, 2011.

REFERENCE BOOKS:

1. R. Yadav, "Thermodynamics And Heat Engines", 6th edition, Central Publishing House,2012.
2. Bill Poirier, "A Conceptual Guide to Thermodynamics", 2nd edition, Wiley Publishers, 2014.

WEB LINKS:

1. home.iitk.ac.in/~anandh/E-book/Basics_of_Thermodynamics.ppt
2. www4.smsd.org/jakeburkholder/docs/Doc-133494.ppt
3. www.mhhe.com/engcs/mech/cengel/demo/newmedia/.../ppt/pptsource



16ME205 COMPUTER AIDED MACHINE DRAWING (CAMD)

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
25	-	10	3	-	6

Course Description and Objective:

This laboratory course deals with modeling of machine components using softwares such as AutoCAD and Solid Works. The objective of this laboratory is to enable the students understand and perform basic modeling of components used in various engineering applications.

Course Outcomes:

The student will be able to:

- understand 2D modeling of orthographic and isometric views.
- plot different views of machine elements.
- analyze 3D modeling of machine components.
- draft orthographic views from 3D model.
- assemble machine components using solid works.

SKILLS:

- *Draw the 3-D view for mechanical components such as bolts, nuts, blocks etc*
- *Convert the given drawing into 2-D or 3-D*
- *Draw orthographic projections and sections*
- *Convert sketches to technical drawings*
- *Use AutoCad for 2-D and 3-D drawings*

UNIT - 1 **P-9**

ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS (AUTOCAD)

Computer aided drawing; Isometric Projection, Orthographic Projection, Isometric view of simple and compound 3D bodies.

UNIT - 2 **P-9**

Sectional Views (AutoCAD)

Sectional front view; top view and side view of different machine components such as parts of screw jack; stuffing box etc.

UNIT - 3 **P-9**

3D MODELING (SOLID WORKS)

Generation of various 3D models through extrusion, revolve, sweep, rib. Modification of the models using various edge operations such as chamfer; fillet etc.Modelling of surfaces using feature based and Boolean based operations.

UNIT - 4 **P-9**

DRAFTING (SOLID WORKS)

Front view, top view, side view, sectional views and isometric view of different machine components;

UNIT - 5 **P-9**

ASSEMBLY (SOLID WORKS)

Assembly modeling; Study of various standard assembly operations; assembling of simple components like Nut and Bolt; Sleeve and cotter joint; Knuckle joint; universal joint; couplings; shaft and journal bearing.

TEXT BOOK:

1. K.L.Narayana, P.Kanniah and K.Venkata Reddy, “Machine Drawing” 3rd edition, New Age international publishers, 2014.

REFERENCE BOOK:

1. P.S.Gill “A Textbook of Machine Drawing” 18th edition, S.K.Kataria& Sons, reprint 2015.

WEB LINKS:

1. https://www.youtube.com/watch?v=9qFI9tOIOC4
2. https://www.youtube.com/watch?v=59rhPE3dXq8andlist=PLCK4TnRpcHSYLqReZFKyU-QFE9KOiPg0g

ACTIVITIES:

- *Convert mechanical drawings into AutoCAD sketches and vice-versa.*
- *Draw 2-D sketches for various mechanical components such as bolts, nuts etc.*
- *Convert the production drawing into isometric diagram on CAD.*
- *Draw 3-D assembly drawings of engine parts such as connecting rod, stuffing box etc.*

16MS201 MANAGEMENT SCIENCE

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course provides an introduction to the evolution of management along with the framework of managerial functions related to organization structure, production, operations, marketing, human resource management, strategy etc. The objective of the course is to introduce the students and make them well versed with the operational functions of management.

Course Outcomes:

The student will be able to:

- understand the nature, importance and evolution of management.
- identify the significance of Operations Management.
- carry out production operations through work study.
- understand the markets, customers and competition.
- plan and control the HR function.

SKILLS :

ü *Analyze and improve productivity.*

ü *Analyze the customer needs, wants and demand.*

ü *Recognize the need of different types/qualities of Human Resources.*

ü *Analyze the reasons for the evolution of management.*

ü *Analyze the philosophies of different management thinkers.*

UNIT - 1 **L-9**

INTRODUCTION TO MANAGEMENT : Concepts of Management and organization; nature, importance and Functions of Management; Systems approach to Management; Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Leadership Styles, Social responsibilities of Management.

UNIT - 2 **L-9**

OPERATIONS MANAGEMENT : Principles and Types of Plant Layout; Methods of production (Job, Batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement

UNIT - 3 **L-9**

MATERIALS MANAGEMENT : Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records;

STATISTICAL QUALITY CONTROL: control charts for variables and attributes (simple Problems), Acceptance Sampling

UNIT - 4 **L-9**

HUMAN RESOURCES MANAGEMENT (HRM) : Concepts of HRM, Basic functions of HR Manager; Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT - 5 **L-9**

MARKETING MANAGEMENT : Evolution of Marketing, Functions of Marketing Selling Vs Marketing; 4 P's of Marketing – Product Mix, Product Life Cycle, Place Mix – Channels of Distribution, Price Mix – Pricing Methods, Promotion Mix, Tools of Promotions.

TEXT BOOKS:

1. P. Vijay Kumar, N. Appa Rao, Ashnab and Chnalill, "Introduction to Management Science", 6th edition, Cengage Learning India, 2012.
2. Stoner, Freeman and Gilbert, "Management", 6th edition, Pearson Education, New Delhi, 2004.

REFERENCE BOOKS:

1. Kotler Philip and Keller Kevin Lane, "Marketing Mangement" 12th edition, PHI, 2005.
2. Koontz and Weihrich, "Essentials of Management", 6th edition, TMH, 2005.

ACTIVITIES:

- *Solve a test case to identify the various operational functions of management .*
- *Solve a test case to know the importance of marketing.*
- *Solve a test case to know the importance of human resources.*
- *Solve a test case to know the importance and evolution of management discipline.*

16HS301 PROFESSIONAL ETHICS

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
30	-	-	10	-	-

Course Description and Objectives:

This course offers insight into workplace rights of people, their safety concerns and more importantly the ethics that are to be followed by professionals and corporates. The objective of the course is to bring in awareness among the students about human values, social responsibility and the ethics to be followed by engineering professionals.

Course Outcomes:

The student will be able to:

- understand professional responsibilities and ethics in the workplace.
- have knowledge of contemporary issues related to personal and professional interactions at the workplace.
- understand the impact of engineering solutions in global and societal context.

SKILLS:

- *Analyze the issues faced by society and business world related to safe technologies/ practices, employee rights, resource sharing and allocation, team work, organizational dynamics, legislations related to business and technology, discrimination.*
- *Appreciate the need for workplace etiquette and proper code of conduct.*
- *Construct and evaluate arguments during decision making by considering viewpoints of all the stakeholders.*
- *Analyze one's own beliefs and values during interpersonal and intra-organizational conflicts.*
- *Detect inconsistencies and common errors in reasoning during discussions and practices.*

UNIT - 1 **L- 06**

HUMAN VALUES : Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality.

UNIT - 2 **L- 06**

ENGINEERING ETHICS & ENGINEERING AS SOCIAL EXPERIMENTATION : Engineering Ethics - Variety of moral issues – types of inquiry moral dilemmas – moral autonomy – The problems of Many Hands – Kohlburg's theory – Gilligan's theory Impediments to Responsible Action.

Engineering as social experimentation - Codes of ethics - a balanced outlook on law - the challenger case study.

UNIT - 3 **L- 06**

ENGINEER'S RESPONSIBILITY FOR SAFETY : Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal.

UNIT - 4 **L- 06**

WORKPLACE RIGHTS AND RESPONSIBILITIES & WORK ENVIRONMENT : Workplace Rights and Responsibilities : Engineers and Managers. Oganizational complaint procedures. Government agencies. Resolving Employee concerns. Limits on acceptable behaviour in large corporation. Work Environment : Ethical and legal considerations, Organizational responses to offensive behaviour and harassment. Ethics in a Global Context.

UNIT - 5 **L- 06**

GLOBAL ISSUES : Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TEXT BOOK:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005

REFERENCE BOOKS:

1. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

ACTIVITIES:

- *Discuss a typical case study on workers strike and analyze the conflict of interest among different stakeholders.*
- *Reading and analyzing a prisoner's narrative of police abuse in custody.*
- *Watching and discussing a video report on mishaps such as space shuttle mishap.*
- *Analyze and comment on disasters such as Chernobyl, Bhopal etc.*
- *Analyzing the HR policies documents of a typical company on issues such as working hours, employee security and health care.*

16ME206 FLUID MECHANICS AND HYDRAULIC MACHINES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	15	40	8	4	-	2

Course Description and Objective:

This course offers basic knowledge on fluid statics, dynamics and hydraulic machines. The objective of this course is to enable the student to understand laws of fluid mechanics and evaluate pressure, velocity and acceleration fields for various fluid flows and performance parameters for hydraulic machinery

Course Outcomes:

The student will be able to:

- identify importance of various fluid properties at rest and in transit.
- derive and apply general governing equations for various fluid flows.
- understand the concept of boundary layer theory and flow seperation.
- plot velocity and pressure profiles for any given fluid flow.
- evaluate the perfomance characteristics of hydraulic turbines and pumps.

SKILLS:

ü *Solve problems involving fluid properties and shear forces resulting from Newtonian fluids.*

ü *Calculate the magnitude and location of hydrostatic forces on flat plates and curved surfaces immersed in a static fluid.*

ü *Analyze fluid systems using the integral form of the continuity, momentum, impulse momentum, and energy equation.*

ü *Measure velocity and fluid flow rates using flow measuring devices.*

ü *Distinguish laminar and turbulent flows through pipes.*

ü *Identify major and minor losses associated with pipe flow*

ü *Apply the concepts of impulse momentum principle for hydraulic machines.*

ü *Perform basic vector analysis of different types of turbines and pumps.*

UNIT - 1 **L-9**

BASICS OF FLUID ANDFLUID STATICS: Units and Dimensions - Properties of fluids - density; specific gravity; specific weight; viscosity; compressibility; vapour pressure; Capillarity and surface tension. Forces on immersed surfaces. Introduction about center of pressure and buoyancy. Piezometer; U-tube and Differential Manometers.

UNIT - 2 **L-9**

FLUID KINEMATICS AND DYNAMICS: Flow characteristics; concepts of system and control volume -Continuity equation - application of control volume to continuity - Energy equation – Euler equation - Bernoulli equation and Momentum equation.

UNIT - 3 **L-9**

FLOW THROUGH CIRCULAR CONDUITS: Laminar flow through circular tubes and boundary layer concepts -Boundary layer thickness – Hydraulic and energy gradient - Darcy equation on pipe roughness - Friction factor - Minor losses – Flow through pipes in series and in parallel.

UNIT - 4 **L-9**

ROTO DYNAMIC MACHINES: Impact of jets -fixed and moving vanes-classification of turbines; impulse and reaction turbines; Pelton wheel; Francis turbine; Kaplan turbine-working proportions; work done; efficiencies; draft tube theory-efficiency.

UNIT - 5 **L-9**

CENTRIFUGAL AND RECIPROCATING PUMPS: Classification; working Principles -Manometric head losses and efficiencies-specific speed-pumps in series and parallel. Reciprocating pumps-working-Discharge-slip-indicator diagram; Air vessels.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours:30

1. Impact of jets on vanes.
2. Pelton wheel.
3. Francis turbine.
4. Kaplan turbine.
5. Single stage centrifugal pump.
6. Multi stage centrifugal pump.
7. Reciprocating pump.
8. Venturimeter.
9. Orifice meter.
10. Friction factor for a given pipe line.
11. Minor losses in a pipeline.
12. Verification of Bernoulli's equation.

ACTIVITIES:

- *Evaluate various fluid properties.*
- *Pressure measurement using manometers*
- *Flow measurement using venturimeter and orificemeter*
- *Determination of flowrate in realtime applications*
- *Evaluate the performance of centrifugal pump.*

TEXT BOOKS :

1. P.N.Modi and Seth, "Fluid Mechanics and Hydraulic Machines",15th edition, Standard Book House, 2002.
2. Bansal R.K., "Fluid Mechanics and Hydraulic Machines", 5th edition, Laxmi Publications (P)Ltd., New Delhi, 1995

REFERENCE BOOKS :

1. R.K.Rajput, "A Text Book of Fluid Mechanics and Hydraulic Machines", 3rd edition, S. Chand,2006.
2. Frank. M. White, "Fluid Mechanics", 7th edition, McGraw Hill, 2011.
3. Fox and Mcdonald's,"Introduction to Fluid Mechanics", 8th edition, John Wiley and Sons 2015.

WEB LINKS:

1. http://nptel.ac.in/courses/112105171/1
2. http://web.mit.edu/hml/ncfmf.html

16ME207 KINEMATICS OF MACHINES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	20	40	5	5	5	3

Course Description and Objective:

This course offers kinematic aspects of mechanical machines and major parts in running the machines. The objective of the course is to understand various parts involved in kinematics of machines for different applications.

Course Outcomes:

The student will be able to:

- understand common mechanisms that are used in machines in everyday life.
- analyze velocity and acceleration in different mechanisms.
- distinguish various types of steering gear mechanism
- draw cam profiles and follower mechanisms.
- understand the applications of gear and belt drives.

SKILLS:

- *Compute degrees of freedom in different types of mechanisms*
- *Determine velocity and acceleration at different points on links in a mechanism.*
- *Select different pairs for various applications viz., cams, gears, gear trains and belt drives.*
- *Identify various straight line motion mechanisms.*

ACTIVITIES:

- *Creation of various joints.*
- *Perform inversions of various mechanisms.*
- *Draw velocity and acceleration diagrams.*
- *Calculate the coefficient of friction and tensions between belt and pulley.*
- *Draw cam profiles for a given application.*

UNIT - 1 **L-9**

INTRODUCTION: Statics and dynamics; links-classification; constrained motion-types; kinematic pairs-classification; kinematic chains; mechanisms; degrees of freedom; inversions of quadratic chain; single slider crank chain and double slider crank chain. Straight line motion mechanisms: classification of straight line motion mechanisms; peaucellier's, grass hopper and Pantograph mechanisms

UNIT - 2 **L-9**

VELOCITY AND ACCELERATION IN MECHANISMS: Steering gear mechanism: Davis and Ackerman steering gear; Single and Double Hook's Joint analysis. Motion of a link in machine; velocity of a point on a link – Instantaneous center – types of instantaneous centers – kennedy theorem – velocity measurement by relative velocity and Instantaneous center method.

UNIT - 3 **L-9**

CAMS: Nomenclatures; Types of cams and followers; types of follower motion; generation of cam profiles for uniform velocity; uniform acceleration and simple harmonic motion. Maximum velocity and maximum acceleration; analysis of roller follower and circular cam with straight flanks.

UNIT - 4 **L-9**

GEARS: Friction wheels and toothed gears- types-law of gearing; condition of constant velocity ratio for transmission of motion; velocity of sliding; cycloidal and involute teeth profiles; expressions for arc of contact and path of contact; interference - condition for minimum number of teeth to avoid interference.

UNIT - 5 **L-9**

GEAR TRAINS: Introduction; Types of Gear Trains – Simple; Compound; Reverted and epicyclic gear train; velocity ratio – epicyclic gear train with bevel gears.
BELTS: Introduction, types of belts, materials, length of open and cross belt drive, slip and creep of the belt, power transmission by a belt, angle of contact, centrifugal tension, condition for maximum power transmission, initial tension.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Kinematic links, pairs, chain and mechanisms.
2. Inversion of four bar mechanisms.
3. Velocity diagram for four bar and slider crank mechanism.
4. Hook joint or universal joint
5. Various types of steering gear mechanisms
6. Cam and follower arrangement.
7. Gears and determination of gear efficiency
8. Different types of gear trains.
9. Various types of belt drives.
10. Coefficient of friction between belt and pulley.

TEXT BOOKS:

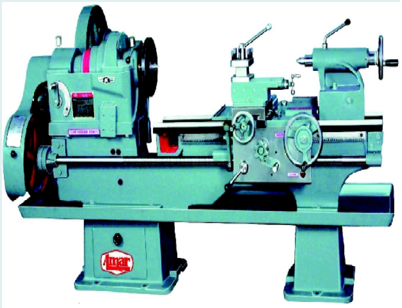
1. A.Ghosh and A.K. Mallik, "Theory of Mechanisms and Machines", 2nd edition, Affiliated EWP Press, 2007.

2. S.S. Rattan, "Theory of Machines", 4th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2009.

REFERENCE BOOKS:

1. Jagdish Lal, "Theory of Mechanisms and Machines", 2nd edition, Metropolitan Book Company, 2002.

2. J. E. Shigley, J. J. Uicker and G.Pennock, "Theory of Machines and Mechanisms", 4th edition, Oxford University Press, 2010.



16ME208 METAL CUTTING AND MACHINE TOOLS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	15	5	5	5	3

Course Description and Objective:

This course deals with the fundamentals of metal removal principles and processes. The objective of this course is to acquire knowledge on cutting tool geometry and its significance. In addition it deals with the operations and applications of various general purpose conventional machine tools.

Course Outcomes:

The student will be able to:

- designate various standard systems of cutting tool geometry.
- ascertain the benefits and state the purposes of determining cutting forces.
- classify different types of lathes.
- state the basic functions and purposes of using drilling and milling machines.
- identify the factors that govern machining time.
- perform turning, drilling, milling, grinding and shaping operations.

SKILLS:

- ü *Demonstrate tool geometry and define tool angles followed in various systems*
- ü *Develop Merchant's circle diagram and indicate forces and their relations*
- ü *Assess tool life of cutting tools*
- ü *Evaluate the machining time required for various metal removal processes*
- ü *Illustrate various techniques, advantages and applications of super finishing processess*

UNIT - 1 **L-9**

INTRODUCTION:

PRINCIPLES AND ELEMENTS OF MACHINING - Machine Tools classification; Types of cutting tools ; Geometry of single point cutting tool, chip formation and types of chips, chip breakers. Orthogonal and Oblique cutting; Forces of a single point cutting tool; Chip thickness ratio; Merchant's force diagram; Velocity relationship; Machinability; Cutting speed, feed, depth of cut. Tool life and Wear Tool materials.

UNIT - 2 **L-9**

LATHE:

CLASSIFICATION: line diagram of lathe; Lathe Parts; Lathe specifications.
LATHE OPERATIONS: Turning, Facing, Taper turning, Drilling, Boring, Knurling and Thread cutting.
WORK HOLDING DEVICES: Three jaw chuck, Four jaw chuck, Combination chuck and other work holding devices.
CAPSTAN AND TURRET LATHE: Constructional features; Comparison of capstan, turret and conventional lathe; collet chuck, tool holders; types of tool layout.

UNIT - 3 **L-9**

SHAPER: Line diagram and parts; specifications; quick return mechanism for shapers; work holding devices and shaper operations.
PLANER: Types of planers; specifications; quick return mechanism of a planer; work holding devices.
SLOTTING MACHINE: Line diagram and parts of a slotter; specifications; Ram drive mechanism.

UNIT - 4 **L-9**

DRILLING MACHINE: Classification and Specifications; Drill bits; Twist drill; Nomenclature; Tool Holding devices; Drilling operations.
MILLING MACHINE: Classification of Milling Machines; Parts and Specifications; Types of milling cutters; Milling Operations; Indexing; Types of indexing methods; Plain and universal dividing heads.

UNIT - 5 **L-9**

GRINDING: Cylindrical - external and internal; surface and center less grinding machines.
GRINDING WHEEL: Specifications; Abrasives; Bonds; Grit; grade and structure of grinding wheel. Wheel truing.
FINE FINISHING PROCESSES: Lapping; Honing and super finishing operations.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Step turning and taper turning using lathe machine.
2. Thread cutting and knurling using lathe machine.
3. Drilling and step boring using lathe machine.
4. Drilling and tapping using drilling machine.
5. Shaping of V groove using shaper.
6. Slotting of a keyway using slotter machine.
7. Milling of gear.
8. Surface grinding operation

ACTIVITIES:

- *Fabricate a few sample components on various machine tools.*
- *Determine the tool materials and machining parameters for various operations.*
- *Calculate machining time for various machining operations.*
- *Determine surface roughness of a material on grinding machine.*

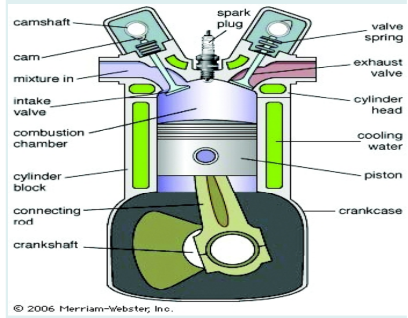
TEXT BOOKS:

1. S.K.Hajra Chowdary, “Workshop Technology”, Vol-II, 15th edition, Media Publishers, 2012.
2. B.S. Raghu Vamsi, “A Course in Workshop Technology”, Vol-II, 2nd edition, Dhanapath Rai and Sons, 2013.

REFERENCE BOOKS:

1. “Hand book of Hindustan Machine Tools, Production Technology”, 3rd edition, Tata McGraw Hill, 2014.
2. R.K. Jain and S.C. Gupta, “Production Technology”, 17th edition, Khanna Publishers, 2011.

16ME209 PRIME MOVERS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	10	30	-	12	-	2

Course Description and Objective:

This course offers detailed analysis of various thermodynamic applications such as internal combustion engines, steam boiler, chimney, nozzle operations and vapor power cycles. The objective of this course is to understand and evaluate the performance parameters of various types of IC engines and thermal power plant devices such as boilers, nozzle and steam condenser.

Course Outcomes:

The student will be able to:

- distinguish various types of IC engines that are common in everyday life.
- understand the working principles of various sub systems of an IC engine such as carburetor, fuel injector and ignitor.
- evaluate the performance of IC engines, steam boilers, chimney draught and steam nozzle.

SKILLS:

ü *Identify various types of IC engines for a specific application*

ü *Analyze combustion process in various IC engines*

ü *Measure cylinder pressure and fuel consumption in automobiles*

ü *Calculate thermodynamic aspects of reciprocating engines*

ü *Evaluate boiler and nozzle efficiencies*

ACTIVITIES:

- o *Assembly of a 2-stroke diesel engine*
- o *Assembly of a 4-stroke diesel engine*
- o *MATLAB code for calculating indicated power and friction power in IC engines.*
- o *Fabrication of prototype model of a fire tube boiler.*
- o *Fabrication of prototype model of a water tube boiler.*

UNIT - 1 **L-9**

INTRODUCTION: Introduction; Comparison of Air Standard and Actual Cycles, Actual and Fuel-Air Cycles of IC Engines; Classification - Working principles; Valve and Port Timing Diagrams.
ENGINE SYSTEMS: Fuel Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication.

UNIT - 2 **L-9**

COMBUSTION IN S.I ENGINES: Normal, Abnormal Combustion and Detonation; Importance of flame speed, pre-ignition and knocking, anti-knock additives, combustion chamber types.
COMBUSTION IN C.I. ENGINE: Stages of combustion – Delay period and its importance – Diesel Knock– Need for air movement; suction; compression and combustion induced turbulence.

UNIT - 3 **L-9**

PERFORMANCE OF I.C ENGINES: Measurement of cylinder pressure; fuel Consumption; air intake; exhaust gas composition; Brake power –Determination of frictional losses and indicated power – Performance test; Numericals.

UNIT - 4 **L-9**

BOILERS: Classification; Working principles; H.P. Boilers; Mountings and Accessories. Properties of steam-dryness fraction of steam. Performance of boilers - Parameters; equivalent evaporation; efficiency.
DRAUGHT: Classification-artificial and forced draughts. Design of chimney for given draught and discharge; condition for maximum discharge; efficiency of chimney.
STEAM CONDENSERS: Use and Classification of condensers; working principles of different types; vacuum efficiency and condenser efficiency; air leakage - sources and its effects; air pump-cooling water requirement.

UNIT - 5 **L-9**

VAPOUR POWER CYCLES: Rankine cycle; Thermodynamic Analysis; Concept of Mean Temperature of Heat addition; Methods to improve cycle performance; Regeneration and Reheating.
STEAM NOZZLES: Function of nozzle and its types - Flow through nozzles, thermodynamic analysis, assumptions, velocity of nozzle at exit-ideal and actual expansion in nozzle, condition for maximum discharge, criteria to decide nozzle shape, super saturated condition-Wilson line.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Cut section view of an IC engine; valve and port timing diagrams of IC Engines
2. Lubrication of IC engines
3. Fuel injection system
4. Pressure- crank angle diagrams for SI engines
5. Pressure- crank angle diagrams for CI engines
6. Calculations of brake power using different dynamometers
7. Finding friction power using various methods
8. Air and fuel consumption experiments
9. Single stage compressor
10. Multi stage compressors; with and without intercooler.
11. Demonstration of steam boilers.

TEXT BOOKS:

1. Ganesan V, “Internal Combustion Engines”, 2nd edition, TMH. 2007.
2. Yadav R, “Thermal Engineering” , 2nd edition, Central Book Depot, 2005.

REFERENCEBOOKS:

1. Sarkar B.K, “Thermal Engineering”, 2nd edition, Tata McGraw-Hill, 2003.
2. John B. Hey Wood “Fundamentals of I.C. Engines”, 2nd edition, McGraw- Hill, 2004.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	30	-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, Preparing Resume, Group Discussion, and Interview Skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs equip with requisite professional and inter-personal skills.
- they will possess the ability to think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- through identification and introspection on individual strengths and weaknesses.
- students will emerge with improved levels of self-awareness and self-worth, for greater efficacy at workplace.

SKILLS:

- ü *Able to Communicate and understand the difference between soft skills and hard skills.*
- ü *Able to learn professionalism and Employability skills.*
- ü *Able to plan Career by drawing their SWOT, Setting the Goal, learn the importance of Time and Stress Management.*
- ü *Able to learn Vocabulary, Situational English, Group Discussion, Reading Comprehension and Listening Comprehension which are essential for all competitive examinations.*
- ü *Able to prepare Resume and learn how to face interview.*
- ü *Able to learn Gender sensitive language, Good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - the process of communication, levels of communication, flow of communication, choice of diction and style with reference to setting (formal, semi-formal or informal); communication networks, barriers to communication, miscommunication, noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, need for soft skills, professionalism, employability skills.

C) CAREER PLANNING:

Job vs. career, Goal setting, SWOT analysis, planning and prioritization, four quadrant time management system, self-management, stress-management.

ACTIVITY: Johari Window for SWOT analysis; Setting a SMART goal using the provided grid; Writing a Statement of Purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, roots, prefixes & suffixes, synonyms & antonyms, collocations, one-word substitutes, analogies, idioms and phrases, contextual guessing of unfamiliar words, task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student) – vocabulary exercises with hand-outs – Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, dynamics of group discussion, intervention, summarizing and conclusion, voice modulation, content generation, Key Word Approach (KWA), Social, Political, Economic, Legal and Technical Approach (SPELT), View Point of Affected Part (VAP), language relevance, fluency and coherence.

ACTIVITY: Viewing a recorded video of GD & Mock sessions on different types of GD topics-controversial, knowledge, case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, preparing the resume, writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, understanding employer expectations, pre-interview planning, opening strategies, impressive self-introduction, answering strategies, other critical aspects such as body language, grooming, other types of interviews such as stress-based interviews, tele- interviews, video interviews, frequently asked questions (FAQs) including Behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, techniques for speed reading, understanding the tone, skimming and scanning, appreciating stylistics, impediments for speed reading, eye fixation, sub-vocalization, critical reading, reading based on purpose, reading for information, reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas. (Hand-outs). Newspaper activity with students divided into 4 groups. Each group looks at critical component of communication such as Listening, Speaking, Reading and Writing enabling them to be better communicators as well as be more aware about the current affairs, which help in Group Discussion.

B) LISTENING COMPREHENSION: Listening as a skill, different types of listening, active and passive listening, top-down approach, bottom-up approach, understanding the non verbal cues of communication; intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, cultural sensitivity, social awareness, emotional intelligence, good manners, self-grooming, positive body language, accepting and handling responsibility, assertiveness, problem solving, negotiating skills, networking and creating a good first impression.

Seven essential skills for a team player; attentive listening, intelligent questioning, gently persuading, respecting other's views, assisting others, sharing, participating actively.

ACTIVITY: Johari Window, Games and Case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation" 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan & NP Singh, "Speaking English Effectively" 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa & Co. 2004.

VFSTR UNIVERSITY

III Year - B.Tech

COURSE CONTENT

I SEM & II SEM

III Year B.Tech. Mechanical Engg. I - Semester

L	T	P	To	C
3	1	-	4	4

ME317 DESIGN OF MACHINE ELEMENTS - I

Course Description & Objectives:

To impart knowledge of the basic engineering design against static and dynamic loading by considering strength and rigidity. To train individual components design methodology and selection procedure for various industrial applications.

Course Outcomes:

1. *Designing the components against static loading.*
2. *Designing the components against cyclic loading.*
3. *Designing the fasteners like rivits, bolts and cotter joints.*
4. *Designing power transmission shafts and couplings.*

UNIT - I Introduction to Design :

Steps involved in conventional design – Preferred numbers and significance. Engineering Materials – Classification – Properties – Specifications. Principal stresses - Principal planes - Mohr's circle
Theories of failure - Maximum Principal stress theory - Maximum shear stress theory - Distortion energy theory.
Factor of safety and its importance in design – design for static strength - rigidity.

UNIT - II Design for Fatigue Strength:

Stress concentration - Methods to reduce stress concentration – Fluctuating stresses – Fatigue failure – Endurance limit – Factors influencing fatigue strength – Fatigue stress concentration – Notch sensitivity. Low cycle and high cycle fatigue – Cumulative fatigue – Design for finite and infinite life – Soderberg, Goodman, Gerber equations for fatigue design.

UNIT - III Design of Fastners:

Design of Bolted Joints : Joints designed for simple and eccentric loadings.

Design of Riveted Joints : Lap and butt joint . Failure of riveted joints – Design of boiler joints – Joints of Uniform strength – Eccentrically loaded riveted joints.

UNIT - IV Design of Welds:

Strength of transverse and parallel fillet welds – Butt welds - Eccentrically Loaded welded joints.

Keys, Cotters and Knuckle Joints : Types of Keys - Stresses in Keys - Cotter Joints - Socket and Spigot joints - Sleeve and cotter - Gib and Cotter Joints - Knuckle Joints.

UNIT - V Design of Shafts:

Materials used for shafts – Stresses in shafts – Shafts subjected to fluctuating loads – Combined bending , twisting and axial loads – Design for strength and rigidity.

Design of couplings: Muff, split muff, flanged and bushed pin coupling, Modified Flange Coupling,Oldham Coupling, Universal coupling.

TEXT BOOKS :

1. J.E. Shiegly, “Mechanical Engineering Design”, 9th ed., Tata McGraw Hill, 2013.
2. V.B. Bhandari, “Design of Machine Elements”, 3rd ed., Tata McGraw Hill, 2010.

REFERENCE BOOKS :

1. Juvinell, Marshell, “Fundamentals of Machine Conponents”, 5th ed., John Wiley & Sons, 2011.
2. R.S. Khurmi and J.K. Gupta, “Machine Design”, 14th ed., S.Chand & Co., 2010.
3. R.L. Norton, “Machine Design - An Integrated Approach”, 5th ed., Pearson Publication, 2013.

III Year B.Tech. Mechanical Engg. I - Semester	L	T	P	To	C
	3	1	-	4	4

ME319 DYNAMICS OF MACHINES

Course Description & Objective:

The course will focus on the study of forces, motion and inertia in machines and performance of machines under dynamic conditions and their analysis.

Course Outcomes:

1. *Able to do static and dynamic force analysis on slider crank mechanism but also on other mechanisms.*

2. *Able to demonstrate the torque analysis on any kind of fly wheel i.e., either on engine flywheel or machine flywheel*
3. *Able to calculate the brake force analysis on any type of four wheeler*
4. *Able to perform the experiment and measure the torque acting on a dynamometer*
5. *Able to conduct experiment on the effect of the gyroscopic torque on any moving/rotating machine*
6. *Able to demonstrate the working principle of a governor and able to identify different types of governors in actual practice*

UNIT - I Static and Dynamic force Analysis:
Introduction, analytical methods to find displacement, velocity and acceleration of the piston, forces acting on connecting rod and crank.
Flywheel: Turning moment diagram, determination of work done and power from turning moment diagram, fluctuation of energy, flywheels.

UNIT - II Brakes:
Block brakes, band brakes, differential band brakes, self locking and self energizing brakes, braking force analysis of a four wheeler.
Gyroscope: Precision motion and its effect on stability of ships, Aeroplanes, and four wheelers.

UNIT - III Governors:

Watt, Porter and Proell governors, spring loaded governors-Hartnell and Hartung governors, terms associated with governor performance - sensitiveness, isochronism and hunting.

Clutches: Uniform pressure and uniform wear, single plate and multiplate clutches, cone clutch.

UNIT - IV Balancing of Rotating Masses:
Balancing of rotating masses, single and multiple masses acting at single and different planes.
Balancing of Reciprocating Masses: primary, secondary balancing, analytical and graphical methods, unbalanced forces and couples, locomotive balancing- hammer blow, swaying couple and tractive efforts,balancing of inline engines.

UNIT - V Longitudinal Vibrations:
Introduction – Definitions – Types of Vibrations – Free Longitudinal Vibrations – Damped Vibrations – Logarithmic Decrement – Forced Vibrations – Vibrations Isolation and Transmissibility.
Transverse & Torsional vibrations – Whirling of Shafts – critical speeds - Free Torsional vibrations - Two rotor systems.

TEXT BOOKS :

1. J.E. Shigley, "Theory of Machines & Mechanisms", 4th ed., Oxford University Press, 2010.
2. R.S.Khurmi and J.K.Gupta, "Theory of Machines", 15th ed., Eurasia Publishing House (Pvt.) Ltd., New Delhi, 2009.

REFERENCE BOOKS :

1. William J. Thomson, "Theory of Vibrations with Applications", 5th ed., Prentice Hall, 1997.
2. J.S. Rao and R.V. Dukkipati, "Mechanism and Machine Theory", 2nd ed., New Age International, 2009.
3. S.S. Rattan, "Theory of Machines", 3rd ed., Tata Mc Graw-Hill Education Pvt. Ltd., New Delhi, 2009.

III Year B.Tech. Mechanical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

ME321 MANUFACTURING PROCESS - II

Course Description & Objectives:

To expose students to the metal removal principles and its processes. To acquire deep knowledge of single point and multi point cutting tool geometry and its performance. With the help of various cutting tools and accessories development of various machine tools knowledge is imparted.

Course Outcomes:

1. *Complete knowledge of tool geometry and its performance.*
2. *Force and power requirement calculations for various machining operations.*
3. *Lathe machine and its operations exposure.*
4. *Plain surfaces machining by shaper and planer machine.*
5. *Drilling and milling operations familiarity.*
6. *Super finishing process and its applications.*

UNIT - I Introduction:

Principles and Elements of machining - Types of cutting tools – Geometry of single point cutting tool – chip formation and types of chips, chip breakers. Orthogonal and Oblique cutting – Machinability - Merchant's force diagram – velocity relationship – cutting speed, feed, depth of cut. Tool life and wear – Tool materials.

UNIT - II Lathe:

Classification - line diagram of lathe – Lathe Parts – Lathe specifications.
Work Holding Devices : Three jaw chuck – Four jaw chuck – combination chuck and other work holding devices. Tool holders.
Lathe Operations : Turning, facing – taper turning – thread cutting.
Capstan & Turret Lathe : Differences, collet chuck, tool holders, tool layout.

UNIT - III Shaper:

Line diagram and parts, specifications, quick return mechanism for shapers – work holding devices and shaper operations.
Planer : Types of planers, specifications, quick return mechanism of a planer – work holding devices.
Slotting Machine : Line diagram and parts of a slotter – specifications – Ram drive mechanism.

UNIT - IV Drilling Machine:
Classification and Specifications – Drill bits – twist drill – nomenclature – Tool Holding devices – Drilling operations. Special purpose machines.

Milling Machine : Classification of Milling Machines – Parts and Specifications – types of milling cutters – Milling Operations – Indexing heads – plain and universal dividing heads.

UNIT - V Grinding:

Cylindrical - external and internal, surface and centerless grinding machines.
Grinding Wheel : Specifications - Abrasives, bonds, grit, grade and structure of grinding wheel.
Fine Finishing Processes : Lapping, Honing and superfinishing operations.

TEXT BOOKS :

1. S.K.Hajra Chowdary "Workshop Technology", Vol-II, 15th ed., Media Publishers, 2012.
2. B.S. Raghu Vamsi, "A Course in Workshop Technology", Vol-II, 2nd ed., Dhanapathi Rai & Sons, 2013.

REFERENCE BOOKS :

1. Hindustan Machin Tools, "Production Technology", 3rd ed., Tata McGrawHill, 2014.
2. R.K. Jain and S.C. Gupta, "Production Technology", 17th ed., Kanna Publishers, 2011.

III Year B.Tech. Mechanical Engg. I - Semester

L	T	P	To	C
3	1	-	4	4

ME323 THERMAL ENGINEERING - II

Course Description & Objectives:

To establish an understanding of the types of steam boilers and its performance parameters and working of different steam turbines,steam nozzles, steam condensers gas turbines and jet propulsive devices. To make them understand thoroughly the methods to improve the thermal efficiency of the cycles. To provide students with exposure to the systematic methods for solving engineering problems on boiler performance, steam nozzles, steam condensers, steam turbines jet engines and rocket engines. To build the necessary theoretical background that suits the power sector needs.

Course Outcomes:

1. *Classifydifferent types of boilers and its applications and its various mountings and accessories and its performance parameters.*
2. *Understanding the working phenomenon ofchimney and condition for maximum discharge of mass through it.*
3. *Understand the working of different types of condensers, performance parameters and its applications in steam power plants.*
4. *Calculate the thermal efficiency ofRankine Cycle and methods to improve the efficiency of a steam power plant.*
5. *Understand the working of different types of steam nozzles and its applications, conditions for maximum discharge of steam through it*
6. *Classify different types of steam turbines and working of impulse turbine and its performance parameters and methods of compounding to reduce rotor speed of an impulse turbine.*

UNIT - I Boilers:

Classification - Working principles - H.P. Boilers, Mountings and Accessories. Properties of steam-dryness fraction of steam.

Performance of boilers - Parameters, equivalent evaporation, efficiency.
Draught - classification-artificial and forced draughts. Design of chimney for given draught and discharge,condition for maximum discharge, efficiency of chimney.

Steam Condensers: Use and Classification of condensers, working principles of different types, vacuum efficiency and condenser efficiency, air leakage - sources and its effects, air pump-cooling water requirement.

UNIT - II Vapour Power Cycles:

Rankine cycle, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance, Regeneration & Reheating.

Steam Nozzles: Function of nozzle and its types - Flow through nozzles, thermodynamic analysis,assumptions, velocity of nozzle at exit-ideal and actual expansion in nozzle, condition for maximum discharge,criteria to decide nozzle shape, super saturated condition-Wilson line.

UNIT - III Steam Turbines:

Impulse Turbine : Classification, Mechanical details of Impulse turbine, Velocity diagram -effect of friction - power developed, axial thrust, blade or diagram efficiency - condition for maximum efficiency, De-Laval Turbine - its features.Methods to reduce rotor speed - Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow, combined velocity and pressure compounding of impulse turbine.

Reaction Turbine: Mechanical details - principle of operation, Thermodynamic analysis of a stage, degree of reaction - velocity diagram - Parson's reaction turbine - condition for maximum efficiency.

UNIT - IV Gas Turbines:

Simple gas turbine plant - ideal cycle, essential components - parameters of performance -actual cycle - regeneration, inter cooling and reheating - Closed and Semi-closed cycles - merits and demerits.

UNIT - V Jet Proupulsion:

Classification of jet propulsive engines - Working Principles with schematic diagrams and representation on T.S. diagram. Thrust, Thrust Power and Propulsion Efficiency of Turbo jet engines-Thermodynamic Cycle, Performance Evaluation, Thrust Augmentation Methods.

Rocket Propulsion: Application - Working Principle - Classification - Propellant Type - Thrust, Propulsive Efficiency - Specific Impulse - Solid and Liquid propellant Rocket Engines.

TEXT BOOKS :

1. R.K. Rajput, "Thermal Engineering", 8th Edition, Laxmi Publications, New Delhi, 2010.
2. M M El Wakil, "Power Plant Technology", 2nd Edition, McGraw Hill International, 2002.

REFERENCE BOOKS :

1. V.Ganesan, "Gas Turbines", 3rd ed., Tata McGraw Hill, New Delhi, 2010.
2. Sarkar B. K, " Thermal Engineering", 1st ed., Tata McGraw Hill, 2005.
3. P K Nag, "Power Plant Engineering", 3rd ed.,Tata McGraw Hill, 2008.
4. Ballaney, P.L., "Thermal Engineering", 23rd ed., Khanna Publishers, 2007.

IV Year B.Tech. Mechanical Engg. I-Semester

L	T	P	To	C
3	1	-	4	4

ME325 MECHANICAL VIBRATIONS

(Dept. Elective - I)

Course Description & Objectives:

An introductory course in linear mechanical vibrations where students acquire the ability to Formulate mathematical models of problems in vibrations using Newton's second law or energy principles, determine a complete solution to the modeled mechanical vibration problems. Correlate results from the mathematical model to physical characteristics of the actual system. Design of a mechanical system using fundamental principles developed in the class.

Course Outcomes:

1. *Students will be able to construct the equations of motion for free-body diagrams.*
2. *And are able to solve for the motion and the natural frequency of (1) a freely vibrating single degree of freedom undamped motion and (2) a freely vibrating single degree of freedom damped motion.*
3. *To construct the governing differential equation and its solution for a vibrating mass subjected to an arbitrary force. Students will be able to decompose any periodic function into a series of simple harmonic motions using Fourier series analysis.*
4. *Students will be able to solve for the motion and the natural frequency for forced vibration of a single degree of freedom damped or undamped system.*
5. *Students will have an ability to obtain the complete solution for the motion of a single degree of freedom vibratory system (damped or undamped) that is subjected to non-periodic forcing functions.*

6. *To solve vibration problems that contain multiple degrees of freedom. and to obtain numerical solutions to vibration problems by simple algorithms, and display the findings in graphical form.*

UNIT - I Single Degree of Freedom Systems:

Introduction, types of vibrations, Frequency and time period for longitudinal and transverse vibrations, Newton's Law of motion - Energy method, Raleigh's method.

UNIT - II Vibrations:

Free vibration, Forced vibration, Damped vibrations, types of damping, logarithmic decrement, Isolation of vibrations & Transmissibility.

UNIT - III Two Degree-of-Freedom Systems:

Two degrees-of-freedom system, Lagrange's equation, modes of vibration, Principal modes, Principles of orthogonality, Generalized coordinates, Co-ordinate coupling, Dynamic vibration Absorber.

UNIT - IV Multi Degrees-of-Freedom Systems:

Newton's second law to derive equation of motion, Influence co-efficients - Stiffness, Flexibility, Inertia. Eigen values & Eigen vectors.

UNIT - V Transient Vibration of Continuous Systems:

Transient Vibrations - Impulse excitation, Arbitrary excitation, Laplace Transform formulation - Continuous System - longitudinal Vibration of rods, Transverse Vibration of beams, Transverse Vibration of string, Torsional Vibration of shaft.

TEXT BOOKS :

1. G.K. Groover, "Mechanical Vibrations", 4th ed., NEM Chand & Brothers, 2009.
2. L.Meirovitch, "Fundamentals of Vibrations", 1st ed., Tata McGraw Hill, 2009.

REFERENCE BOOKS :

1. S.GrahamKelly, "Schaum's Outlines, Theory & Problems of Mechanical Vibrations", 3rd ed., Tata McGraw Hill, 2007.
2. W.T. Thomson and M.D. Dehlen, "Theory of Vibrations with Applications", 5th ed., Pearson Education, 2007.

III Year B.Tech. Mechanical Engg. I - Semester

L	T	P	To	C
4	0	-	4	4

ME327 METROLOGY & INSTRUMENTATION

Course Description & Objectives:

Manufacturing of components with correct dimensions and features like tapers, center positioning and surface finish are essential for quality products. At the same time product inspection should be finished in less time without any error. Metrology course is aimed to provide knowledge of limits, gauges, linear and angular measurements. Different process parameters like temperature, pressure, flow rate are very much important in process industry for the quality production. Students are given sufficient exposure of these through this course.

Course Outcomes:

1. *Sound knowledge in gauge design and gauge selection*
2. *Angle measurement with various measuring instruments*
3. *Different comparators working and selection, measurement of surface finish by different techniques*
4. *Various transducers working and application to physical parameters by the instruments*
5. *Different techniques to measure temperature force and flow.*

UNIT - I Introduction to Metrology:

Line and end standards – Theory of limits, fits and tolerances - Fundamental deviation – types – Grades of tolerances – Fits – Types of fits - Hole basis and shaft basis systems – Interchangeability and selective assembly. Limit Gauges - Taylor's principle – GO and NO GO gauges – plug and ring gauges.

UNIT - II Linear, Angle, Taper and Optical Measurements:

Linear measurements : Slip gauges – Dial indicators – Micrometer.

Angle and Taper measurement : Bevel protractor – Angle slip gauges —sine bar – Taper determination using Rollers and spheres.

Optical Measurements : Optical flats – NPL Interferometer.

UNIT - III comporators & Surface Roughness Measurement:

Comporators : Mechanical – Electrical – Pneumatic comparators.

Surface roughness measurement : Surface roughness and surface texture – Numerical assessment of surface finish – CLA – RMS- Ten point height of irregularity - Measuring Instruments - Profilograph – Talysurf.

UNIT - IV Introduction to Instrumentation & Displacement Measurement:

Introduction to Instrumentation : Generalized configuration and functional description of measuring instruments - Static and dynamic characteristics - Calibration.

Displacement measurements: Theory and construction of various transducers to measure displacement - Resitance type - LVDT – Capacitive type - piezo electric type Instruments

UNIT - V Temperature, Strain Measurements :

Temperature Measurements: various principles of temperature measurements, expansion thermometers, resistance thermometers, thermistors, thermocouples, pyrometers

Strain measurements: Various types of strain measurements, electrical resistance strain gauge, gauge factor - configurations to measure tensile, compressive and bending strains.

TEXT BOOKS:

1. D.S.Kumar, "Mecahnical Measurements & Controls", 5th ed., Metropolitan Book Pvt. Ltd., 2012.
2. R.K.Jain, "Engineering Metrology", 20th ed., Khanna Publishers, New Delhi, 2009.

REFERENCE BOOKS:

1. R.K. Rajput, "Mechanical Measurements & Instrumentation", 3rd ed., S.K. Kataria & Sons, 2010.
2. E.O. Doebelin, "Measurement Systems", 6th ed., Tata Mc Graw Hill, New Delhi, 2011.

III Year B.Tech. Mechanical Engg. I - Semester	L	T	P	To	C
	4	0	-	4	4

ME 329 RAPID PROTOTYPING

Course Description & Objectives:

This subject provides students with an understanding of the various rapid prototyping, rapid tooling technologies; The knowledge to select appropriate technologies for product development purposes.

Course Outcomes:

1. *Understand the principle, parameters and applications of R P processes*
2. *Recognize various types of rapid tooling*
3. *Identify different allied processes*

UNIT - I Introduction:
Need for the compression in product development, History of RP systems, Survey of applications, Growth of RP industry, Classification of RP systems.

UNIT-II RP Process:
Principle, process parameters, process details and applications of Stereo lithography systems, Selective Laser Sintering, Fused Deposition Modeling,

UNIT-III RP Process:
Principle, process parameters, process details and applications of Laminated Object Manufacturing, Solid Ground Curing, Laser Engineered Net Shaping, 3D Printing.

UNIT-IV Rapid Tooling
Indirect rapid tooling - silicone rubber tooling, aluminum filled epoxy tooling, spray metal tooling, Direct rapid tooling - direct AIM, copper polyamide, sand casting tooling, laminate tooling, soft tooling Vs hard tooling.

UNIT-V Rapid Manufacturing Process:
Rapid Manufacturing Process Optimization- Factors influencing accuracy, data preparation errors, part building errors, errors in finishing, influence of part build orientation.

TEXT BOOKS:

1. Pham D T and Dimov S S, “Rapid Manufacturing”, Verlag, 2001.
2. Paul F Jacobs, “Stereo lithography and other RP&M Technologies”, SME, 1996.

REFERENCE BOOKS:

1. Terry Wohlers, “Wohlers Report 2001”, Wohlers Associates, 2008.

II Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
-	-	1	1	1

SR002 SEMINAR

Course Description & Objective:

Seminar is offered as an opportunity for graduate students to broaden their knowledge beyond their specific area of research and/or studies. This is important at and beyond the graduate level where our activities are highly focused and specialized from a topical perspective.

III Year B.Tech. Mechanical Engg. I - Semester	L	T	P	To	C
	-	-	3	3	2

ME331 MACHINE TOOLS & METROLOGY LAB

Course Description & Objective:

To create awareness on various mechanical measuring instruments. To make students familiar with various operations on machine tools.

Course Outcomes:

1. *Hands on experience on lathe machine to perform turning, facing, threading operations.*
2. *Practical exposure on flat surface machining, milling and grinding operations.*
3. *Skill development in drilling and threading operations.*
4. *Linear and angular measurements exposure.*

1. Section - A

1. Step turning and taper turning using lathe machine.
2. Thread cutting and knurling using lathe machine.
3. Drilling and step boring using lathe machine.
4. Drilling and Tapping using drilling machine.
5. Shaping of V groove using shaper.
6. Slotting of a keyway using slotter machine.
7. Milling of gear.
8. Surface Grinding.

2. Section - B

1. Length, Depth, Diameter measuring using vernier calipers & micrometer.
2. Bore measurement using bore gauge.
3. Use of gear teeth caliper for checking the chordal addendum and chordal height of spur gear.
4. Angle and taper measurements using Bevel protractor, Sine bar and slip gauges.
5. Screw thread measurement by Three wire method.
6. Surface roughness measurement by Tolysurf.

III Year B.Tech. Mechanical Engg. I - Semester

L	T	P	To	C
-	-	3	3	2

ME333 FUELS & I.C. ENGINES LAB

Course Description & Objectives:

The main objective of this lab is to develop an idea of fuel properties and their variation with temperature, determination of kinematic viscosity and calorific value of fuels, understanding of basic internal combustion engine performance, determination of friction power and volumetric efficiency of I.C. engines and the use of multi-stage compression.

Course Outcomes:

After the completion of this course, the student should be able to:

1. *Understand the complete operation of 2 stroke and 4 stroke I.C engines which can be further confirmed through V.T.D and P.T.D*
2. *Find the performance of 2-S and 4-S engines and the variation of various performance parameters with load and speed.*
3. *Know how to balance the heat energy available in engine cylinder after the combustion process.*
4. *Understand the working and performance evaluation of mechanical power consuming devices like compressors.*
5. *Analyze the performance of the variable compression ratio engine with computerized set up which enables the understanding of pressure variation with crank angle during a cycle of operation.*
6. *Find the kinematic viscosity of fuels and its variation with temperature.*

I. FUELS & LUBRICANTS :

1. Determination of Flash and Fire points of Liquid Fuels / Lubricants: Pensky martens apparatus
2. Carbon Residue Test : Solid/ Liquid Fuels
3. Determination of Viscosity : Liquid Lubricants & Fuels : Saybolts viscometer, Redwood Viscometer, Engler Viscometer.
4. Determination of Calorific Value: Solid/Liquid/Gaseous Fuels: Bomb Calorimeter, Junker Calorimeter.
5. Grease Penetration Test.

II. I.C. ENGINES :

1. I.C. Engines Valve Timing Diagram (Diesel Engine)
2. I.C. Engines Valve Timing Diagram (Petrol Engine)

3. I.C. Engines Performance Test (4 – S Diesel Engines)
4. I.C. Engines Performance Test (2 – S Petrol Engines)
5. Evaluation of Engine friction by conducting morse test on 4-S Multi cylinder Petrol Engine and retardation and motoring test on 4-S diesel engine.
6. I.C. Engines Heat Balance Sheet.
7. Performance Test on Variable Compression Ratio Engines, economical speed test.
8. Performance Test on Reciprocating Air-Compressor Unit
9. Study of Boilers
10. Dis-assembly / Assembly of Engines.

Note : A minimum of total 12 Experiments to be completed by a student.

III Year B.Tech. Mechanical Engg. I - Semester	**L**	**T**	**P**	**To**	**C**
	-	-	3	3	2

ME335 MANUFACTURING DRAWING & INSRUMENTATION LAB

Course Description & Objective:

To provide basic knowledge in the preparation of production drawings and to give exposure on calibration of various instruments.

Course Outcomes:

1. Able to aware of various types of measurements, requirement of calibrations, instruments used errors in measurement etc.
2. Able to perform accurate measurements and measuring instrument for any engineering system.

I. Production Drawing :

Limits and Fits : Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

Form and Positional Tolerances : Introduction and indication of the tolerances of from and position on drawings, deformation of runout and total runout and their indication.

Surface roughness and its indication : Definitions - finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

Part and Assembly Drawings : Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

II. Instrumentation :

1. Study and calibration of LVDT transducer for displacement measurement.
2. Calibration of strain gauge for force measurement.
3. Calibration of thermocouple for temperature measurement.
4. Calibration of resistance temperature detector for temperature measurement.
5. Calibration of capacitative pick-ups for angular displacement.
6. Study and calibration of photo and magnetic speed pickups for the measurement of speed.

III Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
3	1	-	4	4

ME318 DESIGN OF MACHINE ELEMENTS - II

Course Description & Objective:

To provide enough hands on experience with the usage of design data book to design standard machine elements like bearings, gears and other elements. Students are familiarized with the design of Internal combustion engine parts to know the way how a system of elements in an engine are designed.

Course Outcomes:

1. *Journal and roller bearing design and selection from the data book*
2. *Gear design against static and dynamic loading along with wear strength*
3. *Stress and load calculations along with deformations of various types of springs*
4. *Power screws design and curved beam application to crane hook design*
5. *Piston, connecting rod and crankshaft design based on maximum bending and twisting moment*

UNIT - I Bearings:

Introduction – Classification of bearings – Hydrodynamic and Hydrostatic lubrication – McKee equation – Design of Journal bearings. Design of Thrust bearings. Rolling contact bearings – Classification and selection of rolling contact bearings – Advantages and limitations of rolling contact bearings – Static load carrying capacity – Dynamic load carrying capacity – Life-load relationship – Selecting the bearing using manufacturers catalogue.

UNIT - II Design of Gears:

Classification of gears – Design of spur gears – Lewis Beam strength equation – Bukingham's equation - Wear strength. Design of helical gear.

UNIT - III Design of Springs:

Introduction to springs – Classification – materials used for springs – Nomenclature in springs – Stresses and deflection of springs – Helical, torsional, Coaxial springs. Laminated springs – Stresses and deflection in Leaf springs – Applications.

UNIT - IV Design of Curved Beams:

Introduction - Stresses in curved beams – Expression for radius of neutral axis for rectangular – Circular, trapezoidal and T-Section - Design of crane hooks, C-Clamps.

Design of Power Screws : Types of thread profiles - Square, Buttress, ACME; design of square threads and nuts, design of screw jack, compound screw and differential screw.

UNIT - V Design of Engine Parts:

Design of Piston – Cylinder, Cylinder liner – Connecting rod – Stress due to whipping action on connecting rod ends – Crank and Crank shafts – Side Crank – Center Crank – Crank Pins, Crank Shafts.

DATA BOOKS :

1. B. Mahadevan, “Design Data Hand Books for Mechanical Engineers.”, 4th ed., CBS Publishers, 2013.
2. P.S.G., “Design Data Book of Engineers “. 1st ed., Kalaikathir Achagam Publishers, 2011.

Note : Design data books are permitted in the Examination.

TEXT BOOKS :

1. J.E. Shiegly, “Mechanical Engineering Design”, 9th ed., Tata McGraw Hill, 2013.
2. V.B. Bhandari, “Design of Machine Elements”, 3rd ed., Tata McGraw Hill, 2010.

REFERENCE BOOKS :

1. Juvinell, Marshell, “Fundamentals of Machine Conponents”, 5th ed., John Wiley & Sons, 2011.
2. R.S. Khurmi and J.K. Gupta, “Machine Design”, 14th ed., S.Chand & Co., 2010.
3. R.L. Norton, “Machine Design - An Integrated Approach”, 5th ed., Pearson Publication, 2013.

III Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
3	1	-	4	4

ME320 HEAT TRANSFER

Course Description & Objectives:

This course is designed to introduce a basic study of the phenomena of heat to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems. A knowledge-based design problem requiring the formulations of solid conduction and fluid convection and the technique of numerical computation progressively elucidated in different chapters will be assigned and studied in detail. As well, to gain experience in designing experiments for thermal systems, the design, fabrication, and experimentation of a thin film heat flux gage will be attempted as part of laboratory requirements.

Course Outcomes:

1. *Understand the basic laws of heat transfer.*
2. *Account for the consequence of heat transfer in thermal analyses of engineering systems.*
3. *Analyze problems involving steady state heat conduction in simple geometries.*
4. *Develop solutions for transient heat conduction in simple geometries.*
5. *Obtain numerical solutions for conduction and radiation heat transfer problems.*
6. *Understand the fundamentals of convective heat transfer process.*
7. *Evaluate heat transfer coefficients for natural convection.*
8. *Evaluate heat transfer coefficients for forced convection inside ducts.*
9. *Evaluate heat transfer coefficients for forced convection over exterior surfaces.*
10. *Analyze heat exchanger performance by using the method of log mean temperature difference.*
11. *Analyze heat exchanger performance by using the method of heat exchanger effectiveness.*
12. *Calculate radiation heat transfer between black body surfaces.*
13. *Calculate radiation heat exchange between gray body surfaces.*

UNIT - I Introduction:

Modes and mechanisms of heat transfer - Basic laws of heat transfer - General discussion about applications of heat transfer.

Conduction Heat Transfer : Fourier's law - General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

UNIT - II One Dimensional Steady State Conduction Heat Transfer:

Homogeneous slabs, hollow cylinders and spheres - overall heat transfer coefficient, electrical analogy - Critical radius of insulation. systems with heat sources or Heat generation. Heat transfer through extended surfaces – rectangular fins.

UNIT - III One Dimensional Transient Conduction Heat Transfer:

Systems with negligible internal resistance -Significance of Biot and Fourier Numbers - Chart solutions of transient conduction systems.

UNIT - IV Convective Heat Transfer:

Concepts about Continuity, Momentum and Energy Equations.Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer - Flat plates and Cylinders.

Heat Exchangers : Classification of heat exchangers - overall heat transfer Coefficient and fouling factor -Concepts of LMTD and NTU methods - Heat Exchanger design using LMTD and NTU methods.

UNIT - V Boiling and condensation:

Pool boiling - Regimes, Calculations on Nucleate boiling, Critical Heat flux and Film boiling **:** Film wise and drop wise condensation - Nusselt's Theory of Condensation on a vertical plate.

Radiation Heat Transfer : Emission characteristics and laws of black-body radiation heat exchange between two black bodies - concepts of shape factor - Emissivity - heat exchange between grey bodies -radiation shields - electrical analogy for radiation networks.

DATA BOOK:

1. C. P. Kothandaraman, "Heat And Mass Transfer Data Book", 6th ed., New Age International Publishers Ltd., 2007.

TEXT BOOKS:

1. Holman J.P "Heat transfer" 10th ed., McGraw Hill, London, 2009.
2. R.K.Rajput,"Heat And Mass Transfer", 4th ed., S.Chand & Co, New Delhi, 2008.

REFERENCE BOOKS:

1. R C Sachdeva "Fundamentals of Engineering Heat and Mass Transfer " 4th Edition, New Age International Publishers Ltd., 2009.
2. Sukhatme S.P., "Heat Transfer",4th Edition, University Press India Ltd., 2006.
3. Frank P. Incropera, David P. DeWitt, "Fundamentals of Heat and Mass Transfer", 7th Edition, Wiley Publications, 2011.
4. R Yadav "Heat Transfer", 6th Edition, McGraw Hill Publications, 2004.
5. R.K. Rajput, Thermal Engineering, 8th Edition, Laxmi Publications, New Delhi, 2010.

III Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	3	1	-	4	4

ME322 FINITE ELEMENT ANALYSIS

Course Description & Objective:

This course deals with the theory and application of the finite element methods for analyzing structural systems and heat transfer problems.

Course Outcomes:

The students can follow the terminology and basics associated with finite element method. The manual problems solving skills also help to use the analysis package efficiently.

1. *Familiarize with the energy methods used for FEM procedure*
2. *Able to solve 1D static structural bar problems subjected to axial loading*
3. *Able to solve the plane truss problems under different loading*
4. *Able to solve the 2D plane problems associated with plane stress and plane strain by using 3 noded triangular elements*
5. *Familiarize with the higher order elements used for solving 2D problems*
6. *Able to solve complicated integral equations by using numerical methods*

UNIT - I Fundamental Concepts and Energy Methods:

Introduction, Historical background, Stresses and Equilibrium, Boundary conditions, Strain-Displacement relations, Stress-Strain relations, Plane stress, Plane strain problems, Potential energy method. The Rayleigh - Ritz method, Galerkin's method, bar problems only.

One Dimensional problems : Finite element modeling coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions, Simple bar / stepped bar problems by using two noded line elements.

UNIT - II Two-dimensional Problems Using Constant Strain Triangles:

Introduction, Finite element modeling, Constant strain triangle, Problem modeling and boundary conditions.

Plane Trusses: Global and local d.o.f, Truss element stiffness matrix, Analysis of Plane trusses up to four members only.

UNIT - III Two-dimensional Isoparametric Elements and Numerical Integration:

Introduction, shape functions of four-node quadrilateral elements. Numerical integration: 1D,2D Gauss Quadrature (up to 2 / 2 x 2 Gauss points).

Analysis of Beams: Introduction, Finite element formulation, Load vector, element stiffness matrix, boundary considerations, Shear force and bending moment.

UNIT - IV Heat Transfer Analysis:

One dimensional analysis of plane walls, fins. Two dimensional analysis of plane walls.

UNIT - V Dynamic Analysis:

Dynamic considerations, Formulation of finite element model, elemental mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar.

TEXT BOOKS:

1. Chandraputla, Ashok and Belegundu, “Introduction to Finite Elements in Engineering”, 3rd ed., PHI Publishers, 2009.
2. S.S. Rao, “The Finite Element Methods in Engineering”, 4th ed., Pergamon, 2011.

REFERENCE BOOKS:

1. J.N. Reddy, “An introduction to Finite Element Method”, 3rd ed., Tata McGraw Hill, 2005.
2. Alavala, “Finite Element Methods”, 2nd ed., PHI, 2008.
3. Kenneth H. Huebner, Donald L. Dewhirst, “The Finite Element Method for Engineers”, 4th ed., John Wiley & Sons (ASIA), 2007.
4. C.S. Krishna Murthy, “Finite Element Analysis”, 2nd ed., Tata MC graw Hill, 2009.

III Year B.Tech. Mechanical Engg. II - Semester

L	T	P	To	C
4	0	0	4	4

ME324 CAD / CAM

Course Description & Objective:

To familiarize the students with drafting, design, modeling and manufacturing aspects using computers.

Course Outcomes:

1. *Students will understood the basic structure of CAD, CAM and product development.*
2. *They got the knowledge on working of various input and output devices in computer.*
3. *They will understood the, how the line was generated on computer screen.*
4. *They learn, the mathematical form of object/drawing transformations in 2D and 3D.*
5. *They will understood, the methodology developed for representation of cures and importance of parametric form.*
6. *Got the knowledge on usage of Boolean operations in solid modeling.*

UNIT - I Introduction to CAD/CAM:

Definitions, Applications, product life cycle, Automation, Types of automation, Advantages of CAD/CAM, Basic structure, Input & output devices, CAD procedure, DDA algorithm.

UNIT - II Transformation of Geometry:

2-D, 3-D and Homogenous Coordinate systems, Translation, Scaling, Reflection and Rotation.

Geometric modeling- Requirements, Primitives and Boolean operators, Wireframe model, Curve representation, Cubic Splines, B-splines, Bezier-Curves, Surface model, Solid model - Sweep representation.

UNIT - III NC/CNC Machines:

Introduction, NC components, NC procedure, NC coordinates systems and NC motion control Systems. Applications of NC, Economies of NC,NC Machining center. Computer controls in NC-Introduction to CNC, DNC.

UNIT - IV NC Part Programming:

NC co-ordinate system. Axis movements and interpolation with other axes. Application of rotary axis, Part programming fundamentals. Manual part programming - Programming formats, G-codes and M-codes. Introduction to

Computer Assisted part programming-APT language. Computer aided process planning (retrieval type system and generative type system).

UNIT - V Group Technology & Flexible Manufacturing System:

Introduction, part families, parts Classification and Coding systems, design and manufacturing attributes, Production Flow Analysis (Rank order clustering technique), Benefits of GT. Basics of FMS and lean-manufacturing methods.

TEXT BOOKS:

1. Ibrahim Zeid, "CAD/CAM Theory and Practice", 2nd ed., Tata Mc Graw Hill, 5th reprint, 2010.
2. Koren, "Computer Control of Manufacturing Systems", 2nd ed., Tata Mc Graw Hill, 2nd reprint 2006.

REFERENCE BOOKS:

1. Groover M.P., "Automation Production Systems and Computer Integrated Manufacturing", 4th ed., Prentice Hall of India, 2014.
2. P.N.Rao, "CAD/CAM Principles and Applications" 3rd ed., Tata McGraw Hill, 2nd reprint 2010.
3. David F.Rogers and J.Alan Adams, "Computer Graphics", 2nd ed., Tata McGraw Hill, 2002,
4. Kundra T.K. Rao P.N. & Tewari N.K, "Computer Aided Manufacturing", 1st ed., Tata McGraw Hill, 13th reprint 2008.

III Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	3	1	-	4	4

ME326 COMPUTATIONAL FLUID DYNAMICS

(Dept. Elective - II)

Course Description & Objective:

Students will be taught to appreciate how computers are used to perform millions of calculations required to simulate the interaction of fluids and gases with the complex surfaces used in engineering.

Course Outcomes:

1. *Understand the process of developing a geometrical model of the flow, applying appropriate boundary conditions, specifying solution parameters, and visualizing and analyzing the results.*
2. *Become conscious of the limitations of CFD and develop an appreciation for the factors limiting the accuracy of CFD solutions.*
3. *To develop an understanding for the major theories, approaches and methodologies used in CFDand apply it to numerically solve the governing equations for fluid flow*
4. *To build up the skills in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modelling etc.)*
5. *Understand and apply finite difference and finite volume methods to fluid flow problems*
6. *Understand how to assess stability and conduct a grid-convergence assessment.*

UNIT - I Governing Equations and Boundary Conditions:

Basics of computational fluid dynamics – Definition and overview of CFD, need, advantages, problem areas, Governing equations of fluid dynamics – Continuity, Momentum and Energy equations –– Physical boundary conditions – Time-averaged equations for Turbulent flow - Turbulence -Kinetic -Energy Equations – mathematical behavior of PDEs in CFD: Elliptic, Parabolic and Hyperbolic equations.

UNIT - II Discretization and Solution Methodologies:

Methods of Deriving the Discretization Equations - Taylor Series formulation – Finite difference method – Control volume Formulation – Detailed treatment of Finite Difference method, explicit and implicit methods, errors and stability analysis.

Solution methodologies: The Lax-Wendroff Technique, MacCormack's Technique, Space marching, Direct and iterative methods, Thomas algorithm, Relaxation method, Alternating Direction Implicit method.

UNIT - III Heat Conduction:

Finite difference and finite volume formulation of steady/transient one-dimensional conduction equation, Source term linearization, Incorporating boundary conditions, Finite volume formulations for two and three dimensional conduction problems.

UNIT - IV Convection and Diffusion:

Finite volume formulation of steady one-dimensional convection and Diffusion problems, Central, upwind, hybrid and power-law schemes - Discretization equations for two dimensional convection and diffusion.

UNIT - V Calculation of Flow Field:

Representation of the pressure gradient term and continuity equation - Staggered grid - Momentum equations - Pressure and velocity corrections - Pressure - Correction equation, SIMPLE algorithm and its variants.

TEXT BOOKS :

1. Versteeg, H.K, and Malalasekera, W., "An Introduction to Computational Fluid Dynamics : The Finite Volume Method", 2nd ed., Longman Publication, 2004.
2. John D. Anderson Jr, "Computational Fluid Dynamics-The Basics withApplications", 6th ed., Mcgraw Hill, 2009.

REFERENCE BOOKS :

1. C. Hirsch, "Numerical Computation of Internal and External Flows", Volumes I and II, 2nd ed., John Wiley & Sons, 2007.
2. Subas, V.Patankar "Numerical heat transfer fluid flow", 2nd ed., Hemisphere Publishing Corporation, 2004.
3. Muralidhar, K.,and Sundararajan,T., "Computational Fluid Flow and Heat Transfer", 2nd ed., Narosa Publishing House New Delhi, 2011.
4. Fletcher C.A.J. "Computational Techniques for Fluid Dynamics", Volumes I and II, 2nd ed., Springer, 2000.
5. Anderson, D.A.,Tannehill, I.I., and Pletcher, R.H., Computational Fluid Mechanics and Heat Transfer, 2nd ed., Hemishphere Publishing Corporation, 1997.

III Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	4	-	-	4	4

ME328 MECHATRONICS

Course Description & Objective:

This course gives an overview of Mechatronics systems and their components for evolving hybrid technologies in various applications.

Course Outcomes:

On successful completion of this module the learner will be able to:

1. *Summerise how mechatronics integrates knowledge from different disciplines in order to realise engineering and consumer products that are useful in everyday life.*

2. *Design static and dynamic boolean logic systems using Combinational, synchronous and asynchronous sequential logic.*
3. *Outline the operation of the fundamental elements of microprocessor systems.*
4. *Select appropriate transducer signal conditioning and devices for data conversion including operational amplifiers for analogue signal processing.*
5. *Implement a continuous-time control design using software on a microprocessor for the Manipulation, Transmission, and Recording of Data.*

UNIT - I Introduction:

Introduction to Mechatronics - Multi disciplinary Scenarios, Systems for Measurement and Control. Microprocessor based controllers, Response of Systems.

UNIT - II Signal Conditioning:

Signal Conditioning, the op-amp, protection, filtering, Wheatstone bridge, digital signals, multiplexers, Data acquisition, Digital signal processing, pulse modulation, displays, magnetic recording, measurement systems, Testing calibration.

UNIT - III System Modeling& Dynamic Response of Systems:

Introduction to Mathematical Modeling, Building Blocks of Mechanical Systems, Electrical Systems, Fluid Systems and thermal systems. Engineering Systems: Rotational, translational, Electro-Mechanical & Hydraulic- Mechanical. Performance measures of first order & second order systems, Transfer function.

UNIT - IV H & P Systems:

Actuation to Hydraulic and Pneumatic Systems, Mechanical Systems, Electrical Systems, Mechanical Switches, Solid State Switches, Operation of Solenoids, AC, DC & Stepper Motors.

UNIT - V Microprocessors & PLC's:

Introduction to digital logic - logic gates - applications of logic gates - sequential logic - Applications - Basic structure of PLCs - selection of a PLC - case studies of mechatronics systems - Microprocessor systems - microcontrollers.

TEXT BOOKS:

1. W. Bolton, "Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering" 3rd ed., Pearson Education, 2009.
2. Appuu Kuttan K K, "Introduction to Mechatronics", 2nd ed., Oxford Press, 2009.

REFERENCE BOOKS:

1. Nitaigour Premchand Mahalik, “Mechatronics Principles, Concepts and Applications” 2nd ed., Tata McGraw Hill, 2008.
2. David G Alciators, Michael B. Histand, “Mechatronics and Measurement Systems” 3rd ed., Tata McGraw Hill, 2009.

III Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	4	0	-	4	4

ME330 COMPOSITE MATERIALS

Course Description and objective:

This course focuses on contituent materials,processing, testing and various applications of the composites materials.

Course Outcomes:

Uponcompletion of this course, the students will be able to:

1. *know various composite components e.g. reinforcement andmatrices*
2. *develop a knowledge of the manufacturing of composite materials.*
3. *employ principles of material selection and design for composite materials.*
4. *demonstrate basic knowledge on the various composite processing techniques.*
5. *explain International and national standardtesting methods*

UNIT –I Introduction to Composites:

General introduction & concept, Historical development, Concept of Composite materials, material properties that can be improved by forming a composite material& its engineering potential. Basic definitions, Types of composites based on matrix and fiber. Advantages & limitations of Composites

UNIT-II Constituent materials in Composites :

Role and Selection of reinforcement materials, Types of fibers, Mechanical properties of fibers, Glass fibers, Carbon fibers, Aramid fibers, Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc. Functions of a Matrix, Desired Properties of a Matrix Polymer Matrix (Thermosets and Thermoplastics),Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

Fiber reinforced Polymer (FRP) Laminated composites.Lamina & Laminate Lay-up, Ply-orientation definition

UNIT-III Composite Manufacturing Processes :

Fabrication Techniques:Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films. Hand Lay-up, Autoclave molding, Fiber-only performs, Wet Lay-up and Spray-up, Filament winding, Pultrusion, Resin Transfer Molding(RTM), Compounding, Injection molding

Recycling of CompositesCategories of scrap composites, Recycling methods for: Thermoplastic matrix composites, Thermoset matrix composites.

UNIT-IV Characterization of Composites:

Mechanical testing of composites, Tensile testing, Compressive testing, Intralaminar shear testing, Inter laminar shear testing, Thermal testing, Fracture testing etc. Environmental Effects on composite.

Strength and Failure theories:Strength of Laminates Failure Mechanics of Composites, Macromechanical Failure Theories, Maximum stress theory, Maximum Strain Theory , Tsai-Hill Theory , Tsai-Wu Theory,Comparison of Failure Theories

UNIT-V Engineering Applications :

Applications of FRP composites. Applications related to Aerospace, Automobile, , Bridge and other Civil Engineering Structures.

Civil Engineering Applications : Typical Applications of FRP Composites in Civil Engineering Adhesively Bonded FRP composites in strengthening of civil engineering structural components such as beams, Columns, Masonry etc.Various Strengthening Techniques, Advantage and Disadvantage of FRP composites laminated plate bonding & Misc. Issues

TEXT BOOKS:

1. Hull D. and Clyne T.W., An Introduction to Composite Materials, 2nd Ed., Cambridge University Press 2013
2. Mallick, P.K. and Newman S., (edition)," Composite Materia ls Technology Processes and properties", Hansen Publisher, Munish, 1990.

REFERENCE BOOKS:

1. Mallick, P.K., Fiber Reinforced Composites Materials, Manufacturing and Manufacturing and Design", Maneel Dekker Inc, 1993.
2. Chawla K.K., Composite Materials: Science and Engineering 3rd Ed., Springer 2012

II Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
-	-	1	1	1

SR002 SEMINAR

Course Description & Objective:

Seminar is offered as an opportunity for graduate students to broaden their knowledge beyond their specific area of research and/or studies. This is important at and beyond the graduate level where our activities are highly focused and specialized from a topical perspective.

III Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
-	-	3	3	2

ME332 MODELING AND SIMULATION LAB

Course Description & Objectives:

This lab is meant for the development of modeling and analysis skills of the machine components using software. This enables the students basic idea regarding modeling activities that are carried in present industries using modeling software.

Course Outcomes:

1. *Students will expertise on modelling tools, for drawing machine components on computer screen.*
2. *Students will gain the knowledge on 3D and assemble drawings of machine components, which helps to understanding its functioning.*
3. *Students will expertise on simulation software, for analyzing machine components.*
4. *Students will gain the knowledge on structural, thermal and modal analysis.*
5. *The graphical and animation of the simulation results helps to the students, to understanding the load or its functional effects on machine components.*

MODELING :

1. **Sketcher:** Development of part drawings for various components in the form of orthographic and isometric. Constraining the drawings. Study of blueprints.

2. **3-D Modeling:** Generation of various 3D models through protrusion, revolve, shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface.
3. **Assembly:** Assembly modeling, study of various standard assembly operations. Assembling of simple components like Bolt & Nut, Sleeve and cotter joint, Knuckle Joint, shaft with journal bearing.
4. **Sheet metal work:** Basic sheet metal operations, making different sheet metal patterns.

SIMULATION :

1. Static Analysis of Plane Truss
2. Static Analysis of Thick cylinder using 2D axis symmetry
3. Analysis of a plate with center hole
4. Free vibrations analysis of a simply supported beam.
5. Steady state heat transfer in square plate
6. Analysis of plate with center hole at quarter section
7. Static analysis of simple plane truss
8. Steady state heat transfer in composite plate
9. Static analysis of thick cylinder using 3D
10. Analysis of cantilever beam with point load at its end.

III Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	-	-	3	3	2

ME334 MINIPROJECT

Course Description & Objective:

The main objective of this miniproject is to enable the students analytical and practical exposure by giving the targets like Hands on work, also it is very much essential before the students allow into the main curriculum project work.

III Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
1	-	2	3	2

HS304 PROFESSIONAL COMMUNICATION LAB

Course Rationale:

The Professional Communication exposes students to conventions of corporate communication and documentation procedures involved in the day-to-day functioning of the business world. The course is aimed at improving written communication skills of undergraduate students and preparing them to meet professional challenges in the work spheres. Writing and Personality are not two exclusive spheres of influence and this course will work on the relationship between professional writing and a personality that is able to meet the goals of an organization in creative and innovative ways.

Training Methodology:*The methodology is designed to give hands-on practice to students in formal and informal report writing, structure and format of letters as well as other organization related work.*

Course Description & Objectives:

To enable students to write logical sentences and paragraphs, use appropriate diction, grammar and punctuation.

To expose them to the world of business and business register. To make them compose clear and concise business messages. To produce business documents for mailing to external recipients or intra-organizational circulation. To enable them to speak business English for handling various business situations

Mechanics of writing:

- Elements of Technical Writing : Sentence structure - reducing verbosity - arranging ideas logically – building coherence - paragraph level and document level - topic sentence - cohesive devices – transitionals – paraphrasing – précis-writing.
- Mechanics of Writing: Stylistic elements – the rapporteur- the purpose- the reader (audience) -elementary rules of grammar- choice of diction - elementary principles of composition - matters of form – punctuation - conventions of business communication -language and tone - weak links in business correspondence - ethical concerns in business writing

Business Report Writing:

- Parts of the Report: Writing an abstract - features of a good abstract – approach - compare and contrast - cause and effect.
- Types of Technical Reports : Drafting a technical proposal - formal and informal proposals - factual reports, feasibility reports, survey reports – parts of a report - title page –declaration – acknowledgements – table of contents - abstract – introduction – conclusion – citations – references - appendices - oral reports and presentations

Business Letter Writing:

- Letter-Writing - Formal and informal letters - structure of formal letters - expressions of salutations, introductory and concluding paragraphs - different types of letters - sales letter - complaint letter - adjustment letter - letter to the editor - covering letter - claim letter – letter of condolence.

Business E- writing:

- E-mail – nature and scope - e-mail etiquette – Common Errors in composing e-mails –
- Quotations - Inviting quotations - sending quotations –placing orders

  Office Communication - agenda - notice - circular
- Effective Resume-Writing: Structure and presentation - defining career objective - projecting one's strengths and skill-sets
- Summarizing - formats and styles - covering letter.

Business visual presentations:

- Business Proposals: Drafting business proposals - calculating profit and loss-averages - ratios and proportions – partnership - simple interest - compound interest - calculating volumes and areas
- course of action - cause and effect- theme detection - making judgments - logical deductions - analyzing arguments – syllogisms - Venn diagrams - matching definitions -verbal reasoning - numerical reasoning - working out justifications.

Reference Books:

1. Strunk , William, Jr.*The Elements of Style*, Fourth Edition,
2. Rozakis, Laurie, Ph.D, (2003). *English Grammar for the Utterly Confused*, McGraw-Hill.
3. Sharma. C. (1978) *Business Correspondence & Report Writing*, Tata McGraw-Hill.
4. Kirkman, John. *Good Style: Writing for science & technology*, Routledge Study Guides, second edition.
5. Monippally, Matthukutty. M. 2001. *Business Communication Strategies*. 11th Reprint. Tata McGraw-Hill, New Delhi.

IV Year B.Tech. Mechanical Engg. I-Semester

L	T	P	To	C
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ME421 OPERATIONS RESEARCH

Course Description & Objectives:

Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively; knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry; skills in the use of Operations Research approaches and computer tools in solving real problems in industry; Mathematical models for analysis of real problems in Operations Research. Identify and develop operational research models from the verbal description of the real system.

Course Outcomes:

1. *Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry.*
2. *Formulate a managerial decision problem into a mathematical model;*
3. *Understand Operations Research models and apply them to real-life problems;*
4. *Use computer tools to solve a mathematical model for a practical problem.*
5. *Cognitive skills (thinking and analysis)*
6. *Be able to build and solve Transportation Models and Assignment Models.*
7. *Be able to understand the characteristics of different types of decision.*

UNIT - I Definition:

Definition - Characteristics and phases, Applications of OR.

Allocation Models : Linear Programming Problem Formulation - Graphical solution - Simplex method - Artificial variables technique (i.e. Big M method only) - Duality principle, simple problems on dual formulation only.

UNIT - II Transportation Model:

Formulation, IBFS, Optimality test by MODI method, unbalanced transportation problem.

Assignment Model - Formulation - Optimal solution by Hungarian method – Unbalanced Assignment problem- Restricted case.

UNIT - III Sequencing:

Introduction - Optimal solution for processing 'n' jobs through two machines and 'n' jobs through three machines.

Replacement Model: Introduction - Replacement of resources that deteriorate with time - when money value is counted and not counted.

UNIT - IV Theory of Games:

Introduction-classification of games- 2 person zero sum games- Assumptions -solution of games with saddle points - Rectangular games without saddle points, dominance principle - 2 X 2 games by Algebraic method, Matrix method to 3 x 3 games – m X 2 & 2 X n games by graphical method.

Waitingline Models: Introduction – Kendall's Lee notation- single channel with infinite population, Multichannel with infinite population.

UNIT - V Inventory Models:

Introduction - single item - Deterministic models - Purchase inventory models with one price break when shortages are not allowed.

Simulation : Definition - types of simulation models - inventory and queuing problems.

TEXT BOOKS :

1. Taha, "Introduction to Operations Research.", 8th ed., PHI Publications, 2008.
2. S.D. Sharma, "Operations Research", 8th ed., Kedarnath Publishers, 2007.

REFERENCE BOOKS :

1. Hiller & Libermann, "Introduction to Operations Research", 8th ed., Tata Mc Graw Hill, 2010.
2. D.S. Hira and R.K. Gupta, "Operations Research", 5th ed., S.Chand & Co., 2008.
3. P.K.Gupta and Manmohan, "Problems in Operations Research", 8th ed., S.Chand & Co., 2003.
4. Manohar Mahajan, "Operation Research", 1st ed., Dhanpat Rai & Co., 2008.

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ME423 ROBOTICS

Course Description & Objective:

The objective of this course is to establish an understanding of Robot anatomy, design and synthesis of manipulator mechanism, kinematics, end effector, trajectory planning, machine vision, real world interface and problem associated with their design.

Course Outcomes:

1. *Gives an idea to be familiar with the automation and brief history of robot and construction of a manipulator.*
2. *To give the student familiarities with the kinematics of robots and basics of robot control systems.*
3. *To give knowledge about robot end effectors, their design and their pros and cons.*
4. *To give knowledge about various Sensors, their applications in robots and a brief understanding of robot vision.*
5. *To give a wide knowledge about the various real world and industrial application or robot in the current days.*

UNIT - I Introduction:

Definition of automation-programmable automation - flexible automation - Definition of a Robot - Basic Concepts - Robot configurations - characteristics of robots – accuracy and repeatability-load carrying capacity - Actuators - Basic robot motions - Point to point control - Continuous path control.

UNIT - II Kinematics of Robot:

Basic control system concepts – control system analysis – robot actuation and feed back,Manipulators – direct and inverse kinematics – the Denavit-Hartenberg Transformation Method – Coordinate transformation.

UNIT - III Classification of Robot End Effectors:

End effectors. Types of Robot end effectors – Grippers, tools as end effectors – End effectors interfacing. Automated Manufacturing Work Cell – Concepts and Design.

UNIT - IV Sensor & Machine Vision:

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing - Image processing and analysis. Encoders - tachometers.

UNIT - V Robot Application:

Application and characteristics of robots in machining - Welding - Assembly - Material handling -Loading and unloading – spray painting - inspection – forging -medical surgery - CIM.

TEXT BOOKS :

1. Spong M. and Vidyasagar M., “Robot Dynamics and Control”, 2nd ed., John Wiley & Sons, 2008.
2. Mikell P. Groover, Mitchell Weiss, “Industrial Robotics, Technology, Programming and Applications”, 2nd ed., Mc.Graw Hill International, 2008.

REFERENCE BOOKS :

1. K.S. Fu., R.C.Gonalez and C.S.G.Lee, “Robotics Control sensing, Vision and Intelligence”, 1st ed., McGraw Hill International, 2nd reprint 2008.
2. R.K. Mittal & I.J.Nagrath, “Robotics and Control”, 2nd ed., Tata McGraw Hill, 6th reprint 2007.
3. Saeed B.Niku, “Introduction to Robotics Analysis, Systems, Applications”, 2nd ed., PHI Learning Publication, 2009.
4. S.K. Saha, “Introduction to Robotics”, 2nd ed., Tata McGraw Hill, 2009.

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	3	1	-	4	4

ME425   REFRIGERATION AND AIR CONDITIONING

Course Description & Objective:

To introduce history, importance and components of mechanical engineering, concepts of unit operations and unit processes, and current scenario of refrigerants & industrial applications.

Course Outcomes: *.*

1. *Upon successful completion of this course, the student will be able to*
2. *Understand the difference between refrigeration and air conditioning*
3. *Describe the two methods of lowering the temperature of material*
4. *Identifying and describe the three methods of heat transfer*
5. *Understand what kind of refrigeration systems are available*
6. *Understand what kind of air refrigeration systems are available*
7. *Understand what kind of vapor refrigeration systems are available*
8. *Understand what causes matter to change its state*

UNIT - I Air Refrigeration Systems:

Introduction to Refrigeration - Unit of refrigeration,Reversed Carnot Cycle, Bell-Coleman refrigeration system

Air Refrigeration: Actual air refrigeration system - Refrigeration needs of Aircrafts - Adoption of Air refrigeration, Justification - Types of air refrigeration systems - Problems.

Refrigerants: Desirable and undesirable properties - Common refrigerants used - Nomenclature.

UNIT - II Vapour Compression Refrigeration System:

Vapour Compression System. Wet Compression, Dry Compression, Superheated Compression Representation of cycle on T-S, P-H and H-S charts - effect of subcooling and super heating - cycle analysis - Actual Cycle, Influence of various parameters on system performance - use of P-H charts - Problems

System Components: Compressors - General classification - comparison - Advantages and disadvantages.Condensors - Classification - Working. Evaporators - Classification - Working. Expansion Devices - Types -Working.

UNIT - III KVapour Absorption Refrigeration System:

Basic vapour absorption system. Ammonia absorption system,Electrolux refrigeration system Li - Br system, Calculation of COP. Principle and Operation of (i) Steam Jet Refrigeration System, (ii) Thermoelectric Refrigeration and (iii) Vortex tube or Hilsch tube.

UNIT - IV Psychrometry:

Psychrometric Properties and Processes, Need for Ventilation, Infiltration, Concepts of RSHF,ASHF, ESHF and ADP. Concept of human comfort and effective temperature, comfort Air conditioning,Industrial Air conditioning and Requirements.

UNIT - V Equipment of Air-Conditioning Systems:

Air cleaning and filters, Humidifiers and dehumidifiers, Fans and Blowers, Grills and Registers. Heat pump, different heat pump circuits - Application.Air conditioning Load Calculations.

TEXT BOOKS:

1. S.C. Arora & Domkundwar, “A Course in Refrigeration and Air Conditioning”, 2nd ed., Dhanpatrai & Sons, 2009.
2. Dossat, “Principles of Refrigerations”, 2nd ed., Wiley Eastern, 2006.

REFERENCE BOOKS:

1. Manohar Prasad, "Refrigeration and Air Conditioning", 3rd ed., New Age, 2015.
2. C.P. Arora, "Refrigeration and Air Conditioning", 3rd ed., Tata McGraw Hill 2009.

Data Book: C.P.Kodandaraman, "Refrigeration and Air Conditioning", 2nd ed., New Age, 2010.

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	4	0	-	4	4

MS310 MANAGERIAL ECONOMICS

Course Description & Objectives:

To make the student familiar with the basic concepts and principles of Business Economics. The course aims to develop student's capacity to analyze the economic environment in which business entities operate and understand how managerial decisions can vary under different constraints that each economic environment places on a manager's pursuit of it's goals, focusing on analyzing the functioning of markets and the economic behavior of firms and other economic agents.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. *Understand nature and scope of managerial economics and its application in managerial decision making*
2. *Demand determinants, elasticity of demand and demand forecasting methods for marketing planning.*
3. *Theory of production, law of variable proportions and returns to scale*
4. *Cost analysis and cost output relationship*
5. *Types of markets and price determination*

UNIT – I Introduction to Managerial Economics:

Nature & Scope of Managerial Economics**- Basic tools and techniques of Business Economics, Macro Economic Environment and Managerial decisions.**

UNIT – II Demand analysis:

Types of Demand, Demand determination Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT – III Theory of Production:
Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors,Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT – IV Cost Analysis:
Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis.

UNIT-V Markets and price determination:
Features and types of different competitive situations – Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

Text Books:

1. Gupta: Managerial Economics, 1/e TMH, 2005.
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010.

Reference Books:

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006.
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004.

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ME427 AUTOMOBILE ENGINEERING

(Dept. Elective - III)

Course Description & Objectives:

The objective of Automobile Engineering is to develop and understand the principles of conversion in design, construction and working of mechanical systems. Graduates will be equipped to solve multi-disciplinary problems and will be part of future developments in industries. It is anticipated that graduates from the course will play a major/lead role in design, management and coordination of multi-disciplinary projects. The scope of this program is to impart knowledge to graduating students on the basics of automobiles, understanding of mechanical analysis and design. To provide students with sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, analyze and solve engineering problems and to prepare them for higher studies and for successful careers in automobile industry.

Course Outcomes:

1. *An ability to communicate effectively.*
2. *An ability to identify, formulates, and solves engineering problems.*
3. *Apply knowledge of science, math, statistics, and engineering technology to solve problems encountered in a professional career in the automotive industry.*
4. *Graduates will be familiar with modern engineering software tools and equipment to analyze automotive engineering problems.*
5. *Graduates will be broadly educated and will have an understanding of the impact of engineering on society and demonstrate awareness of contemporary issues.*

UNIT - I Introduction to an Automobile:

Components of four wheeler automobile, chassis, frame, body, engine, cylinder block and crankcase, cylinder head, liners – pistons, connecting rod – engine valves – valve mechanisms.

UNIT - II SI Engine Fuel Supply System:

Types – fuel pumps – carburettors – functions – mixture strength, simple carburettor – defects and remedies – typical carburettors - Solex carburettor, Zenith Carburettor.

CI engine fuel supply system- functional requirements of an injection system – methods of injection – fuel injection pumps – fuel injector – spray formation.

UNIT - III Engine Lubrication:

Objectives of lubrication –requirements of lubricants- Types of lubrication systems– oil pumps and filters.

Cooling system : Objectives of Cooling – methods of cooling – components of air and water cooling systems – radiators.

UNIT - IV Ignition Systems:

Requirements of an ignition system – types of ignition system – battery ignition system, magneto ignition system and electronic ignition system - Ignition advance methods - Spark plug.

Starting system – starting motor – bendex drive – solenoid switch.

UNIT - V Transmission System:

Requirements of transmission system – principle of clutch- types of clutches- cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches. Gear boxes- Need of gear box- types- sliding mesh, constant mesh, synchro mesh epicyclic type gear box. propeller shaft , Hotch kiss drive, differential and rear axles.

TEXT BOOKS :

1. Heitner, "Automobile Engineering", 2nd Edition, IPC Transport Press Ltd., 2010.
2. Dr. Kirpal Singh, "Automobile Engineering", Volume - 1 & 2, 9th Edition, Standard Publishers Distributors, 2009.

REFERENCE BOOKS :

1. K.R. Govindan, "Automobile Engineering", 1st Edition, Anuradha Publications, 2005.
2. R.K. Rajput, "Automobile Engineering", 1st Edition, Lakshmi Publications, 2007.

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ME429 POWER PLANT ENGINEERING

Course Description & Objectives:

Understand the sources of energy and their contributions to the energy and power needs of the nation and the world. Know percentages and have understanding for magnitudes of energy and resources used. Describe sources of energy and types of power plants. List different types of fuels used in power plants and estimate their heating values. List types, principles of operations, components and applications of steam turbines, steam Generators, condensers, feed water and circulating water systems.

Course Outcomes:

The expected learning outcomes are that the student will be able to:

1. *Describe sources of energy and type of power plants.*
2. *Should be able to understand the machines and accessories used in thermal power plant.*
3. *Describe basic working principle of Gas turbine and Diesel engine power plant.*
4. *List the principle components and type of nuclear reactors.*
5. *Define terms and factors associated with power plant economics. Calculate present worth depreciation and const of different types of power plants. Estimate the cost of power production per kW.*

UNIT - I Introduction:
Various Energy Sources, types of power plants.

Thermal Power Plant : General Plant Layout, Working of Different circuits, types of coals, coal analysis, coal and ash handling systems. Burning of coal, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cooling towers and ponds.

UNIT - II Diesel Power Plant:

Introduction, field of use - Plant layout with auxiliaries - fuel supply system, air starting equipment, lubrication and cooling system - super charging.

Gas Turbine Plant : Introduction - classification - Layout with auxiliaries - Principles of working of closed and open cycle gas turbines.

UNIT - III Hydrao Electric Power Plant:

Hydrology, Rainfall, Run off and their measurement, hydrograph, Flow duration curve, Mass curve and calculation of storage capacity, site selection of hydro plant, different types of hydro plants.

Power from Non-conventional Sources: Solar Energy : Solar cells, solar energy storage, solar ponds, solar energy utilization and applications.

Wind Power : Basic principle, different types of wind mills, wind energy conversion systems, applications.

UNIT - IV Nuclear Power Plants:

Nuclear Fission, Nuclear Fuels, Components of Reactor, Types of Reactors - Pressurized water reactor, boiling water reactor, fast Breeder reactor, Homogeneous reactor, Gas cooled reactor, Radiation Hazards and shielding - radioactive waste disposal.

UNIT - V Power Plant Economics:

Fixed costs, operating costs, cost per kwh, comparison of fixed and operating costs of hydro, thermal, nuclear plants, power tariffs.

Pollution Control : Introduction, Particulate and gaseous pollutants, thermal pollution and solid waste pollution, methods to control pollution, brief description.

TEXT BOOKS :

1. Mohammad El Wakil, “Power Plant Technology”, 2nd ed., Mc Graw-Hill, 2010.
2. R.K. Rajput, “Power Plant Engineering”, 3rd ed., Lakshmi Publication, 2008.

REFERENCE BOOKS :

1. P.K. Nag, "Power Plant Engineering", 3rd ed., Tata McGraw-Hill, 2014.
2. Arora and S.Domkundwar, "A Course in Power Plant Engineering", 1st ed., Dhanpat Roy & Sons,2013.
3. G.D. Rai, "An Introduction to Power Plant Technology", 3rd ed., Khanna Publishers, 2013.

IV Year B.Tech. Mechanical Engg. I-Semester

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ME431 NON DESTRUCTIVE TESTING

Course Description & Objective:

To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications

Course Outcome:

Upon completion of this course, the students can able to use the various Non Destructive Testing and Testing methods understand for defects and characterization of industrial components

UNIT-I Introduction to NDT:

NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection

UNIT-II Liquid Penetrant Testing:

Principles - types and properties of liquid penetrants - developers - advantages and limitations of various methods - Control and measurement of penetrant process variables - Limitation and Applications

UNIT-III Magnetic Particle Testing:

Theory of magnetism - ferromagnetic, Paramagnetic materials - advantages - Circular magnetisation techniques, Limitation and Applications

UNIT-IV Ultrasonic Inspection Methods:

Equipment/Materials: Principle of pulse echo method, through transmission method, resonance method - Advantages, limitations - Focussing Techniques (SAFT), Time of Flight Diffraction (TOFD), Signal Analysis. Capabilities, Limitation and Applications

UNIT-V Radiography:
Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films – graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence,applications.

TEXT BOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu ¡§Practical Non-Destructive Testing¡¨, Narosa Publishing House, 2009.
2. Ravi Prakash, ¡§Non-Destructive Testing Techniques¡¨, 1st revised edition, New Age International Publishers, 2010

REFERENCE BOOKS:

1. American Metals Society, “Non-Destructive Examination and Quality Contro!”, Metals Hand Book, Vol. I 7, 9th Ed, Metals Park, OH, 1989.
2. Krautkramer, Josef and Hebert Krautkramer, “Ultrasonic Testing of Materials”, 3rd Ed, Newyork, Springer- verlag, 1983.
3. A. Goswami, “Thin film fundamentals”, New age international (P) Ltd. Publishers, New Delhi, 1996.
4. Birchan, D, “Non Destructive Testing”, Oxford University Press, 1977.

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	4	0	-	4	4

ME433 NANO TECHNOLOGY
(Dept. Elective - IV)

Course Description & Objectives:

This course is intended to develop interest among the students in the area of nano technology and to initiate research inclination and also brings together relevant knowledge from the disciplines of material science, physics and chemistry to give students a fundamental understanding of the integrated multidisciplinary nature of Nanotechnology.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. *understand how basic nanosystems work;*
2. *have a sound grounding and expert knowledge in multidisciplinary areas of nanoscience*
3. *use physical reasoning to develop simple nanoscale models to interpret the behavior of such physical systems*

4. *analyse and critically evaluate ideas/information/data and apply relevant scientific principles to solve problems by, for example, creating hypotheses, testing theories and predictions, designing and carrying out experiments and analysing reported data*
5. *be prepared to work in a high tech work force or pursue a research higher degree in nanotechnology*

UNIT - I Genesis of Nano Technology :

Introduction - Nano Science - Nano technology - Nano materials - Scope of applications - topics from nature - Basic principles of Nano science and technology - Basics of quantum mechanics - Quantum Nano structures.

UNIT - II Fabrication of nano Materials:

Introduction - Nano materials - Properties of Nano materials - Techniques used in Nano technology - Top - Down approach - Bottoms-up approach - Tools used in Nano technology - Electron Micro Scope - Atomic Force Microscope (AFM). Synthesis of Nano materials.

UNIT - III Carbon Nano Tubes(CNT):

Introduction - Preparation - Properties - Classification - Fullerens - Applications of Carbon Nano Tubes.

UNIT - IV Domain Application of Nano Technology:

Introduction - Applications of Nano technology - Environment and Energy - Textiles - Agriculture - Electronics & Communication - Computers - Medicine - Space technology.

UNIT - V Projected use & Implications of Nano Technology:

Introduction - Assessment of opportunities - Bottlenecks in implementation of Nano technology - Exploration and Economical concerns of Nano technology - Current research activity.

TEXT BOOKS :

1. Mark Ratner, "Nano technology", 3rd ed., Pearson Education, 2008.
2. Manasi Karkare, "Nano Technology Fundamentals and Applications", 1st ed., I.K. International Publishing House, 2008.

REFERENCE BOOKS :

1. T. Pradeep, "Nano The Essentials", 3rd ed., McGraw-Hill Education, 2009.
2. A.K. Badyopadhyay, "Nano Materials", 1st ed., New age International Publications, 2009.

IV Year B.Tech. Mechanical Engg. I-Semester

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ME435 AUTOMATION IN MANUFACTURING

Course Description & Objective:

To expose the students in the area of automation followed by industries for material handling, storage, automated flow lines, and line balancing systems. To familiarize the methodologies followed for line balancing and verity of automated guided vehicles and other systems. To give the awareness on standard circuit systems followed by industries in the case of pneumatic and hydraulic systems.

Course Outcomes:

1. *Students will understood the automation technology, and its importance in manufacturing process.*
2. *Students gain the knowledge in hydraulic and pneumatic circuits followed in industries.*
3. *Students gain the knowledge on transports system used in industries and its working principle.*
4. *Students will understood, the importance of buffer storage and familiarize its design concept.*
5. *Students will understood the line balancing concept followed in industries and its need.*

UNIT – I Introduction:

Types and strategies of automation, pneumatic and hydraulic components and circuits. Automation in machine tools, Mechanical feeding systems and machine tool control systems.

UNIT – II Automated Flow Lines:

Methods of work part transport, Mechanical buffer storage control function, design and fabrication considerations.

Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation and implementation aspects.

UNIT – III Assembly Line Balancing:

Assembly process and systems, assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – IV Automated Material Handling:

Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems. Automated storage and retrieval systems; work in process storage, interfacing of handling and storage with manufacturing.

UNIT – V Adaptive Control Systems:

Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, Temperatures,
vibration and acoustic emission.

TEXT BOOKS :

1. M.P. Groover, "Automation, Production Systems and Computer Integrated Manufacturing", 3rd ed., PHI Publications, 2008.
2. Radhakrishnan, "CAD / CAM/ CIM" 3rd ed., Newage Publications, 2009.

REFERENCE BOOKS :

1. Yoram Koren, "Computer control of Manufacturing Systems", 2nd ed., McGraw Hill Publications, 2005.
2. W. Buekinsham, "Automation", 3rd ed., PHI Publications, 2011.

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CS223 OBJECT ORIENTED PROGRAMMING

Course Description & Objectives:

On Completion of this course, the student will be able to understand fundamentals of object- oriented programming in Java, including defining classes, invoking methods, using class libraries. Have the ability to write a computer program to solve specified problems. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

The student is expected to have

1. *Understanding of OOP concepts and basics of java programming (Console and GUI based)*
2. *The skills to apply OOP and Java programming in problem solving*
3. *Should have the ability to extend his knowledge of Java programming further on his/her own.*

UNIT - I Introduction, Classes and Objects:
Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects Class fundamentals – Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT - II Inheritance, Packages and Interfaces:
Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces.

UNIT - III Exception Handling, Multithreading:
Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating own exception Sub classes, Concepts of Multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, deadlocks, Thread groups.

UNIT - IV Applets:
Applet Class, Applet Architecture, Applet Skeleton - Applet Initialization and Termination, Overriding update(), Simple Applet, Display Methods, Requesting Repainting - A simple banner Applet, Using The Status Window, The HTML APPLET Tag, Passing parameters to Applets, Applet Context and show Document.

Event Handling & AWT Controls: Event sources, Event classes – ActionEvent, AdjustmentEvent, ComponentEvent, Container Event, Focus Event, InputEvent, ItemEvent, KeyEvent and MouseEvent, Delegation event model, Event Listeners, Handling mouse and Keyboard events, Adapter classes.

UNIT - V AWT:
Concepts of components, Container, Panel, Window, Frame, Canvas, Font class, Color class and Graphics. AWT Controls : Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers - Flow, Border, Grid, Card and Grid bag.

Swing: JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, Text fields, Buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Herbert Schildt, “The Complete Reference Java J2SE”, 7th ed., TMH Publishing Company Ltd, New Delhi, 2008.
2. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd ed., TMH, 2009.

REFERENCE BOOKS:

1. Cay Horstmann, “Big Java”, 2nd ed., John Wiley and Sons, 2006.

IV Year B.Tech. Mechanical Engg. I-Semester	L	T	P	To	C
	-	-	3	3	2

ME437 MECHANISMS & MACHINE DYNAMICS LAB

Course Description & Objectives:

To provide basic knowledge in the working of various mechanisms through practical experiments. It also provides real hands on experience with the detailed functional requirements of various components in a machine.

Course Outcomes:

1. *Mechanisms form the basis of any machine and it is an assemblage of rigid bodies so that they move upon each other with definite relative motion.*
2. *With the study of rigid bodies motions and forces for the transmission systems, machine kinematics and dynamics can be well understood.*

List of Experiments :

1. Static Balancing of rotating masses.
2. Dynamic balancing of rotating masses.
3. Determination of gyroscopic couple.
4. Determination of natural frequency of vibrating system, damped frequency and effect of viscosity on damping.
5. Analysis of forced vibration
6. Study of Mechanisms involved in leg operated air pump.
7. Study of Mechanisms involved in sewing machine.
8. Study of Mechanisms involved in tail stock.
9. Study of Automobile differential mechanism
10. Study of Brake system in two wheeler and four wheeler
11. Study of Clutch system in Automobile

12. Study of fertilizer sprayer.
13. Study of pantograph mechanism.

IV Year B.Tech. Mechanical Engg. I-Semester

L	T	P	To	C
-	-	3	3	2

ME439 HEAT TRANSFER LAB

Course Description & Objective:

Through this course, students will study about the various heat transfer processes, so as to train the students practically to utilize this knowledge in industry.

Course Outcomes:

1. *Should be able to distinguish between the usage of heat transfer correlations to be applied for transient and steady state heat transfer analysis*
2. *Understand the means of accelerating the achievement of steady state in the given forced convection setup by varying the heat input, the duration of heating, the instant at which we start the fan etc.,*
3. *Distinguish between the radiation, convection and conduction practically and be able to apply empirical correlations according to the experimental conditions*
4. *Able to analyze the performance of a heat exchanger in co-current and counter current mode*

List of Experiments

1. Composite Slab Apparatus - To calculate overall heat transfer co-efficient.
2. Heat Transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere.
4. Thermal Conductivity of given metal rod.
5. Heat transfer through pin-fin
6. Experiment on Transient Heat Conduction.
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection.
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Shell and tube heat exchanger.

Note : A minimum of total 12 Experiments to be completed by a student.

IV Year B.Tech. Mechanical Engg. I-Semester

L	T	P	To	C
-	-	3	3	2

ME441 HYDRAULICS & PNEUMATICS LAB

Course Description & Objectives:

This lab provides the student with the basic knowledge concerned with the function, processes, and applications of the hydraulic and Pneumatic, electro pneumatic components. The student should recognize to the important hydraulic and pneumatic components and their functions in the simple systems. Also, the students should know the devices used in generating the hydraulic and pneumatic power and how to transmit and control energy.
The student should be able to know the theory of operation, structure and the symbols of the following:
Elements of energy conversion in hydraulic systems (Pumps). Elements energy conversion in pneumatic systems (Compressors). Hydraulic, pneumatic, electro pneumatic actuators. Hydraulic and pneumatic control elements (valves).

Course Outcomes:

After the completion of this laboratory course, the student is able to understand energy conservations in Hydraulic, pneumatic, electro pneumatic systems and also make the devices used in generating the hydraulic and pneumatic power and how to transmit and control energy.

LIST OF EXPERIMENTS

1 Introduction to the hydraulic work benches and lab equipments.
2 Principles of hydraulic systems, power and control circuits, cavitations.
3 Introduction to the pneumatic work benches and lab equipments.
4 Basic pneumatic circuits.
5 Speed control and feedback and timers.
6 Advance pneumatic circuits.
7 Introduction to the electrical work benches and lab equipments.
8 Basic electrical switching circuits.
9 Relay and timer circuits.
10 Electro pneumatic circuits.

IV Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
4	0	-	4	4

ME420 TOTAL QUALITY MANAGEMENT

(Dept. Elective - V)

Course Description & Objectives:

To understand the Total Quality Management concepts, principles and the various tools available to achieve Total Quality Management. To understand the statistical approach for quality control. To create an awareness about the ISO and QS certification process and its need for the industries.

Course Outcomes:

Upon completion of the subject, students will be able to

1. *select and apply appropriate techniques in identifying customer needs, as well as the quality impact that will be used as inputs in TQM methodologies;*
2. *measure the cost of poor quality and process effectiveness and efficiency to track performance quality and to identify areas for improvement;*
3. *understand proven methodologies to enhance management processes, such as benchmarking and business process reengineering;*
4. *Choose a framework to evaluate the performance excellence of an organization, and determine the set of performance indicators that will align people with the objectives of the organization.*

UNIT - I Introduction:

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Deming Philosophy, Barriers to TQM Implementation.

UNIT - II TQM Principles:

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supply Chain Management. Concepts in Performance Measures of Quality.

UNIT - III Statistical Process Control (SPC):

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma.

UNIT - IV TQM Tools:
Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT - V Quality Systems:
Need for ISO 9000 and Other Quality Systems, ISO 9000:20XX Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 14000 – Concept, Requirements and Benefits.

TEXT BOOKS :

1. Dale H.Besterfiled, "Total Quality Management", 2nd ed., Pearson Education, 2011.
2. James R.Evans & William M.Lidsay, "The Management and Control of Quality", 5th ed., South-Western Publication, 2010.

REFERENCES BOOKS :

1. Feigenbaum.A.V. "Total Quality Management", 2nd ed., McGraw-Hill, 2003.
2. Oakland.J.S. "Total Quality Management", 1st ed., Butterworth Hcinemann Ltd., Oxford, 2005.
3. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", 2nd ed., New Age International, 2000.
4. Zeiri. "Total Quality Management for Engineers", 1st ed., Wood Head Publishers, 1998.

IV Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	4	0	-	4	4

ME422 UNCONVENTIONAL MANUFACTURING PROCESSES

Course Description & Objectives:
Advanced technology demands new materials with high strength and hardness for the sophisticated products with long life and reliability. Existing conventional manufacturing techniques of traditional machining and forming are unable to cater these materials. Non contact type machining, modern machining techniques using laser beam, electron beam and water jet

machining and its process parameters study is focused. New techniques to develop the product using Rapid prototyping is emphasized.

Course Outcomes:

1. *Water jet, abrasive jet machining techniques and Ultrasonic and plasma arc machining application to high end materials machining*
2. *Electrical and laser techniques like EDM, EBM and LBM and its process parameter study*
3. *Welding techniques and its characteristics using Plasma , Laser and electron beam methods*
4. *Advanced techniques of forming like explosive , electro hydraulic and magnetic forming and extrusion and rolling techniques using non contact type methods.*
5. *Product design and development advanced techniques of Rapid prototyping by various techniques exposure.*

UNIT - I Unconventional Machining Processes:

Introduction to unconventional machining Processes - classification - Abrasive jet machining, ultra sonic machining process. Plasma Arc Machining - Working principle, Equipment and Characteristics. Water Jet Machining, Abrasive Water Jet Machining.

UNIT - II EDM, ECM & LBM :

EDM Circuits, Electric discharge wire cutting, Electron Beam Machining. Electrochemical Machining - Process, Principle, Equipment, Mechanism and Applications. Introduction to laser, production of laser and laser Beam Machining.

UNIT - III Uniconventional Welding Processes:

Laser Beam Welding, Electron Beam Welding, Ultra-Sonic Welding,Plasma Arc Welding, Explosive Welding, Under Water Welding, Micro Welding Processes, Friction stir welding.

UNIT - IV Unconventional Forming Processes:

Explosive forming, Electro hydraulic forming, Electro magnetic forming, Laser Bending, Powder rolling, Spray rolling, Hydro forming, Hydrostatic and Powder extrusion, rotary and isothermal forming.

UNIT - V Rapid Prototyping:

Definition, types of prototypes, Classification of Rapid Prototyping systems. Stereolithography System, Selective laser sintering, Solid ground curing, Laminated object manufacturing.

TEXT BOOKS:

1. Benedict G.F., “Non Traditional Manufacturing Processes”, 1st ed., Marcel Dekker Publication, 1987.
2. V.K.Jain, “Advanced Machining Processes”, 2nd ed., Allied Publisher Bombay, 2010.
3. Amitabha Ghosh, “Rapid Prototyping; A brief Introduction”, 1st ed., East West Publishers, 2006.

REFERENCE BOOKS:

1. Hassan, E.L.-HOFY, ”Advanced Machining Process - Nontraditional & Hybrid Machining Process”, 1st ed., Tata Mc Graw Hill, 2005.
2. P.C.Pandey, “Modern Machining Processes”, 1st ed.,Tata Mc Graw Hill, New Delhi, 2009.
3. Ghosh and Malik, “Manufacturing Science”, 1st ed., EWP Private Ltd., 2008.

IV Year B.Tech. Mechanical Engg. II-Semester	**L**	**T**	**P**	**To**	**C**
	4	-	-	4	4

ME424 NON-CONVENTIONAL SOURCES OF ENERGY

Course Description & Objective:

This course is aimed to introduce the fundamentals concerned with alternative ways of producing power. It also enables the importance of future energy demand.

Course Outcomes:

1. To know the energy demand of world, nation and available resources to full fill the demand.
2. To know about the conventional energy resources and their effective utilization.
3. To acquire the knowledge of modern energy conversion technologies.
4. To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively.

UNIT – I Principles of Solar Radiation:

Role and potential of new and renewable energy sources. Environmental impact of solar energy, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT – II Solar Energy Collection, Storage and Applications:
Flat plate and concentrating collectors; classification of concentrating collectors, their orientation and thermal analysis. Brief on advanced collectors. Different methods of storage - Sensible, latent heat, stratified and solar ponds. Solar Applications- solar heating and cooling techniques, solar distillation and drying, photovoltaic energy conversion.

UNIT - III Wind Energy:

Sources and potential, horizontal and vertical axis windmills, performance characteristics, Betz criteria.
Bio-mass Energy : Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT - IV Geothermal Energy & Ocean Energy:
Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT - V Direct Energy Conversion:
Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seeback, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, Faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Tiwari and Ghosal, "Renewable energy resources", 1st ed., Narosa Publications, 2007.
2. G.D. Rai, "Non-Conventional Energy Sources", 2nd ed., Standards Publishers, 2004.

REFERENCE BOOKS :

1. Sukhatme, "Solar Energy", 3rd ed., Tata Mc Graw Hill, 2008.
2. Ashok V Desai, "Non-Conventional Energy", 2nd ed., New Age International, 2008.
3. B.H. Khan, "Non Conventional Energy Sources", 1st ed., Tata Mc Graw Hill, 2009.

IV Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
3	1	-	4	4

ME426 OPERATIONS MANAGEMENT

(Dept. Elective - VI)

Course Description & Objectives:

To understand the concept of various types of manufacturing systems, productivity concept and various types of layouts Emphasize the importance of Production planning and control parameters in manufacturing organizations Be aware of the demand forecasting importance and its various qualitative and quantitative methods. To understand the concept of Capacity planning, Aggregate planning and assembly line balancing. To understand the concept of inventory, classification of inventory and reasons for keeping inventory. Also understand about what the economic order quantity is and how to calculate it. To understand the concept of Automation and its types, Group Technology cells and the concept of MRP-I, MRP-II

Course Outcomes:

Upon course completion, the students will be able to:

1. *To gain an understanding and appreciation of the principles and applications relevant to the planning, design, and operations of manufacturing/service firms.*
2. *To develop skills necessary to effectively analyze and synthesize the many inter-relationships inherent in complex socio-economic productive systems.*
3. *To reinforce analytical skills already learned, and build on these skills to further increase your "portfolio" of useful analytical tools for operations tasks.*
4. *To gain some ability to recognize situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making on operations management and strategy.*
5. *To understand how Enterprise Resource Planning and MRPII systems are used in managing operations*

UNIT – I Introduction to Operations Management:

Production Definition - Types of production systems-Job order, Batch & continuous. Productivity - Definition, Measurement, Factors affecting productivity. Plant layout - Definition, Objectives, Factors Influencing Plant layout. Types of plant layouts - Product, Process, Fixed Position, Combination. Functions of production planning and control.

UNIT - II Planning for Production:

MRP - Definition, Objectives, System, Simple calculations. Demand forecasting techniques - (i.e., least square method, moving average method, Exponential smoothing method).

Single Machine Scheduling: Priority rules - SPT, EDD, FCFS. Terminology - Completion time, Flow time, Tardiness, Lateness, Mean Completion Time, Mean Tardiness. Simple Problems.

UNIT - III Inventory Management:

Inventory management - Functions of inventories - relevant inventory costs - ABC analysis - VED analysis - EOQ model (Purchase and production models without shortages) - Singe and multiple Price breaks without shortages-Simple problems on above concepts.

UNIT - IV Automation:

Definition, Applications, Advantages, Disadvantages.Types of automation - Fixed, Programmable, Flexible. Design of GT cells formation using ROC Algorithms - Clasification of control systems.

UNIT - V Line Balancing:

Definition, Terminology, Line balancing techniques (Rank positional weightage method), Problems on line balancing. Aggregate planning - Definition, Pure Stratagies, Formulation of Aggregate planning problem as a Transportation problem.

TEXT BOOKS :

1. Joseph Monks, “Operations Management”, 3rd ed., Tata Mc Graw Hill, 2005.
2. S.N. Chary, “Production & Operations Management”, 4th ed., Tata Mc Graw Hill, 2009.

REFERENCES BOOKS :

1. R. Panner Selvam, “Production & Operations Management”, 2nd ed., Prentice Hall of India, 2009.
2. Martand Telsang, “Industrial Engineering and Production Management”, 2nd ed., S.Chand & Co. Ltd., 2009.
3. Samuel Eilon, “Elements of Production Planning and Conrol”, 1st ed., Universal Book Publishers, 2004.

IV Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	4	0	-	4	4

EE319 LINEAR CONTROL SYSTEMS

(Interdisciplinary Subject)

Course Description & Objectives:

This course is to explore the modeling of linear dynamic systems via differential equations and transfer functions utilizing input-output representations; analysis of control systems in the time and frequency domains and using transfer function and state-space methods

Course Outcomes:

1. *Able to formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs*
2. *Able to analyze the words Transient & Steady State Performance of a system.*
3. *Able to understand the stability of an Electrical, Electronics and other physical systems*
4. *Able to Design controllers, compensators and control systems*

UNIT - I Introduction:

Concepts of Control Systems - Open Loop and closed loop control systems and their differences - Different examples of control systems - Clasification of control systems.

Mathematical Models of Physical Systems : Differentical equations - transfer functions and block diagram representation of systems considering electrical systems as examples Block diagram algebra -Representation by Signal flow graph - reduction using Mason’s gain formula - translational and rotational mechanical systems.

UNIT - II Feed-Back Characteristics:

What is Feedback? Effects of feedback - reduction of parameter variations by use of feedback-Control over system dynamics - by the use of feedback.

Elements of Control Systems : DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

UNIT - III Time Response Analysis:

Standard test signals - Time response of first order systems - Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications - Steady state response - Steady state errors and error constant

Concepts of stability : The concept of stability, Routh stability criterion

UNIT - IV Root Locus Technique:

The root locus concept - construction of root loci

Frequency Response Analysis : Introduction, Frequency domain specifications - Bode diagrams - Determination of Frequency domain specifications from the Bode Diagram - Phase margin

and Gain margin - Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots and Nyquist stability criterion

UNIT - V Design and Compensation Technique:

Introduction and Preliminary design considerations - Lead, Lag, Lead-lag. PID controller.

State Space Analysis of Continuous Systems : Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization - Solving the Time Invariant state Equations - State Transition Matrix.

TEXT BOOKS :

1. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, 2nd ed., New Age International (P) Limited, 2010.
2. Katsuhiko Ogata, “Modern Control Engineering”, 3rd ed.,Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS :

1. B. C. Kuo, “Automatic Control Systems”, 8th ed., John wiley and son’s, 2003.
2. John wiley, “Control Systems Engg”., 3rd ed., NISE, 2000.

IV Year B.Tech. Mechanical Engg. II-Semester

L	T	P	To	C
4	0	-	4	4

EE321 DIGITAL ELECTRONICS CIRCUITS

(Interdisciplinary Subject)

Course Description & Objectives:

As part of this course, students:
To introduce the concepts and techniques associated with the number systems and codes. To minimize the logical expressions using Boolean postulates. To design various combinational and sequential circuits. To provide with an Sufficient Number of applications for the techniques and mathematics used in this course.

Course Outcomes:

Upon successful completion of this course, students should be able to:

1. *Determine the philosophy of number systems and codes.*
2. *Simplify the logic expressions using Boolean laws and postulates and design them by using logic gates.*
3. *Minimize the logic expressions using map method and tabular method.*
4. *Design of combinational logic circuits using conventional gates.*
5. *Design of sequential logic circuits.*
6. *Knowledge of the nomenclature and technology in the area of memory devices: ROM, RAM, PROM and logic families like CMOS and TTL.*

UNIT-1 Number System:

Binary arithmetic (Addition, subtraction, multiplication, division), octal number system, hexadecimal number system, 1's and 2's complement. Signed numbers, EX-3, gray code alphanumeric code, EBCDIC, ASCII,, Error detection & correction, parity, 7- bit hamming

UNIT-II Logic gates and Minimization:

Basic gates, Universal gates, and their truth tables, postulates of Boolean algebra, De-Morgan's theorem
Min term and Max term representation of logical function, Minimization using K-map- Don't care condition, Quinn Mc-clusky method for minimization

UNIT-III Combinational Logic

half and full adders, parallel adder, subs tractor, decoder (BCD to Seven segment), Encoder, Multiplexer, Demultiplexer, parity generation & checking, Look ahead carry generator

UNIT-IV Sequential Logic:
Sequential circuits, flip-flops (SR,D,T, JK, Master-slave), timing specifications, asynchronous and synchronous counters-up/down counters. Registers , serial in serial out shift registers.

UNIT-V Memory:
RAM, ROM,PROM, EPROM and Flash memory, Introduction to Cache memory Logic Families: Logic levels, propagation delay time, power dissipation fan-out and fan-in, noise margin, Comparison of logic families and their characteristics. TTL (NAND, NOT, TOTEMPOLE), CMOS (NOR,NOT and NAND) integrated circuits .

Textbooks

1. Thomas. L.Floyd, “Digital fundamentals”,9th ed, Prentice Hall,2005
2. ZVI KOHAVI, “ Switching and Finite Automata Theory”,2nd ed. TMH,2009

References:

1. John M. Yarbrough, “Digital Logic Applications and Design”,1st ed.,Thomson Publications, 2006.
2. Fletcher, “An Engineering Approach To Digital Design” , 1st ed.,Prentice Hall of India. 2009.
3. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
4. D. Roy Chowdhury, “Linear Integrated Circuits”, 2nd ed., New Age International(p)Ltd, , 2003
5. Morris Mano, “Digital Logic & computer Deisgn”,1st ed,Pearson
6. John F walkerly, Digital Design Principles and Practices, 3rd ed., PHI/ Pearson Education, 2005.

IV Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
	-	-	10	10	10

ME428 PROJECT

B.Tech Project - II

The evaluation details of Project - II are given in section 4.3 in Rules and Regulations.

I

YEAR

AUTOMOBILE ENGINEERING

B.Tech.

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16CH104 - Materials Science and Technology
- 16ME102 - Engineering Mechanics
- 16ME103 - Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L-9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L-9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L-9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L-9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L-9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.
11. Solving first order O.D.E.
12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fiber which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

- ✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*
- ✓ *Study the wavelengths of light sources and lasers.*
- ✓ *Estimate the efficiency of a given solar cell.*
- ✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*
- ✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non- linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt. Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to:

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**

  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory

  Practice : Introduction to phonetics (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory
  Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory
  Practice : Situational conversations – Role - Plays (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit)) Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs

  Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

(from Energy Unit) Summarizing, Text on “Flight from conversation” (New York Times)

- Laboratory Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**
  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 “Mindscapes - English for Technologists and Engineers”, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, “A Textbook of English Phonetics for Indian Students”, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. “Spoken English: A Self-Learning Guide to Conversation Practice”, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine Your English”, 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, “Effective Technical Communication”, Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to:

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools.
   a. Text formatting and table.
   b. Mathematical equations.

- c. Watermarking using Analysis tool.
- d. Calculate student mark details.
- e. Create four types of charts.
- f. Import external data, sort & filter using Power Point tool.
- g. Create text and images with effects.
- h. Create animation and sound effects.

7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, "Introduction to Computers", 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, "Introduction to Computer Science", 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, "Fundamentals of Network Security", 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

✓ *Identify suitable data types for an application.*

✓ *Apply control statements for decision making problems.*

✓ *Use multidimension array for matrix application.*

✓ *Design a program to calculate average of a class.*

✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L-10, T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L-8, T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of 'n' numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

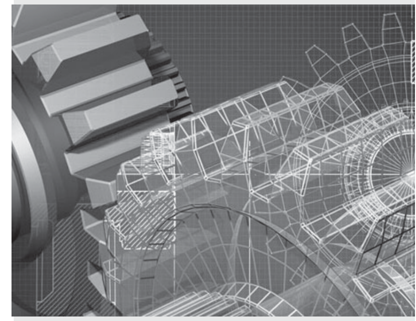
TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1st edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2nd edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4th edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a Lighting scheme for specific working environment.*

✓ *Design a composition of Heating element for a particular application.*

✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

✓ *Provide an earthing for Domestic Outlet.*

✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks,

Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of

cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, "Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj and A. Sumathi, "Electrical engineering - Electrical machines and Appliances Theory", 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, "How Stuff Works", 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, "Basic Mechanical Engineering", 1 st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to:

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

- ✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*
- ✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*
- ✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*
- ✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

Listening – Following long conversations / Interviews

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

PRACTICE: Objective PET Units 25 – 30

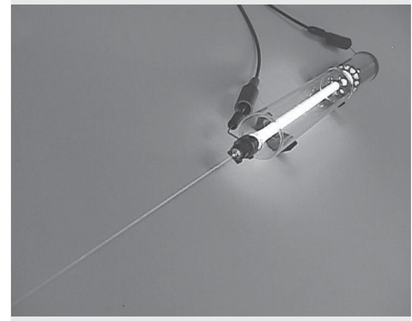
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, "Introduction to PET", Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

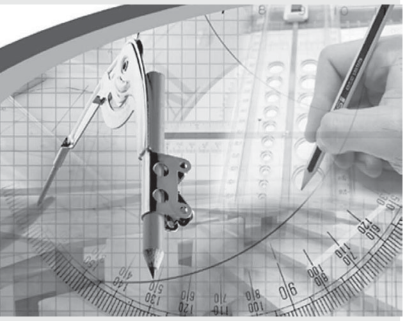
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments, field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- carry out the basic operations of matrix algebra.
- use row operations to reduce a matrix to echelon form, normal form.
- determine consistency of a system linear equations.
- compute eigen values and eigen vectors.
- evaluate double integrals and triple integrals.
- evaluate double integrals in polar coordinates.
- utilize Cartesian and polar coordinates to find area.
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals.

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9,T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L-9,T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L-9,T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L-9,T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L-9,T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B.V.Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

✓ *Analyse the total hardness of water sample.*

✓ *Understand the basic principles involved in various batteries.*

✓ *Understand the mechanisms of corrosion and various controlling methods.*

✓ *Synthesize various polymers.*

✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula Chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an “International language of Engineers”. It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to:

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT – 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT – 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT – 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT – 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT – 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

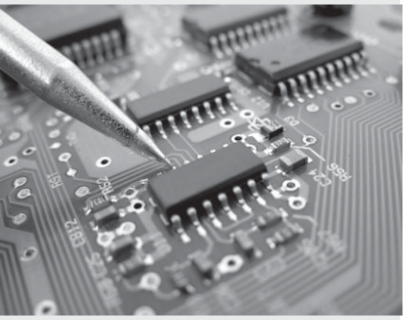
1. N. D. Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal, C.M.Agrawal, "Engineering Drawing" , 2nd edition, Tata McGraw Hill, 2014.

REFERENCE BOOKS:

1. J. Hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC, AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
✓ *Develop a simple loop generator.*
✓ *Design a voltage regulator using Zener diode.*
✓ *Design a half wave rectifier using PN junction diode.*
✓ *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V. K. Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D. P. Kothari, “Basic Electrical and Electronics Engineering”, 1st edition, TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A. K. Thereja and B.L. Thereja, “Electrical Technology”, Vol.– II, S Chand Publications, 2007.
3. U. Bakshi & A. Bakshi, “Basic Electrical Engineering”, 1st edition, Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to:

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

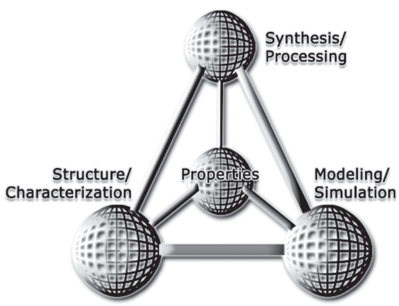
LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.

2. Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.



16CH104 MATERIALS SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
8	60	-	10	-	-

Course Description and Objectives:

This course will emphasize the structure-property relationships of engineering materials. The objective of this course is to provide knowledge in basic principles of material science and also to study structure of materials at all length scales.

Course Outcomes:

The student will be able to:

- understand crystal structure of various materials and techniques used for structure determination.
- understand the influence of defects on the properties of materials
- understand the fundamentals of equilibrium phase diagrams.
- gain knowledge on various fabrication techniques used for manufacturing common engineering materials.

SKILLS:

✓ *Identify the type of material: ceramic, polymer, metal or composite.*

✓ *Select materials with suitable properties for a given application.*

✓ *Predict the type of fracture/failure in a material.*

✓ *Read and draw conclusion from binary phase diagrams.*

✓ *Suggest manufacturing methods for metals, ceramics and polymeric materials.*

✓ *Determine basic mechanical properties of materials using universal testing machine.*

I-UNIT **L-9**

BONDING IN SOLIDS: Inter atomic forces and potential energy, Types of bonds: primary and secondary, Variation in bonding character and resulting properties

CRYSTAL STRUCTURE : Classification of crystal systems – SC, BCC, FCC & HCP crystal structures with examples, Atomic packing factor, coordination number, determination of miller indices of planes & directions of cubic and hexagonal crystals, linear and planar densities, separation between successive planes, Crystal structure determination: Bragg law, powder method.

II-UNIT **L-10**

CRYSTAL DEFECTS: Point defects, Dislocations: edge, screw and mixed, burgers vectors, energy of dislocation, motion of dislocation, dislocation density. Grain boundary, stacking faults and twin boundary.

PHASE DIAGRAMS: Gibb's phase rule & terms involved – Reduced phase rule, tie line and lever rules, Two component systems–invariant reactions – Eutectic system & Iron-Carbon system.

III-UNIT **L-9**

MATERIALS FABRICATION TECHNIQUES: Fabrication of Metals: forming operations, casting, Fabrication of Ceramics: particulate forming processes, cementation. Forming techniques of Plastics: compression, transfer and injection molding, extrusion, blow molding.

MECHANICAL PROPERTIES: Stress-strain relations of various solids – Elastic, Anelastic, Visco-elastic and plastic deformations in solids, creep and fatigue, fracture: Brittle and Ductile, fracture toughness, ductile to brittle transitions.

IV-UNIT **L-8**

ELECTRICAL & SEMICONDUCTING PROPERTIES: Ohm's Law, Electrical Conductivity, Electronic and Ionic Conduction, Energy Band Structures in Solids, Classification of solids based on band models, Electron Mobility, Electrical Resistivity of Metals, Intrinsic Semiconduction, Extrinsic Semiconduction, The temperature dependence of Carrier Concentration, Factors That Affect Carrier Mobility.

V-UNIT **L-8**

DIELECTRIC AND MAGNETIC PROPERTIES: Dielectric behavior: capacitance, polarization, frequency dependence of dielectric constant, dielectric strength. Types of magnetism, Ferromagnetism-Domain theory-hystersis behavior, ferrimagnetism, soft and hard magnets – application of magnetic materials.

TEXT BOOKS:

1. W. D. Callister, "Materials Science and Engineering: An Introduction," 8th ed., John Wiley & Sons Inc, 2009.
2. V.Raghavan, "Materials Science and Engineering:A First Course", 5th ed., PHI Learing Pvt. Ltd., 2013.

REFERENCE BOOKS:

1. L. H. VanVlack, Elements of Materials Science and Engineering, 6th ed., Addison Wesley, 1989.
2. W.F. Smith and J. Hashemi, Foundations of Materials Science and Engineering, 4th ed McGraw_Hill, 2005.
3. D. R. Askeland, Science and Engineering of Materials, 5th ed., Thomson Engineering, 2005.
4. J.F. Shackelford, Introduction to Materials Science for Engineers, 6th ed., Prentice Hall, 2004.
5. Kelly, G. W. Groves, and P. Kidd, Crystallography and Crystal Defects, Wiley, 2002.
6. N.W. Dowling, Mechanical Behavior of Materials, 3rd ed., Prentice_Hall, 2006.
7. P. Haasen and B. L. Mordike, Physical Metallurgy, 3rd ed., Cambridge University Press, 1996.

ACTIVITIES:

- *Testing the type of failures.*
- *"Gee Whiz": Wonder presentations.*
- *Analysis of load test results.*
- *Study of micro structures of materials.*
- *Segregation of the given materials.*
- *Identification of phases in the given phase diagram.*

16ME102 ENGINEERING MECHANICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	-	5	-	5

Course Description and Objectives:

Engineering Mechanics applies principles of mechanics to solve common engineering problems. The goal of this course is to expose students to problems in mechanics as applied to real-world scenarios.

The course uses the Laws of Mechanics to predict forces in machines and structures. This course is prerequisite for courses like Mechanics of Machines, Stress Analysis, Design of Mechanical Systems and others.

Course Outcomes:

The student will be able to:

- use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- apply basic knowledge of mathematics and physics to solve real-world problems such as dams, bridges, fly overs, buildings, large structures etc.

SKILLS:

✓ *Solving classical mechanics problems involving system of forces.*

✓ *In-depth understanding of rigid bodies.*

✓ *Applying principles of center of gravity and moment of inertia.*

UNIT-1 **L-10, T-3**

GENERAL PRINCIPLES: Introduction to engineering mechanics, Idealization in mechanic's basic concepts, Vectors and scalar quantity, Laws of mechanics.

FORCE SYSTEM AND RESULTANT: Concept of force, Representation of force, System of forces, Resolution of forces using rectangular components.

MOMENTS AND COUPLES: Introduction, Moment of force, Varignon's theorem, Resultant of parallel forces, Couple and moment of couple, Characteristic of couple.

UNIT -2 **L-8, T-3**

EQUILIBRIUM OF BODIES: Conditions of equilibrium for a coplanar force system and coplanar non parallel non concurrent force system, Principle of equilibrium (two, three, force principle), Lami's theorem.

TRUSS: Introduction, Classification of truss, Fundamental of truss, Analysis of truss (method of joints and method of section).

UNIT-3 **L-10, T-3**

FRICTION: Introduction, Classification of friction, Coefficient of friction, Laws of friction, Angle of friction, Angle of repose, Cone of friction, Ladder friction, Wedge friction.

UNIT-4 **L-10, T-3**

CENTROID: Introduction, Centroid of lines, Centroid of surfaces, Determine centroid of simple figures, Centroid of composite figures, Centroid of a parabolic spandrel.

CENTER OF GRAVITY: Introduction, Center of gravity, Location of center of gravity - right circular cone and solid hemisphere, Center of mass, Theorem of Pappus.

UNIT-5 **L-10, T-3**

MOMENT OF INERTIA: Moment of inertia of plane areas, Polar moment of an area, Radius of gyration of area, Parallel axis theorem, Perpendicular axis theorem, Moment of inertia of composite areas, Mass moment of inertia- introduction, Radius of gyration of mass, Mass moment of inertia of rod, Rectangular plate, Right circular cylinder, Circular ring, Circular plate.

TEXT BOOKS:

1. A. K. Dhiman, P. Dhiman and D. C. Kulshreshtha, "Engineering Mechanics: Statics and Dynamics", Mc Graw Hill, 2015
2. Basudeb Bhattacharyya, "Engineering Mechanics", 2nd Edition, Oxford University Press 2014.

REFERENCE BOOKS:

1. N. H. Dubey, "Engineering Mechanics : Statics and Dynamics",1st Edition, Mc Graw Hill, 2015.
2. S. S. Bhavikatti, "Engineering Mechanics", 1st edition, New Age International, 2015.
3. J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Statics", 8th Edition, John Wiley and sons, 2015.

WEB LINKS:

1. https://www.youtube.com/user/mySeriesEM
2. https://www.youtube.com/channel/UCSeYfmhG5Z25uvm9C7gdrWw
3. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-engineering-mechanics-i-fall-2007/index.htm

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	20	-	-

Course Description and Objectives :

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes :

The student will be able to:

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs etc.*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*
- ✓ *CNC machines and various machining operations and processes.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin smithy and Black smithy.
4. House wiring.
5. Foundry and welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS:

1. S.K. Hazra Choudhury, "Elements of workshop Technology", 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice: Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S, "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

II

YEAR

AUTOMOBILE ENGINEERING

B.Tech.

I SEMESTER	16EL102	-	Soft Skills Laboratory
	16HS109	-	Environmental Science and Technology
	16AE201	-	Automotive Chassis
	16AE202	-	Engineering Thermodynamics and Heat Transfer
	16AE203	-	Fundamentals of I.C Engines
	16AE204	-	Fundamentals of Motorsport Engineering
	16AE205	-	Materials for Automobile Industry
		-	Employability and Life Skills Elective*
II SEMESTER	16AE206	-	Advanced Theory of I.C Engines
	16AG206	-	Strength of Materials
	16AE207	-	Manufacturing Processes for Automotive Components
	16AG208	-	Theory of Machines
	16HS203	-	Professional Communication Laboratory
		-	Department Elective
		-	Department / Open Elective
		-	Employability and Life Skills Elective*

COURSE CONTENTS

I SEM & II SEM

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	30	-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, Preparing Resume, Group Discussion, and Interview Skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- gain requisite professional and inter-personal skills.
- possess the ability to think critically on issues for informed decision making and know how to communicate effectively, through choice of appropriate language and speech, while dealing with others at the workplace.
- identify and introspect on individual strengths and weaknesses, will emerge with improved levels of self-awareness and self-worth, for greater efficacy at workplace.

SKILLS:

✓ *Communicate and understand the difference between soft skills and hard skills.*

✓ *Learn professionalism and Employability skills.*

✓ *Plan Career by drawing their SWOT, Setting the Goal, learn the importance of Time and Stress Management.*

✓ *Learn Vocabulary, Situational English, Group Discussion, Reading Comprehension and Listening Comprehension which are essential for all competitive examinations.*

✓ *Prepare Resume and learn how to face interview.*

✓ *Learn Gender sensitive language, Good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other’s views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and case studies..

TEXT BOOKS:

1. Edward Holffman, “Ace the Corporate Personality”, McGraw Hill, 2001.
2. Adrian Furnham, “Personality and Intelligence at Work”, Psychology Press, 2008.
3. John Adair Kegan Page, “Leadership for Innovation”, 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, “Effective Technical Communication”, 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan and NP Singh, “Speaking English Effectively”, 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. S.P. Dhanvel, “English and Soft Skills”, Orient Blackswan, 2011.
8. Rajiv K. Mishra, “Personality Development”, Rupa and Co, 2004.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to :

- observe and integrate the diverse information from sources outside the classroom
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness
- adapt eco-friendly technologies in order to maintain hygienic conditions
- understand the human activities that are detrimental to environment
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning*

✓ *Gain perspectives to adrress the challenges, improvise and devise solutions*

✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches*

✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*

✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem*

UNIT - 1 **L-6**

Environmental Studies: Definition Scope and its importance, Need for Public Awareness, Natural Resources, Forest Resources, Deforestation ; Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer-pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources - land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

Ecosystem : Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems.

Biodiversity : Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY

Solid waste Management: Causes, Effects and control measures of Municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and Noise Pollutions; Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, Definitions, Applications of the remote sensing, Innovative practices-objectives, Innovative practices in agriculture and forestry-community, Bio-villages. Green technology for Sustainable development, Life cycle assessment and its Concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA

Sustainable development, Water conservation, Cloud Seeding, Rainwater Harvesting Methods Watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental Legislation: Wildlife Protection Act, Water Act, Forest Conservation Act, Air Act, Environmental Protection Act. Environmental Impact Assssment (EIA), Introduction, definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed Projects / Industry / Developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION

Food sanitation **-** food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water , Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions, Role of youth in the development, Promoting activities, Youth as initiators and activities.

Field work/Environmental Visit: Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment , Common plants, Insects, Birds; Study of simple ecosystems: Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

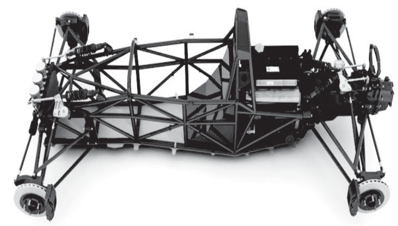
TEXT BOOKS:

1. Anubha Kaushik- CP Kaushik, “Perspectives in Environmental Studies”, 5^{th} edition, 2016
2. Benny Joseph, “Environmental studies”, 2^{nd} edition, Mc Graw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004
7. Kurian Joseph and R.Nagendram, “Essentials of environmental studies”, Pearson Education Pt Ltd, Delhi, 2007.

16AE201 AUTOMOTIVE CHASSIS



Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
2	40	2	5	2	2

Course Description and Objectives :

This course aims at offering the fundamental concepts of different types of chassis frame construction and to gain knowledge about different types of steering geometry and front axle. The objective of this course is to offer knowledge on various components of an automobile chassis such as axles, frames, braking system and suspension systems.In addition, this course will enable the student to learn the concepts regarding the ergonomics of an automobile and modern drive line.

Course Outcomes:

The student will be able to:

- understand the different types of chassis frames.
- gain knowledge about different steering geometries and types of front axles.
- understand constructional features and working of various suspension systems
- gain knowledge on the concepts of modern drive line.
- learn about different braking systems like power assisted brakes, disc brakes, etc.

SKILLS:

✓ *Analyse and test the frames.*

✓ *Choose and design an axle according to requirement*

✓ *Identify various steering systems*

✓ *Select a proper test type for brakes*

✓ *Identify different suspension systems in an automobile*

ACTIVITIES:

- *Hands on experience on various chassis frames for long trailers*
- *Visit to a car/ truck manufacturing industry*
- *Conduct tests on different types of brakes*
- *Testing of suspension system components*
- *Dismantling, testing and assembly of chassis components*

UNIT - 1 **L-5**

INTRODUCTION : Layout with reference to power plant, Steering location and drive, Frames, Frameless constructional details, Materials, Testing of frames, Integral body construction.

UNIT - 2 **L-7**

FRONT AXLE STEERING SYSTEMS : Front axle type, Rigid axle and split axle, Constructional Details, Materials, Front wheel geometry viz., Camber, Castor, Kingpin inclination, Toe-in and toe-out. Condition for true rolling motion of road wheels during steering.Steering geometry.Ackermann and Davis steering. Construction details of steering linkages. Different types of steering gear box. Steering linkages layout for conventional and independent suspensions.Turning radius, Instantaneous centre, Wheel wobble and shimmy. Over-steer and under-steer. Power and power assisted steering.

UNIT - 3 **L-6**

DRIVE LINE STUDY : Effect of driving thrust and torque –reaction .Hotchkiss drives. Torque tube drive, radius rods.Propeller shaft.Universal joints.Final drive- different types. Two speed rear axle. Rear axle construction-full floating, three quarter floating and semi-floating arrangements. Differential-conventional type, Non-slip type, Differential locks and differential housing.

UNIT - 4 **L-6**

BRAKING SYSTEM : Type of brakes, Principles of shoe brakes.Constructional details – materials, braking torque developed by leading and trailing shoes. Disc brake, drum brake theory, constructional details, advantages, Brake actuating systems. Factors affecting brake performance, Exhaust brakes, Power and power assisted brakes. Testing of brakes.

UNIT - 5 **L-6**

SUSPENSION SYSTEM : Types of suspension, Factors influencing ride comfort, Types of suspension springs-independent suspension- front and rear. Rubber, Peumatic, Hydro- elastic suspension.Shock absorbers.Types of wheels.Construction of wheel assembly.Types of tyres and constructional details.Static and rolling properties of pneumatic tyres, Tubeless tyres and aspect ratio of tubed tyres.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Measurement of the following chassis frames:

1. Light duty vehicle frame (Ambassador, Maruthi van etc)
2. Heavy duty vehicle frame (Leyland, Tata etc)

Dismantling and assembling of

3. Front Axle
4. Rear Axle
5. Differential
6. Steering systems along with any two types of steering gear box
7. Braking systems – hydraulic servo vacuum, compressed air power brakes.
8. Leaf spring, coil spring, torsion bar spring, Hydraulic shock absorber

Dismantling and Assembling of

9. Clutch assembly of different types

10. Gear Box

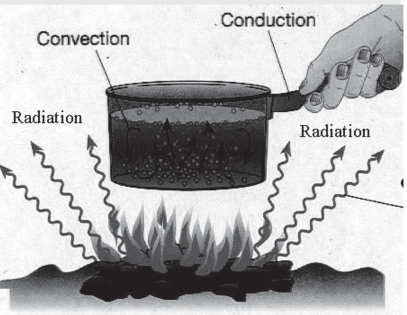
11. Transfer case

TEXT BOOKS:

1. K. Newton, W. Steeds and T. K. Garret, “The Motor Vehicle”, 13th edition, Butterworth Heinemann, 2004.
2. W. Steed, “Mechanics of Road Vehicles”, Iliffe Books,1992.

REFERENCES:

1. Harban Singh Rayat, “The Automobile”, S. Chand and Co., 2000.
2. G. J. Giles, “Steering Suspension and Tyres”, Illiffe Books, 1975.
3. Kirpal Singh, “Automobile Engineering”, Standard publishers and Distributors, 1999.



16AE202 ENGINEERING THERMODYNAMICS AND HEAT TRANSFER

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
2	40	2	5	2	2

Course Description and Objectives:

This course provides fundamental concepts in thermodynamics, first and second laws of thermodynamics, entropy and energy, Ideal and real gases and non-reactive ideal gas mixtures and general thermodynamic properties. The objective of this course is to impart analytical and practical problem solving skills in thermodynamics.

Course Outcomes:

The student will be able to:

- distinguish various thermodynamic properties
- understand the first and second laws of thermodynamics and their applications.
- distinguish open and closed system, boundary conditions, work and heat interactions
- develop an understanding of various work interactions, cycles and subsequently apply first and second law of thermodynamics
- evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility
- understand the concepts of ideal and real gases, gas laws, Maxwell's relations and subsequently apply first and second laws of thermodynamics for an ideal gas and gas mixtures undergoing power and refrigeration cycles.

SKILLS:

✓ *Identify the type of systems, open or closed systems*

✓ *Identify reversible and irreversible processes*

✓ *Identify properties of ideal and real gases*

✓ *Estimate critical wall thickness of insulation*

UNIT - 1 **L- 10**

BASIC CONCEPT AND LAWS OF THERMODYNAMICS Basic concepts, Concept of continuum, Macroscopic approach, Thermodynamic systems, Closed, Open and isolated. Property, State, Path and process, Quasi-static process, Work, Modes of work, Zeroth law of thermodynamics, Concept of temperature and heat. Concept of ideal and real gases. First law of thermodynamics, Application to closed and open systems, Second law of thermodynamics, Reversibility and irreversibility. Carnot cycle reversed Carnot cycle, Efficiency, COP. Thermodynamic temperature Scale, Clausius inequality, Concept of entropy and availability.

UNIT - 2 **L-9**

IDEAL REAL GASES AND THERMODYNAMIC RELATIONS : Gas mixtures, Properties of ideal and real gases, Equation of state, Avagadro's law, Vander Waal's equation of states, Compressibility, and compressibility chart. Dalton's law of partial pressure, Exact differentials, T-D, Relations, Maxwell relations, Clausius Clapeyron equations, Joule Thomson Coefficient.

UNIT - 3 **L-9**

GAS POWER CYCLES : Air standard cycles-Otto-Diesel-Dual-Work output, Efficiency and MEP calculations –comparison of the cycles for same compression ratio and heat addition, Same compression ratio and heat rejection, Same peak pressure, Peak temperature and heat rejection, Same peak pressure and heat input, Same peak pressure and work output , Brayton cycle with inter cooling, Reheating and regeneration.

UNIT - 4 **L- 9**

RECIPROCATING AIR COMPRESSORS & AIR COMPRESSORS & AIR-CONDITIONING : Single acting and double acting air compressors, Work required, Effect of clearance volume, Volumetric efficiency, Isothermal efficiency, Free air delivery, Multistage compression, Condition for minimum work. Fundamentals of refrigeration, C.O.P., Reversed carnot cycle, Simple vapour compression refrigeration system, T-S, P-H diagrams, Simple vapour absorption refrigeration system, Desirable properties of an ideal refrigerant.

UNIT - 5 **L-8**

HEAT TRASNFER : One-dimensional Heat Conduction: Plane wall, Cylinder, Sphere, Composite walls, Critical thickness of insulation, Heat transfer through extended surfaces (simple fins).Convection: Free convection and forced convection, Internal and external flow, Simple Empirical relations. Radiation: Black–Gray bodies, Radiation Shape Factor (RSF)

LIST OF EXPERIMENTS: TOTAL HOURS: 30

THERMODYNAMICS (Any 5 must be performed)

1. Grease penetration Test
2. Viscosity measurement using Redwood viscometer and Saybolt Viscometer
3. Aniline point measurement
4. Carbon residue, cloud and pour point measurement
5. Flash and fire point measurement
6. Water tube and fire tube boilers demonstration
7. Boiler mountings and accessories study and demostration
8. Dryness fraction measurement of steam using steam calorimeter
9. Steam condenser efficiency measurement
10. Steam turbine blade efficiency measurement

ACTIVITIES:

- *Experimentation using Otto, Diesel and dual cycles and determination of their efficiencies*
- *Estimation of critical thickness of insulation for cylinders and spheres*

Heat Transfer (Any 5 must be performed)

1. Overall heat transfer co-efficient measurement using Composite Slab Apparatus
2. Heat Transfer measurement through lagged pipe.
3. Heat Transfer measurement through a Concentric Sphere.
4. Thermal Conductivity of given metal rod.
5. Heat transfer through pin-fin
6. Experiment on Transient Heat Conduction.
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection.
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Shell and tube heat exchanger.

TEXT BOOKS:

1. Nag.P.K. “Engineering Thermodynamics”, Tata McGraw-Hill, 2007.
2. R.K.Rajput “Applied Thermodynamics”, Laxmi Publishing Co., 2007.
3. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice-Hall, 2005.
4. Sukhatme “Heat Transfer

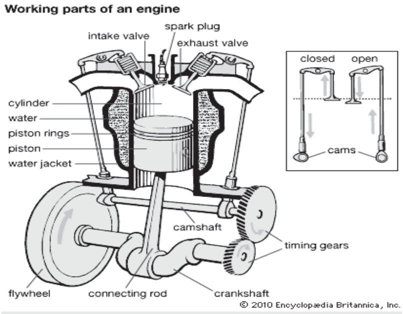
REFERENCE BOOKS:

1. Holman.J.P., “Thermodynamics”, 3rd edition. McGraw-Hill, 2007.
2. Yunus A. Cengel, “Heat Transfer A Practical Approach” Tata McGraw Hill, 2004
3. Arora C.P, “Thermodynamics”, Tata McGraw Hill, 2003.

WEB LINKS:

1. ocw.mit.edu
2. www.nptel.iitm.ac.in

16AE203 FUNDAMENTALS OF IC ENGINES



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
2	30	2	5	2	2

Course Description and Objectives:

The course offers fundamental knowledge of IC engines, working and combustion processes in SI and CI engines. It also provides knowledge on various fuel systems used in different engines. The objective of this course is to provide fundamental aspects of engines, thermodynamic cycles, fuels, charging techniques, cooling systems and lubrication systems and their functions. It also provides knowledge on recent technological developments in fuel systems of SI and CI engines.

Course Outcomes:

The student will be able to:

- understand the constructional and working principles of SI and CI engines
- familiarize with modern technology in fuel system of SI and CI engines
- learn the concept of combustion of SI and CI engines in microscopic level
- know the basic design of combustion chambers
- know the concept and methods of turbo and super charging
- understand the combustion process

SKILLS:

- ✓ *Identify the influence of fuel on engine performance*
- ✓ *Select suitable engine for different applications*
- ✓ *Identify different* engine constructions
- ✓ *Analyze and design a fuel supply system*
- ✓ *Differentiate different engine constructions*

ACTIVITIES:

- *Perform experiments on SI and CI engines for valve/port timing diagram.*
- *Compare and analyze different engine cycles*
- *Dismantle, inspect and reassemble the engine different fuels*

UNIT - 1 **L-10**

ENGINE CYCLES : Otto, Diesel and Dual air standard cycles, Comparison, Fuel-air cycle, Actual cycle, Deviation of actual cycle from air standard cycle. Introduction to I. C. Engine: History, Basic engine components and nomenclature, Classification with respect to cycle of operation, Working principle, Fuel used, Cylinder arrangement, Cooling method, Purpose, Valve timing diagram, Port timing diagram, Engine selection criteria for different applications.

UNIT - 2 **L-9**

ENGINE CONSTRUCTION : Cylinder head, Cylinder block, Crank case, Sump, Cooling passages, Cylinder liners, Piston types, Piston rings, Connecting rods, Crank shafts, Valves, Valve seat inserts, Valve actuating mechanisms, Drive mechanisms.

UNIT - 3 **L-8**

FUELS : Availability and properties of fuels, Octane number, Cetane number. Biofuels: Various vegetable oils for engines, Esterification, Performance in engines, Performance and emission characteristics, Bio diesel and its characteristics. (Conventional fuels, properties etc.)

UNIT - 4 **L-9**

FUEL SUPPLY SYSTEM IN S.I. ENGINE :Carburetion, Factors affecting carburetion, Mixture requirements, Principal of carburetion, Simple carburettor, Calculation of air fuel ratio, Limitations of carburettor, Altitude compensation, Gasoline injection- Direct, Port, Manifold injection, Electronic fuel injection system. Fuel Supply System in C. I. Engine :Requirements & types of injection systems, fuel injection pumps, Injectors, governor – mechanical, Pneumatic, Common rail fuel injection, Electronic injection system.

UNIT - 5 **L-9**

LUBRICATION SYSTEM : Mechanical friction, Factors affecting friction, Pumping losses, Blow by losses, Lubrication of engine components, Lubricating systems. Cooling System: Temperature distribution of engine components, Need of cooling system, Air cooling, Liquid cooling, Types, Comparison.

LIST OF EXPERIMENTS: TOTAL HOURS: 30

1. Construction details of an IC engine
2. Valve and port timing experiments on SI engines
3. Ignition systems demonstration and study.
4. Fuel feed pumps demonstration
5. Performance tests on four stroke diesel engine
6. Engine friction measurement using Morse test
7. Heat balance test on a multi cylinder engine
8. Air fuel ratio and volumetric efficiency measurement
9. Performance tests on variable compression ratio engines
10. Performance tests on reciprocating air compressor unit
11. Study of boilers
12. Disassembly / assembly of engines.

TEXT BOOKS:

1. V. Ganesan,”Fundamentals of Internal Combustion Engines”, 3rd edition, , Tata McGraw Hill, 2012
2. Heywood J.B, “Internal Combustion Engine Fundamentals”, 2nd edition, McGraw Hill, 2002
3. H. N. Gupta, “Fundamentals of Internal Combustion Engines”, PHI Learning, 2012.

REFERENCE BOOKS:

1. “Automobiles and Pollution” SAE Transactions, 1995.
2. Gill P. W., Smith J. H. and Zurich E. J., “Fundamentals of I. C. Engines”, 3rd edition, Oxford and IBH Pub. Co.,1999.
3. Mathur and Sharma, “I. C. Engine”, Dhanpat Rai and Sons, 2000.

16AE203 FUNDAMENTALS OF MOTORSPORT ENGINEERING

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	2	30	2	5	2	2

Course Description and Objectives:

This course provides knowledge on funamentals of motorsports engineering and their organization. It also deals with the rules and regulations of a given motor sport. The objective of this course is to offer comprehensive understanding of motor sporting and its organization, rules and regulations, technical standards and specifications.

Course Outcomes:

The student will be able to:

- understand and appreciate the details of motorsports industry
- gain knowledge about the events and competitions
- take part in national and international competitions
- design and build the vehicle as per the rules and regulations

SKILLS:

✓ *Discuss and appreciate motorsport technology evolution*

✓ *Participate in SAE events and motor sports competitions*

UNIT-1 **L- 9**

INTRODUCTION TO MOTORSPORT ENGINEERING : The history of motorsport engineering, Review of motorsport engineering, Pioneers of Motorsport engineering, Motorsport technology evolution review, Secrecy in Motorsport engineering

UNIT-2 **L-9**

LIST OF MOTORSPORT COMPETITIONS FOR STUDENTS : A brief look at all the events students can take part to develop their skills, Formula SAE - Baja, SAE Super mileage.

UNIT-3 **L-10**

PROFESSIONAL MOTORSPORT EVENTS : The various types of professional motorsport events that take place around the world, Cars:Formula One, World rally championship, Touring car championship, GP2, GP3, World Endurance Racing Championship, Dirt track racing, NASCAR, Indy Car, Cross Country rallies, Drag racing, Motorcycles, Moto GP, Superbike, Endurance, Motocross, Super moto, Freestyle, Trials, Cross-country rallies, Speedway, Board track, Drag racing.

UNIT-4 **L-9**

RULES AND REGULATIONS OF MOTORSPORTS : All about the most important book for a motorsport engineer, the rule book - About the world governing bodies of the sport, Why the rule book keeps changing, How to interpret the rule book, Rules for car races, Rules for bikes races

UNIT-5 **L-8**

CAREER IN MOTORSPORTS :A sneak peek into all the awesome jobs, Motorsport Engineer Race Driver / Rider,Test Driver / Rider, Design engineer, Race technician, Aerodynamics Engineer, Race official / steward.

TEXT BOOKS:

1. Andrew Livesey, “Basic Motorsport Engineering”, Routledge, 2012
2. Andrew Livesey, “Advanced Motorsport Engineering”, Routledge, 2012

REFERENCE BOOKS:

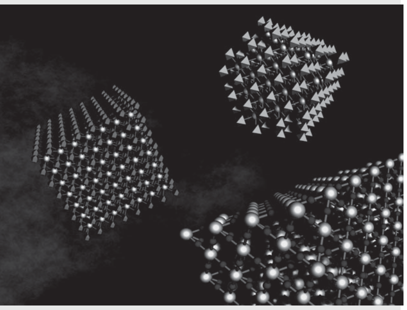
1 Josh Smith, “Smith’s Fundamentals of Motorsport Engineering”, Oxford University Press, 2014
2. Alma Hillier, “Hillier’s Fundamentals of Motor Vehicle Technology” 6th edition, Nelson Thornes, 2007.

WEB LINKS:

1. www.motorsport.com
2. www.motorsportwebsites.co.uk
3. www.motorsportmagazine.com

ACTIVITIES:

- *Analyze a racing sport with respect to its technicalities*
- *Design and develop projects on sports car*



16AE205 MATERIALS FOR AUTOMOBILE INDUSTRY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
2	40	2	5	2	2

Course Description and Objectives:

This course offers the basic classification of materials and different materials used in automotive industry for different components. The objective of this course is to provide the knowledge of properties and applications of ferrous, non-ferrous metals, polymers and composite materials and their production processes.

Course Outcomes:

The student will be able to:

- recognize and understand different materials used in automotive industries
- understand the fundamentals related to production methods of metals and processing of materials for automotive applications
- evaluate mechanical properties of solids, factors affecting such properties in order to select materials
- prepare samples and study various micro structures of steels

SKILLS:

✓ *Distinguish metals, ceramics, polymers and composites.*

✓ *Analyze micro structures of materials such as mild steels, low carbon steels, high carbon steels etc.*

✓ *Measure hardness of steels*

✓ *Prepare samples for micro structure studies*

✓ *Ability to select suitable materials for automobile applications*

UNIT - 1 **L-9**

INTRODUCTION : Classification and characteristics of metals, Ceramics, Polymers and composites.

Iron and Steels: Cast iron – Austempered ductile iron, Compacted graphite iron, Steels -Plain carbon steels, Low alloy steels, HSLA steels, IF steels, Bake hardening steels, TRIP steels, Ultra high strength steels, Stainless steels - production, Properties and applications.

UNIT - 2 **L-9**

NON-FERROUS ALLOYS :Aluminium alloys – Cast alloys, Wrought alloys, Age hardenable alloys, Working and heat treatment, Applications in automobiles, Magnesium alloys – Cast and wrought alloys, Working and heat treatment, Applications. Titanium alloys.

UNIT - 3 **L- 9**

POLYMERS AND CERAMICS : Processing of polymers, Brief description of equipment and process details of extrusion, Injection moulding, Thermoforming, Blow moulding, Concept of polymer design and selection criteria. Preparation and forming of ceramics, Applications.

UNIT - 4 **L-10**

COMPOSITE MATERILS :Production of composite materials and products, Moulding and forming of composites, Machining and joining of composites, Application of composites in automobiles, Metal matrix composites, Polymer matrix composites and ceramic matrix composites, Applications.

UNIT - 5 **L-8**

POWER METALLURGY : Powder metallurgy – principle, Materials and techniques. Automotive applications of powder metallurgical products.

LIST OF EXPERIMENTS: TOTAL HOURS: 30

1. Micro structures of ferrous materials
2. Micro structures of non-ferrous materials
3. Micro structures of composite materials
4. Design of dies and manufacture of composite products
5. Study of micro structures of heat treated steels.
6. Hardness measurement of steels by Jominy End Quench test
7. Rockwell Hardness test
8. Brinell Hardness test

TEXT BOOKS:

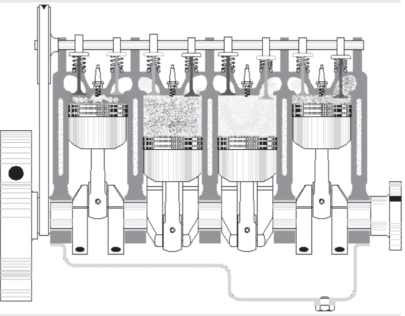
1. Balram Gupta, “Aerospace Materials”, S.Chand and Co., 2015.
2. Dieter G.E, “Mechanical Metallurgy”, McGraw Hill, 1997.

REFERENCE BOOKS:

1. American Society for Metals “Volume 1, 2, 4, 7, 20 and 21”, 1998.
2. John Brown, “Foseco Ferrous and Non Ferrous Foundryman’s Handbook” Butterworth-Heinemann, 1999.

ACTIVITIES:

- *Perform tests to evaluate micro structures of different materials*
- *Measure hardness of different metals*
- *Design of dies and manufacture of products using composite materials*



16AE206 ADVANCED THEORY OF IC ENGINES

Hours Per Week :

L	T	P	C
2	1	-	3

Total Hours :

L	T	P
30	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
2	40	2	5	2	2

Course Description and Objectives:

This course offers comprehensive knowledge on combustion, thermodynamic analysis of IC engines, modeling and simulation of SI and CI engine combustion processes. The Objective of this course is to impart knowledge on thermodynamics aspects in IC engine combustion and formation of different emissions along with mathematical modeling and simulation.

Course Outcomes:

The student will be able to:

- understand the general engineering operation and design compromises involved in spark and compression ignition engines
- be familiar with common IC engine terminologies such as knock, detonation, auto ignition, surface to volume ratio and compression ratio
- apply thermodynamics knowledge to IC engine processes and cycles
- analyze the engine parameters such as friction, torque, mean effective pressure etc.
- understand the mechanisms of combustion and the influence of air fuel ratio on the performance of engines
- understand the influence of variables on undesirable emissions
- gain knowledge on different types of modern engines

SKILLS:

✓ *Formulate/develop alternate fuels*

✓ *Thermodynamic modeling and simulation of IC engines*

✓ *Modelling and simulation of engine emissions*

✓ *Identify the problem and take necessary steps to improve combustion efficiency*

UNIT - 1 **L-5**

INTRODUCTION :Fuel air cycle and Actual cycle analysis, Properties of IC engine fuels, Refining process, Chemical composition and molecular structure of fuels, Octane number, Cetane number. Knock rating of SI engine fuels.

UNIT - 2 **L-8**

COMBUSTION OF FUELS : Combustion Stoichiometry of petrol, Diesel, Alcohol and hydrogen fuels, Chemical energy and heating values, Chemical equilibrium and maximum temperature, SI engine combustion, Flame velocity and area of flame front, Performance number, CI engine combustion. Fuel spray characteristics, Droplet size, Penetration and atomization.

UNIT - 3 **L-6**

COMBUSTION MODELING : Basic concepts of engine simulation, Governing equations, thermodynamic models, SI engine and CI engine models.

UNIT - 4 **L-6**

NON-CONVENTIONAL I.C ENGINES :Adiabatic and L.H.R. engines, Variable compression ratio engine, Wankel rotary combustion engine, Free piston engine, MAN combustion chamber and multi fuel engines, Stratified charge and lean burn engines, Locomotive and marine engines.

UNIT - 5 **L-5**

COMBUSTION ANALYSIS IN I.C ENGINES : Photographic studies of combustion processes, P-Theta diagrams in SI and CI engines, Rate of heat release, hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TEXT BOOKS:

1. Ganesan,V., “Internal combustion engines”, 4th edition ,Tata McGraw Hill, 2012.
2. John,B., Heywood, “ Internal Combustion Engine Fundamentals”, 5th edition , McGraw Hill, 2015 .

REFERENCE BOOKS:

1. Ramalingam. K.K., “Internal Combustion Engine”, 2nd edition , scitech publications, 2009.
2. Ganesan,V., “Compute Simulation of Spark Ignition engine process”, Universities Press, 1996.
3. Benson, R.S., Whitehouse, N.D., “Internal Combustion Engines”, Pergamon Press, 1979.

ACTIVITIES:

- *Formulate equations/ correlations to evaluate effect of various thermodyanmic properties on the efficiency of SI and CI engines.*
- *Develop a program and simulate it for efficiency using thermodynamic relations*
- *Carry out zero dimensional simulation of SI and CI engines*
- *Capture images and analyze combustion processes*

16AG206 STRENGTH OF MATERIALS

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	-

Course Description and Objectives:

This course deals with concepts of mechanics of deformable solids including static equilibrium, geometry of deformation and behaviour of materials. The objective of this course is to enable the students to have an exposure to the systematic methods of solving engineering problems in solid mechanics. In addition, it also provides the basic mechanical principles underlying modern approaches for design of various types of structural members subject to axial, torsion, bending, transverse shear, and combined loading.

Course Outcomes:

The student will be able to:

- understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous and isotropic materials.
- establish relationship between shear load and shear force.
- derive flexural formula for simple bending.
- identify the variation in shear stress-shear strain distribution for various cross sections.
- calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.
- determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.

SKILLS:

✓ *Measure tensile and compressive strength of materials using Universal Testing Machine.*

✓ *Measure shear strength of materials.*

✓ *Analyze deflections produced by axial, torsional and flexural loads.*

UNIT - 1 **L-5**

SIMPLE STRESSES AND STRAINS : Types of Stresses and Strains, Hooke's law, Stress strain diagram for ductile and Brittle materials, Salient points, Elastic constants and relations, Strain energy; Simple and compound bars, Thermal stresses, Stress on an inclined plane, Principle stresses – Mohr circle, Strain Energy-Resilience, Gradual, Sudden, Impact and Shock loadings.

UNIT - 2 **L-6**

SHEAR FORCE AND BENDING MOMENT : Types of loads and beams, Relation between shear load, Shear force and bending moment, Shear force and bending moment diagrams, Cantilevers – Simply supported beams and overhanging beams subjected to point loads, UDL and uniformly varying loads-Point of contra flexure.

DEFLECTION OF BEAMS: Introduction, Deflection equation for elastic curve of a beam, Deflection, Slope for cantilever beam and simply supported beams – point loads, UDL and uniformly varying loads, Double integration method, Macaulay's method, Area moment methods.

UNIT - 3 **L-6**

FLEXURE AND SHEAR STRESSES : Theory of simple bending, Assumptions, Flexural formula, Bending stresses in beams for various cross sections, Shear stresses in beams, Assumptions and derivation for variation of shear stress, Shear stress distribution for various cross-sections.

UNIT - 4 **L-6**

TORSION : Introduction, Torsion equation, Shear stress distribution for circular solid and hollow shafts, Stepped shafts, Shafts fixed at both the ends.

UNIT - 5 **L-7**

THIN CYLINDRICAL SHELLS : Introduction, Hoop and longitudinal stresses, Strains-Thin spherical shell - stresses; Columns and Struts- Introduction, Euler's Formula for critical load of columns for different end conditions, Limitations of Euler's theory, Rankine's formula, Simple Numerical.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS. **Total hours: 30**

1. Direct tension test.
2. Bending test on

   a) Simply supported beam b) Cantilever beam
3. Torsion test.
4. Hardness test

   a) Brinell hardness test b) Rockwell hardness test
5. Test on springs.
6. Compression test on cube.
7. Impact test.

TEXT BOOKS:

1. L. N. Srinath, "Advanced Mechanics of Solids", 3rd edition, Tata McGraw-Hill, 2010.
2. S. Singh, "Strength of Materials", 2nd edition, Khanna Publications, 2001.

REFERENCE BOOKS:

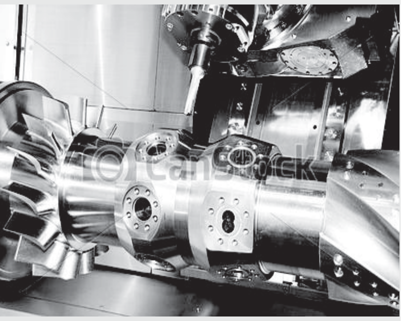
1. Bhavikatti, "Strength of Materials", 3rd edition, New Age International Publishers, 1998.
2. S. Timoshenko, "Strength of Materials", 3rd edition, D. Van Nostrand Company, 2004.
3. P. P. Egor, "Engineering Mechanics of Solids", 2nd edition, Prentice Hall of India, 1999.

WEB LINK:

1. http://ecoursesonline.iasri.res.in/course/view.php?id=9

ACTIVITIES:

- *Measurement of tensile, compressive and shear strength of materials.*
- *Design of cantilever beam.*
- *Design of simply supported and overhanging beams.*



16AE207 MANUFACTURING PROCESSES FOR AUTOMOTIVE COMPONENTS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	2	40	2	5	2	2

Course Description and Objectives:

This course offers basic theory of metal working and cutting principles such as foundry, welding, metal forming and machining. The objective of the course is to provide basic knowledge of different manufacturing process used in automobile industry. it also imparts knowledge on NC and CNC machines programming and surface finishing process.

Course Outcomes:

The student will be able to:

- understand and analyze metal working and cutting processes
- select process parameters and tools for obtaining desired machining characteristics
- analyze the effect of various parameters on process characteristics
- understand the processes involved in surface finishing

SKILLS:

- ✓ *Apply the knowledge of various manufacturing processes*
- ✓ *Identify various process parameters and their effect on processes*
- ✓ *Design and analyze various manufacturing processes and their tooling*
- ✓ *Operate different machines and perform various operations*
- ✓ *Program NC and CNC machines*

UNIT - 1 **L-9**

CASTING : Casting terminology, Moulding sand, Types of patterns, Pattern materials, Pattern allowances, Cores, Elements of gating system, Investment casting, Die casting, Centrifugal casting, Casting defects.

UNIT - 2 **L-10**

FORGING : Types of forging, Drop forging, Press and machine forging, Forging defects .

SHEET MATERIAL OPERATIONS : Shearing, Blanking, Piercing, Spinning, Drawing, Bending.

WELDING : Gas welding, Arc welding, TIG, MIG, Soldering and brazing.

UNIT-3 **L-9**

METAL CUTTING: Elements of metal cutting, Chip formation, Types of chips, Tool geometry speed, Feed, Depth of cut.

LATHE : Working principle of lathe, Principle parts of lathe work holders, Turning operations.

SHAPER : Working principle, Principle part of shaper, Shaping operations.

UNIT-4 **L-9**

MILLING Principle of working, Column and knee type milling machine, Milling operations and cutters, Indexing Methods.

GRINDING : Theory of grinding, Cylindrical and surface grinding, Lapping and Honing.

UNIT-5 **L-8**

NUMERICAL CONTROL :NC elements, Structure of CNC Machine tools, CNC part programming, Manual part programming , Computer Aided part programming, DNC machine tools.

LIST OF EXPERIMENTS: TOTAL HOURS: 30

List of experiments - Lathe:

1. Facing and chamfering
2. Step turning
3. Drilling and taper turning
4. Grooving, and knurling
5. Thread cutting – External and internal

List of experiments – special machines:

6. Internal and external dovetail machining in shaper
7. Spur gear Milling
8. Keyway slotting
9. Pocket Milling
10. Grinding

TEXT BOOKS:

1. P.C. Sarma, “Production Technology”, 3rd edition, S. Chand and Co., 2009.
2. M.P. Groover, “Automation, Production Systems and Computer Integrated Manufacturing”, 3rd edition, PHI Publications, 2008.

REFERENCE BOOKS:

1. H.N. Gupta, R.C. Gupta and Arun Mittal, “Manufacturing Processes”, 2nd editon, New Age International, 2009.
2. AmitabaGhosh and A. Kumar Mallik, “Manufacturing Science”, 1st edition, East West Publishers, 2009.
3. Kalpakjian, “Manufacturing Engineering and Technology”, 4th edition., Pearson Education, 2005.

ACTIVITIES:

- *Mould Preperation and casting different components*
- *Perform forging operations such as drop forging and press/ maching forging*
- *Perform facing, chamfering, step turning, drilling and taper turning using lather machine*
- *Perform milling operation to produce a spur gear*
- *Perform grinding operation to improve surface finish*

16AG208 THEORY OF MACHINES

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	-

Course Description and Objectives:

This course describes the anatomy of mechanisms, machine elements and their response to static and dynamic forces. The objective of this course is to introduce mathematical models used in kinematic and dynamic analysis of machineries. In addition it provides a basic knowledge on kinematic and dynamic designs of machinery as well as mechanical vibrations.

Course Outcomes:

The student will be able to :

- identify common mechanisms in machines used in everyday life.
- calculate mobility using different degrees of freedom.
- analyze velocity, acceleration mechanisms.
- understand gear design, mechanisms, classifications and standards.
- perform static and dynamic force analysis and balancing of masses.
- understand the types of vibrations developed during functioning of any mechanical system.

SKILLS:

✓ *Identify common mechanisms used in machines and their applications.*

✓ *Simulate various mechanisms using various modelling techniques.*

✓ *Measure vibrations in various mechanisms.*

✓ *Determine degree of freedom for mechanisms.*

UNIT - 1 **L-5**

INTRODUCTION TO MECHANISMS: Links, Classifications of links, Kinematic pairs - Lower pairs, Higher pairs; Kinematic chain, Inversion, Four bar chain and slider crank mechanisms, Determination of Degree of freedom of simple mechanisms, Straight line motion mechanisms- Classification of straight line motion mechanisms, Peaucellier's, Tchebicheff's and pantograph mechanisms.

UNIT - 2 **L-7**

VELOCITY AND ACCELERATION IN MECHANISMS: Motion of a link in machine, Velocity of a point on a link, Instantaneous center, Types of instantaneous centers, Kennedy's theorem, Velocity measurement by instantaneous center method, Relative velocity method, Acceleration of a point on a link, Acceleration in slider crank mechanism, Coriolis component of acceleration.

UNIT - 3 **L-6**

GEARS AND GEAR TRAINS: Introduction, Friction wheels toothed gearing, Types of gears, Law of gearing, Condition for constant velocity ratio for transmission, Form of teeth, Cycloidal and involute profiles, Phenomena of interferences, Condition for minimum number of teeth to avoid interference, Expression for arc of contact and path of contact, Introduction to gear train, Train value, Simple, Compound, Reverted and epicyclic gear train, Method to find gear train value.

UNIT - 4 **L-6**

BALANCING: Balancing of rotating masses, Primary, Secondary balancing ,Balancing of reciprocating masses, Analytical and graphical methods, Unbalanced forces and couples, Hammer blow, Swaying couple, Variation of tractive effort.

UNIT - 5 **L-6**

MECHANICAL VIBRATION: Basic Concepts, Types of vibrations, Determination of natural frequency of simple systems, Vibrations of beams due to point loads, Dunkerley's method, Rayleigh's method, Forced and damped vibrations, Vibration isolation and transmissibility, Whirling of shafts, Critical speeds, Torsional vibrations of two and three rotor systems.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Characteristics of four bar mechanism.
2. Variation in velocity and acceleration of the slider crank mechanism.
3. Dynamic balancing of the rotating mass system.
4. Study of the free vibration and determination of natural frequency of vibration of Two- Rotor system.
5. Longitudinal and torsional vibration and determination of natural frequency vibration of single rotor system.
6. Study of damped torsional vibration and determination of damping coefficient.
7. Verification of the relation T = $2\pi\sqrt{l/g}$ for a simple pendulum.
8. Determination of whirling speed of shafts.

ACTIVITIES:

- *Design prototypes of different straight line motion mechanisms.*
- *Simulation and modelling of different mechanisms.*
- *Design of quick return motion mechanism.*
- *Measurement and analysis of vibration in different systems.*

TEXT BOOKS:

1. Thomas Bevan, “Theory of Machines”, 3rd edition, CBS Publishers, 2004.
2. S. S. Rattan, “Theory of Machines”, 4th edition, Tata McGraw-Hill , New Delhi, 2014.

REFERENCE BOOKS:

1. R. L. Norton, “Kinematics and Dynamics of Machinery”, 1st edition, Tata McGraw-Hill, 2009.
2. J. S. Rao and R.V. Dukkipati, “Mechanism and Machine Theory”, 2nd edition, New Age Publications, 2007.
3. J. E. Shigley, “Theory of Machines”, 3rd edition, Oxford Publishers, 2009.

WEB LINKS:

1. http: // nptel.ac.in/courses / 112104121/
2. http: // nptel.ac.in/courses / 112101096/
3. http: // ecoursesonline.iasri.res.in / course / view.php?id=37

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

The student will be able to :

- clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- stand out both in the professional setting as well as for further pursuits in the academic world.
- confidently and successfully attempt all the 4 critical components since this certification looks at LSRW (Listening, Speaking, Reading and Writing) components in great detail.

SKILLS:

- ✓ *Understand and use grammar rules in writing; sentences, paragraphs, paraphrasing.*
- ✓ *Write business emails, memos, letters, reports and proposals.*
- ✓ *Comprehend business articles and documents.*
- ✓ *Use expressions in Professional context and acquire presentation skills like one minute talk and pair discussion in professional context.*
- ✓ *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

ACTIVITIES:

- *Basic grammar practice, Framing paragraphs on topics allocated.*
- *Paraphrasing an article or a video in your own words Finding topic sentences in newspaper articles.*
- *Finding out new words from a professional viewpoint Understanding the meaning and its usage.*
- *Perusing samples of well prepared proposals and reports.*
- *Draft different proposals/reports on topics assigned.*
- *Watching videos/ listening to audios of business presentations.*
- *Classroom activities of team and individual presentations.*
- *Using PPTs, mock exercises for BEC speaking.*
- *Presenting (speaking) the written components completed in Unit 1.*
- *Hand-outs; matching the statements with texts.*
- *Finding missing*

UNIT - 1 **P-6**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage) Elements of technical writing - Sentence structure, Reducing verbosity, Arranging ideas logically, Building coherence, Paragraph level and document level, Topic sentence, Cohesive devices, Transitional words, Paraphrasing and précis-writing; Mechanics of writing - Stylistic elements, The rapporteur, The purpose, The reader's viewpoint (audience); Elementary rules of grammar, Choice of diction, Elementary principles of composition, Matters of form, Punctuation, Conventions of business communication, Language and professional tone, Weak links in business correspondence, Ethical concerns in business writing, Code of conduct (not sending illegal, offensive, Disparaging personal remarks or comments) in written business communication.

UNIT - 2 **P-6**

BUSINESS CORRESPONDENCE: E-mail - Nature and scope, E-mail etiquette, Clear call for action, Common errors in composing e-mails, Office communication such as meeting agenda and minutes of the meeting, Notice, Circular and memo; Letter-Writing - Formal and informal letters, Structure of formal letters, Expressions of salutations, Different types of letters [such as sales letter, Complaint letter, Response to the complaint letter (dispute resolution), Letter of permission, Letter of enquiring, Claim letter - Letter of apology etc]; Introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, Types of reports such as factual reports, Feasibility reports and survey reports, Parts of a report (Such as title page, Declaration, Acknowledgements, Table of contents, Abstract, Introduction, Findings, Conclusion and recommendations, Citations, References and appendices).

UNIT - 3 **P-6**

SPEAKING: Speaking in business context, Assertiveness, Politeness, Making requests, Queries and questions, Negotiations, Asking for information, Offering suggestions, Conflict resolution, Contacting clients, Initiating, Addressing delegates (in public), Features of a good power point presentation (making the PPT), Delivering the presentation effectively, Telephone etiquettes, Delivering seminar/proposal/report effectively, Team meeting etiquettes (face to face and conference call), Making effective one minute presentations.

UNIT - 4 **P-6**

READING: Reading and comprehending business documents, Learning business register, Regularizing the habit of reading business news, Suitable vocabulary, Skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **P-6**

LISTENING: Specific information in business context, Listening to telephonic conversations/messages and understanding the correct intended meaning, Understanding the questions asked in interviews or in professional settings, Summarizing speaker's opinion or suggestion, Enable active listening.

TEXT BOOKS:

1. Guy Brook Hart, “Cambridge English Business Bench Mark: Upper Intermediate”, 2nd edition, CUP, 2014.

2. Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

WEB LINKS:

1. http: // www. cambridgeenglish.org / exams/business-certificates /business vantage/ preparation/

2. https: // www. youtube.com / watch?v=qxFtn9pGaTI.

VFSTR UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

III Year I Semester

L	T	P	To	C
3	1	-	4	4

AE 319 ADVANCED THEORY OF I.C. ENGINES

Course Description & Objectives:

The course aims to develop the students with the knowledge about the advanced theory and working of I.C engines and the phenomena of combustion and modelling.

Course Outcomes:

Upon the successful completion of the course, learners will be able to

1. *Explain the various working cycles of engine*
2. *Describe the various types of combustion in IC engines.*
3. *Illustrate the engine combustion parameters.*
4. *Describe the different types of modern engines.*
5. *Explain the modern electronic engine management system (EMS) of I.C engines.*

UNIT - I: Introduction:

Fuel air cycle and Actual cycle analysis, Properties of IC engine fuels, Refining process, chemical composition and molecular structure of fuels, octane number, cetane number. Knock rating of SI engine fuels.

UNIT - II: Combustion of Fuels:

Combustion Stoichiometry of petrol, diesel, alcohol and hydrogen fuels – Chemical energy and heating values – Chemical equilibrium and maximum temperature – SI engine combustion – Flame velocity and area of flame front –performance number – CI engine combustion. Fuel spray characteristics – droplet size, penetration and atomization.

UNIT - III: Combustion Modelling:

Basic concepts of engine simulation – Governing equations, thermodynamic models – SI engine and CI engine models.

UNIT - IV: Non-Conventional I.C. Engines:

Adiabatic and L.H.R. engines – Variable compression ratio engine – Wankel rotary combustion engine – Free piston engine - MAN combustion chamber and multi fuel engines – Stratified charge and lean burn engines – Locomotive and marine engines.

UNIT – V: Combustion Analysis in I.C. Engines:

Photographic studies of combustion processes – P-è diagrams in SI and CI engines, Rate of heat release – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TEXT BOOKS:

1. Ganesan,V., Internal combustion engines, Tata McGraw Hill Publishing Co., 1994.
2. John,B., Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Publishing Co., New York, 1990.

REFERENCES:

1. Ramalingam. K.K., Internal Combustion Engine, scitech publications, Chennai, 2003.
2. Ganesan,V., Compute Simulation of Spark Ignition engine process, Universities Press (India) Ltd., Hyderabad, 1996.
3. Benson, R.S., Whitehouse, N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979

III Year I Semester	L	T	P	To	C
	3	1	-	4	4

ME319 DYNAMICS OF MACHINES

Course Description & Objectives:

The course will focus on the study of forces, motion and inertia in machines and performance of machines under dynamic conditions and their analysis.

Course Outcomes:

On completion of the course, the students would be able to:

1. *do static and dynamic force analysis on slider crank mechanism but also on other mechanisms.*
2. *demonstrate the torque analysis on any kind of fly wheel i.e., either on engine flywheel or machine flywheel*
3. *calculate the brake force analysis on any type of four wheeler 4. Able to perform the experiment and measure the torque acting on a dynamometer*
4. *conduct experiment on the effect of the gyroscopic torque on any moving/rotating machine*
5. *demonstrate the working principle of a governor and able to identify different types of governors in actual practice*
6. *design different types of bearings.*

7. *calculate the axial force acting/required to operate any clutch.*
8. *do experiment and find out amount of balancing mass required to keep the system in dynamic equilibrium*
9. *balance various types of reciprocating engines.*
10. *understand the types of vibrations developed during functioning of any mechanical system*
11. *find the critical speed of any rotating shaft carrying weights/rotors by conducting experiment.*

UNIT – I: Static and dynamic force analysis:

Introduction, analytical methods to find displacement, velocity and acceleration of the piston, forces acting on connecting rod and crank. **Flywheel:** Turning moment diagram, determination of work done and power from turning moment diagram, fluctuation of energy, flywheels.

UNIT – II: Brakes:

Block brakes, band brakes, differential band brakes, self locking and self energizing brakes, braking force analysis of a four wheeler. **Gyroscope:** Precision motion and its effect on stability of ships, Aeroplanes, and four wheelers.

UNIT – III: Governors:

Watt, Porter and Proell governors, spring loaded governors-Hartnell and Hartung governors, terms associated with governor performance - sensitiveness, isochronism and hunting. **Clutches:** Uniform pressure and uniform wear, single plate and multiplate clutches, cone clutch.

UNIT – IV: Balancing of Rotating Masses:

Balancing of rotating masses, single and multiple masses acting at single and different planes. **Balancing of Reciprocating Masses:** primary, secondary balancing, analytical and graphical methods, unbalanced forces and couples, locomotive balancing- hammer blow, swaying couple and tractive efforts,balancing of inline engines.

UNIT – V: Longitudinal Vibrations:

Introduction – Definitions – Types of Vibrations –Free Longitudinal Vibrations – Damped Vibrations – Logarithmic Decrement – Forced Vibrations – Vibrations Isolation and Transmissibility. **Transverse & Torsional vibrations** – Whirling of Shafts – critical speeds -Free Torsional vibrations - Two rotor systems.

TEXT BOOKS:

1. J.E. Shigley, "Theory of Machines & Mechanisms", 4^{th} ed., Oxford University Press, 2010.
2. R.S.Khurmi and J.K.Gupta, "Theory of Machines", 15^{th} ed., Eurasia

Publishing House (Pvt.) Ltd., New Delhi, 2009.

REFERENCES:

1. William J. Thomson, "Theory of Vibrations with Applications", 5th ed., Prentice Hall, 1997.
2. J.S. Rao and R.V. Dukkipati, "Mechanism and Machine Theory", 2nd ed., New Age International, 2009.
3. S.S. Rattan, "Theory of Machines", 3rd ed., Tata Mc Graw-Hill Education Pvt. Ltd., New Delhi, 2009.

III Year I Semester	L	T	P	To	C
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AE 323 AUTOMOTIVE COMPONENTS DESIGN

Course Description & Objectives:

Course aims to equip the student to analyze the stress and strain on transmission components; and understand, identify and quantify failure modes for the parts. They would be able to demonstrate knowledge on classification /types, functions, materials used, constructional details, methods of manufacturing, Troubles & Remedies.

Course Outcomes:

Upon the successful completion of the course, learners will be able to:

1. *select and design a suitable clutch for the drive system*
2. *select suitable gear ratio and number of speeds to design the gear box for any system.*
3. *estimate the load, moment and stresses on frame members and suspension.*
4. *estimate the load, moment and stresses on front axle and steering system.*
5. *estimate the load, moment and stresses on final drive and rear axle*

UNIT – I: Spur Gears:

Force analysis, Number of teeth, Face width & Beam strength of gear tooth, Incremental dynamic tooth load, Effective load on gear tooth, Estimation of module based on beam strength and wear strength, Spur gear design for maximum power transmission.

Helical Gears: Virtual number of teeth, Tooth proportions, Force analysis, Beam strength and Wear strength of helical gears, Effective load on gear tooth, Herringbone gear.

UNIT – II: Bevel Gears:

Types, Terminology of bevel gears, Force analysis, Beam strength and Wear strength of bevel gears, Effective load on gear tooth, Spiral bevel gears. **Worm Gears**: Terminology, Force analysis, Friction in worm gears, Vector method, Strength rating and wear rating of worm gears, Thermal considerations.

UNIT – III: Gear Box Design:

Ray diagram, gear box configuration and design. **Design of Levers:** Types, Applications in Automobile, design of levers – Rocker arm lever, hand and foot levers.

UNIT – IV: Design and selection of standard components:

Design of flat pulleys, wire ropes, Selection of flat belts,V belts, chains, electric motors, oil seals and gaskets.

UNIT – V: Engine Component Design:

Design of Piston, Piston pin, Connecting Rod, Crankshaft, Cylinder liner, cylinder head.

DESIGN DATA BOOK:

1. PSG Design data book.

TEXT BOOKS:

1. Design of Machine Elements, Bhandari V. B., 2nd ed., Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2000.
2. Mechanical Engineering Design, Joseph E. Shigley & Larry D. Mitchell 6th ed., McGraw-Hill International Book Company, New York.

REFERENCES:

1. M.F. Spotts& T.E. Shoup, “Design of Machine Elements”, 7th ed., Pearson Education.
2. George E. Dieter, “Engineering Design - A Material and Processing Approach”, 2nd ed., McGraw-Hill International edition.
3. Robert C. Junivall, “Fundamentals of Machine Component Design”, 4th ed., John Wiley & Sons, 2000.
4. Paul H. Black & O. Eugene Adams Jr., “Machine Design”, 3rd ed., McGraw- Hill International edition.

III Year I Semester

L	T	P	To	C
4	-	-	4	4

AE 325 AUTOMOTIVE TRANSMISSION

Course Description & Objectives:

To develop the basic knowledge of the students in mechanics, torque conversion areas. To develop the skills of the students in the areas of alternative drives and concepts. To serve as a pre-requisite course for other courses in UG and PG programs specialized studies and research.

Course Outcomes:

On successful completion of this course students will be able to:

1. *understand the concept of gear motions, drive line positions.*
2. *study about different types of gearboxes.*
3. *know about the multi stage and polyphase torque converters, performance characteristics*
4. *study about Automatic transmission*
5. *learn about the different drive systems.*

UNIT I: Vehicle Layouts:

Introduction, Classification of automobile, Types of chassis layout with reference to power plant locations and type of drive, Types of chassis- fully forward, semi forward, Truck or bus chassis, two & three wheeler chassis layout

Clutches: Principle, functions, general requirements, torque capacity, types of clutches, cone clutch, single-plate clutch, diaphragm spring clutch, multi-plate clutch, centrifugal clutch, electromagnetic clutch, lining materials, over-running clutch, Clutch control systems.

UNIT II: Gear Box and Hydrodynamic Drives:

Objective of the gear box. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration. Determination of gear box ratios for different vehicle applications. Different types of gear boxes.

Principles, performance and limitations of fluid coupling Constructional details of a typical fluid coupling. Reduction of drag torque, Principle, construction and advantages of hydrodynamic torque converters. Performance characteristics, converter couplings. Multi-stage Torque converter and poly phase torque converter.

UNIT III: Automatic Transmission

Ford – T model gear box, Wilson gear box- Cotal electric transmission– Hydraulic control systems of automatic transmission.

UNIT IV: Hydrostatic Drive And Electric Drive

Principle of hydrostatic drive systems. Construction and working of typical drives. Advantages and limitations. Control of hydrostatic transmissions, Principle of electric drive. Early and modified Ward Leonard control systems.

UNIT V: Automatic Transmission Applications

Chevrolet “Turboglide” transmission. Toyota’s Automatic transmission with Electronic control system. Continuously Variable Transmission (CVT) – types – Operations.

TEXT BOOKS:

1. Newton, Steed &Garrot, “Motor Vehicles”, 13th ed., Butterworths London,2001.
2. Judge A. W., “Modern Transmission”, 3rd ed., Chapman & Hall Std., London, 1989.
3. Chek Chart, “Automatic Transmission”, A Harper & Raw Publications, 1998.

REFERENCES:

1. Giles J. G., “Steering, Suspension &Tyres”, Lliffe Book Ltd.,London
2. Steed W., “Mechanics of Road Vehicles”, Lliffe Book Ltd.
3. N K Giri, “Automotive Mechanics”, 8th ed., Khanna Publishers, Delhi,
4. Heisler, “Vehicle and Engine Technology”, 2nd ed., SAE International Publication.
5. Heisler, “Advanced Vehicle Technology”, 2nd ed., SAE International Publication.
6. J. Reimpell H. Stoll, J. W. Betzler, “The Automotive Chassis”, SAE International Publication

III Year I Semester	L	T	P	To	C
	4	-	-	4	4

AE 327 AUTOMOTIVE CHASSIS (DEPT. ELECTIVE - I)

Course Description & Objectives:

To understand different types of chassis and to gain knowledge about different types of steering geometry and types of front axle. To educate the students regarding the ergonomics of an automobile and to educate about modern drive line.

Course Outcomes:

On successful completion of this course students will be able to:

1. *Understand the different types of chassis frames.*
2. *Gain knowledge about different steering geometry and types of front axle.*
3. *Study about the various suspension systems*
4. *Study about modern drive line.*
5. *Learn about the different braking systems like power brake, assisted brakes, disc brakes.*

UNIT I: Introduction:

Layout with reference to power plant, steering location and drive, frames, Frameless constructional details, materials, testing of frames, integral body construction.

UNIT II: Front Axle Steering System:

Front axle type, rigid axle and split axle, Constructional Details, Materials, Front wheel geometry viz., camber, castor, kingpin inclination, toe-in and toe-out. Condition for true rolling motion of road wheels during steering. Steering geometry. Ackermann and Davis steering. Construction details of steering linkages. Different types of steering gear box. Steering linkages layout for conventional and independent suspensions. Turning radius, instantaneous centre, wheel wobble and shimmy. Over-steer and under-steer. Power and power assisted steering.

UNIT III: Drive Line Study:

Effect of driving thrust and torque –reaction .Hotchkiss drives. Torque tube drive, radius rods. Propeller shaft. Universal joints. Final drive- different types. Two speed rear axle. Rear axle construction-full floating, three quarter floating and semi-floating arrangements. Differential-conventional type, Non-slip type, Differential locks and differential housing.

UNIT IV: Braking System

Type of brakes, Principles of shoe brakes. Constructional details – materials, braking torque developed by leading and trailing shoes. Disc brake, drum brake theory, constructional details, advantages, Brake actuating systems. Factors affecting brake performance, Exhaust brakes, power and power assisted brakes. Testing of brakes.

UNIT V: Suspension Systems:

Types of suspension, Factors influencing ride comfort, Types of suspension springs-independent suspension- front and rear. Rubber, pneumatic, hydro-elastic suspension. Shock absorbers. Types of wheels. Construction of wheel assembly. Types of tyres and constructional details. Static and rolling properties of pneumatic tyres, tubeless tyres and aspect ratio of tubed tyres.

TEXT BOOKS:

1. K. Newton, W.Steeds and T.K.Garret, "The Motor Vehicle", 13th Edition, Butterworth Heinemann, India, 2004.
2. P.M.Heldt, "Automotive Chassis", Chilton Co., New York, 1982.
3. W.Steed, "Mechanics of Road Vehicles", Illiffe Books Ltd., London. 1992.

REFERENCES:

1. Harban Singh Rayat, "The Automobile", S. Chand & Co. Ltd, New Delhi, 2000.
2. G.J.Giles, "Steering Suspension and Tyres", Illiffe Books Ltd., London, 1975.
3. Kirpal Singh, "Automobile Engineering", Standard publishers, Distributors, Delhi, 1999.
4. G.B.S.Narang, "Automobile Engineering", Khanna Publishers, Twelfth reprint New Delhi, 2005.
5. R.P.Sharma, "Automobile Engineering", Dhanpat Rai & Sons, New Delhi, 2000.

III Year I Semester	L	T	P	To	C
	4	-	-	4	4

AE 329 TWO AND THREE WHEELERS TECHNOLOGY (DEPT. ELECTIVE - I)

Course Description & Objectives:

To develop the basic knowledge of the students in constructional details of two and three wheelers. To develop the skills of the students in the operating principles.

Course Outcomes:

On successful completion of this course students will be able to:

1. *understand the working of two and four stroke engines.*
2. *understand the functioning of clutch and gear box.*
3. *know the wheels, tyres, suspensions and braking systems.*
4. *familiarize the latest models of two wheelers.*
5. *understand the operations of three wheelers and latest models of three wheelers.*

UNIT I : Power Unit:

Two stroke SI engine, four stroke SI engine; merits and demerits. Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes;

merits and demerits, scavenging pumps. Rotary valve engine. Fuel system. Lubrication system. Magneto coil and battery coil spark ignition system, electronic ignition system. Starting system; Kick starter system.

UNIT II : Chassis and Sub-Systems:

Mainframe and its types. Chassis and shaft drive, Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar.

UNIT III: Brakes, Wheels and Tyres

Drum brakes, disc brakes, front and rear brake links, layouts. Spoked wheel, cast wheel, disc wheel, disc types. Tyres and tubes.

UNIT IV: Two Wheelers:

Case study of major Indian models of motorcycles, scooters and mopeds. TVS mopeds and motorcycles, HeroHonda motorcycles, Bajaji scooters and motorcycles, Yamaha, Enfield motorcycles. Servicing and maintenance.

UNIT V: Three Wheelers:

Case study of Indian models. Auto rickshaws, pickup van, delivery van and trailer. Maintenance:& Fault tracing.

TEXT BOOKS:

1. Irving.P.E. - Motor Cycle Engineering - Temple Press Book, London – 1992.
2. The Cycle Motor Manual - Temple Press Limited, London - 1990

REFERENCES:

1. Encyclopedia of Motorcycling - 20 volume Marshall, Cavensih, UK - 1989
2. Brayant R.V,Vespa - Maintenance and Repair Series – S.Chand & Co., New Delhi - 1986.
3. Raymond Broad Lambretta - A Practical Guide to maintenance and repair – S.Chand & Co., New Delhi - 1987.

III Year I Semester	**L**	**T**	**P**	**To**	**C**
	4	-	-	4	4

ME 327 METROLOGY & INSTRUMENTATION (DEPT. ELECTIVE - I)

Course Description & Objectives:

Metrology course is aimed to provide knowledge of limits, gauges, linear and angular measurements. Different process parameters like temperature, pressure, flow rate are very much important in process industry for the quality production. Students are given sufficient exposure of these techniques through this course.

Course Outcomes:

On completion of the course, the student would acquire:

1. *sound knowledge in gauge design and gauge selection*
2. *angle measurement with various measuring instruments*
3. *different comparators working and selection, measurement of surface finish by different techniques*
4. *various transducers working and application to physical parameters by the instruments*
5. *different techniques to measure temperature force and flow.*

UNIT – I: Introduction to metrology:

Line and end standards – Theory of limits, fits and tolerances - Fundamental deviation – types – Grades of tolerances – Fits – Types of fits - Hole basis and shaft basis systems – Interchangeability and selective assembly. Limit Gauges - Taylor's principle – GO and NO GO
gauges – plug and ring gauges.

UNIT – II: Linear, Angle,Taper and Optical measurements:

Linear measurements : Slip gauges – Dial indicators – Micrometer. **Angle and Taper measurement :** Bevel protractor – Angle slip gauges —sine bar – Taper determination using Rollers and spheres. **Optical Measurements:** Optical flats – NPL Interferometer.

UNIT – III: Comporators & Surface roughness measurement:

Comporators : Mechanical – Electrical – Pneumatic comparators. **Surface roughness measurement :** Surface roughness and surface texture – Numerical assessment of surface finish – CLA – RMS- Ten point height of irregularity - Measuring Instruments - Profilograph – Talysurf.

UNIT – IV: Introduction to Instrumentation & Displacement measurements:

Generalized configuration and functional description of measuring instruments - Static and dynamic characteristics - Calibration. Displacement measurements: Theory and construction of various transducers to measure displacement - Resitance type - LVDT – Capacitive type - piezo electric type Instruments

UNIT – V: Temperature, Strain Measurements:

Temperature Measurements: various principles of temperature measurements, expansion thermometers, resistance thermometers, thermistors, thermocouples, pyrometers **Strain measurements:** Various types of strain measurements, electrical resistance strain gauge, gauge factor - configurations to measure tensile, compressive and bending strains.

TEXT BOOKS:

1. D.S.Kumar, "Mecahnical Measurements & Controls", 5th ed., Metropolitan Book Pvt. Ltd., 2012.
2. R.K.Jain, "Engineering Metrology", 20th ed., Khanna Publishers, New

Delhi, 2009.

REFERENCES:

1. R.K. Rajput, “Mechanical Measurements & Instrumentation”, 3rd ed., S.K. Kataria & Sons, 2010.
2. E.O. Doebelin, “Measurement Systems”, 6th ed., Tata Mc Graw Hill, New Delhi, 2011.

III Year I Semester	**L**	**T**	**P**	**To**	**C**
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AE 331 VEHICLE EVALUATION & MAINTENANCE LAB

Course Description & Objectives:

To develop the Practical knowledge in the field of Automobile Engine components. To impart the fundamental knowledge in evaluation & maintenance.

Course Outcomes:

On successful completion of this course students will be able to understand the complete methodology of evaluation & maintenance of automobile and develop skills in dismantling & assembling of automobile components using instruments and special tools. They would acquire knowledge and skills in the fundamental disciplines of an evaluation & maintenance concepts of an automobile components..

List of experiments:

1. Study and layout of an automobile repair, service and maintenance shop.
2. Study and preparation of different statements/records required for the repair and maintenance works.
3. Study and preparation of the list of different types of tools and instruments required.
4. Minor and major tune up of gasoline and diesel engines
5. Fault diagnosis in electrical ignition system, gasoline fuel system, diesel fuel system and rectification
6. Study of the electrical systems such as head lights, side or parking

lights, trafficator lights, electric horn system, windscreen wiper system, starter system and charging system.

7. Study and checking of wheel alignment

8. Simple tinkering, soldering works of body panels, study of door lock and window glass rising mechanisms.

9. Practice of the following:

i) Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play

ii) Air bleeding from hydraulic brakes, air bleeding of diesel fuel system

iii) Wheel bearings tightening and adjustment

10. Practice of the following

i) Adjustment of head lights beam

ii) Removal and fitting of tyre and tube

III Year I Semester	L	T	P	To	C
	-	-	3	3	2

AE 333 AUTOMOTIVE CHASSIS AND TRANSMISSION LAB

Course Description & Objectives:

To develop the practical knowledge in the field of automobile engineering by imparting the fundamental knowledge of chassis and running system.

Course Outcomes:

On successful completion of this course students will be able to understand the various types of frames and develop skills in dismantling and assembling of chassis components. They would be able to undertake minor repairs and trouble shoots the breakdowns and demonstrate front wheel steering geometry and steering system layout along with power steering, steering gear boxes etc.

List of experiments:

Chassis Lab

1. Demonstration of front wheel steering geometry and steering system layout.

2. Demonstration of power steering.
3. Demonstration of steering gear boxes.
4. Experiment on computerized wheel balancing and front wheel alignment.
5. To open the master cylinder, wheel cylinder, identify the different components, sketch & assemble.
6. Demonstration of compressed air, vacuum servo and parking brake.
7. Demonstration of conventional leaf spring suspensions of light, heavy vehicle.

Transmission Lab

1. Demonstration, study and sketching of different vehicle layouts and its comparison.
2. Demonstration, study and prepare dimensional sketch of single plate clutch.
3. Demonstration, study and prepare dimensional sketch of multiplate clutch..
4. Demonstration, study and prepare dimensional sketch of Sliding mesh gear box.
5. Demonstration, study and prepare dimensional sketch of Continuous variable transmission unit (CVT).
6. Demonstration, study and prepare dimensional sketch of differential and final drive

III Year I Semester

L	T	P	To	C
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AE 335 TWO AND THREE WHEELERS TECHNOLOGY LABORATORY

Course Description & Objectives:

To develop the basic knowledge of the students in constructional details of two and Three Wheelers and to develop the skills of the students in the operating principles.

Course Outcomes:

On successful completion of this course students will be able to understand the working of two and four stroke engines and the functioning of clutch and gear box. They would be knowing the wheels, tyres, suspensions and braking systems and familiarize the latest models of two wheelers

List of experiments:

1. Performance test of a two wheeler using chassis dynamometer.
2. Performance test on shock absorber
3. Performance test on shock absorber
4. Two wheeler chain test
5. Brake and Clutch adjustment as per specification
6. Dismantling and assembling of two wheeler gear box and finding gear ratios
7. Dismantling and assembling of three wheeler box and finding gear ratios
8. Three wheeler brake and clutch play adjustment
9. Dismantling and assembling of three wheeler steering system.
10. Study of three wheeler chassis frame and power transmission system

III Year II Semester

L	T	P	To	C
4	-	-	4	4

AE 320 VEHICLE BODY ENGINEERING

Course Description & Objectives:

To develop the basic knowledge of the students in design of the vehicles body to give maximum comfort for the passengers and exposed to the methods of stream lining the vehicles body to minimize drag.

Course Outcomes:

On successful completion of this course students will be able to:

1. *understand the concept of car body design, passenger safety, crumple zone and crash testing.*
2. *know the concepts of wind tunnel testing and vehicle body optimization techniques to reduce drag.*
3. *familiarize the various types of bus body construction, seating layout, regulations and comfort.*
4. *understand the various heavy vehicle bodies, driver's visibility and cabin design.*
5. *know the different types of materials and painting techniques for vehicle body.*

UNIT- I: Car Body:

Types: saloon, convertibles, limousine, estate car, racing and sports car. Visibility: regulations, driver's visibility, tests for visibility, methods of improving visibility and space in cars. Safety: safety design, safety equipments for cars. Car body construction; design criteria, prototype making, initial tests, crash tests on full scale model, Dummies and Instrumentation.

UNIT-II : Vehicle Aerodynamics:

Objectives. Vehicle drag and types; various types of forces and moments, effects of forces and moments, side wind effects on forces and moments, Various body optimization techniques for minimum drag, wind tunnel testing: flow visualization techniques, scale model testing, component balance to measure forces and moments.

UNIT- III: Bus Body:

Types: mini bus, single decker, double-decker, two level and articulated bus. Bus body layout; floor height, engine location, entrance and exit location, seating dimensions. Constructional details: frame construction, double skin construction, types of metal sections used, Regulations, Conventional and integral type construction.

UNIT-IV: Commercial Vehicle:

Types of body; flat platform, drop side, fixed side, tipper body, tanker body, Light commercial vehicle body types. Dimensions of driver's seat relation to controls. Drivers cab design.

UNIT –V: Body Materials, Trim and Mechanisms:

Steel sheet, timber, plastic, GRP, properties of materials; Corrosion, anticorrosion methods. Selection of paint and painting process. Body trim items. Body mechanisms.

TEXT BOOKS:

1. Sydney F. Page, "Body Engineering", 3rd ed. Chapman & Hill Ltd., London.
2. J Fairbrother, "Fundamentals of Vehicle Body work", Hutchinson, London.
3. P.M. Heldt, "Automotive Chassis", Chilton Co. NK

REFERENCES:

1. John Fenton, "Vehicle Body Layout & Analysis", Hutchinson, London.
2. J Powloski, "Vehicle Body Engineering", Business Books Ltd., London.
3. J.G. Giles, "Body Construction and Design", Vol. 6.,llefe Books/ Butterworth & Co. London
4. Crouse W. H. &Anglin D. L., "Automotive Chassis", McGraw-Hill Int. Book Co.
5. P. L. Kohli, "Automotive Chassis & Body", Papyrus Publishing House, New Delhi.
6. Dr. V. Sumantran and Dr. Gino Sovram, "Vehicle Aerodynamics Published" SAE International, USA
7. Wolf-Heinrich Hucho, "Aerodynamics of Road Vehicles" Published by SAE International, USA
8. A. Robinson, W. A. Livesey, "The Repair of Vehicle Bodies" Published by Butterworth-Heinemann LTD.
9. John Fenton, "Handbook of Automotive Body Construction and Design Analysis" Professional Engineering Publishing.

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ME 320 HEAT TRANSFER

Course Description & Objectives:

This course is designed to introduce a basic study of the phenomena of heat to develop methodologies for solving a wide variety of practical engineering problems, and to provide useful information concerning the performance and design of particular systems.

Course Outcomes:

On completion of the course, the student would be able to:

1. *understand the basic laws of heat transfer.*
2. *account for the consequence of heat transfer in thermal analyses of engineering systems.*
3. *analyze problems involving steady state heat conduction in simple geometries.*
4. *develop solutions for transient heat conduction in simple geometries.*
5. *obtain numerical solutions for conduction and radiation heat transfer problems.*
6. *understand the fundamentals of convective heat transfer process.*
7. *evaluate heat transfer coefficients for natural convection.*
8. *evaluate heat transfer coefficients for forced convection inside ducts.*
9. *evaluate heat transfer coefficients for forced convection over exterior surfaces.*
10. *analyze heat exchanger performance by using the method of log mean temperature difference.*
11. *analyze heat exchanger performance by using the method of heat exchanger effectiveness.*
12. *calculate radiation heat transfer between black body surfaces.*
13. *calculate radiation heat exchange between gray body surfaces.*

UNIT – I: Introduction:

Modes and mechanisms of heat transfer - Basic laws of heat transfer - General discussion about applications of heat transfer. Conduction Heat Transfer: Fourier’s law - General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

UNIT – II: One Dimensional Steady State Conduction Heat Transfer:

Homogeneous slabs, hollow cylinders and spheres - overall heat transfer coefficient, electrical analogy - Critical radius of insulation. systems with heat sources or Heat generation. Heat transfer through extended surfaces – rectangular fins.

UNIT – III: One Dimensional Transient Conduction Heat Transfer:

Systems with negligible internal resistance -Significance of Biot and Fourier Numbers – Chart solutions of transient conduction systems.

UNIT – IV: Convective Heat Transfer:

Concepts about Continuity, Momentum and Energy Equations. Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer - Flat plates and Cylinders. Heat Exchangers: Classification of heat exchangers - overall heat transfer Coefficient and fouling factor -Concepts of LMTD and NTU methods – Heat Exchanger design using LMTD and NTU methods.

UNIT – V: Boiling and Condensation:

Pool boiling - Regimes, Calculations on Nucleate boiling, Critical Heat flux and Film boiling: Film wise and drop wise condensation - Nusselt's Theory of Condensation on a vertical plate. Radiation Heat Transfer **:** Emission characteristics and laws of black-body radiation heat exchange between two black bodies - concepts of shape factor - Emissivity - heat exchange between grey bodies -radiation shields – electrical analogy for radiation networks.

DATABOOK:

1. C. P. Kothandaraman, "Heat And Mass Transfer Data Book", 6th ed., New Age International Publishers Ltd., 2007.

TEXT BOOKS:

1. Holman J.P "Heat transfer" 10th ed., McGraw Hill, London, 2009.
2. R.K.Rajput, "Heat And Mass Transfer", 4th ed., S.Chand & Co, New Delhi, 2008.

REFERENCES:

1. R C Sachdeva. "Fundamentals of Engineering Heat and Mass Transfer". 4th Edition, New Age International Publishers Ltd., 2009.
2. Sukhatme S.P., "Heat Transfer", 4th Edition, University Press India Ltd., 2006.
3. Frank P. Incropera, David P. DeWitt, "Fundamentals of Heat and Mass Transfer", 7th Edition, Wiley Publications, 2011.
4. R Yadav "Heat Transfer", 6th Edition, McGraw Hill Publications, 2004.

   R.K. Rajput, Thermal Engineering, 8th Edition, Laxmi Publications, New Delhi, 2010.

III Year II Semester

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AE 324 MODERN VEHICLE TECHNOLOGY

Course Description & Objectives:

The objectives are to familiarize with the latest Automobile accessories and equipments of modern vehicle systems with help of electronic systems.

Course Outcomes

On successful completion of this course students will be able to:

1. *know about the Modern Automobile accessories and engine management systems.*
2. *gain knowledge about various suspension systems.*
3. *understand the concept of automotive air-conditioning systems.*
4. *know about various collision warning systems.*
5. *know about passenger comfort and convenient systems.*

UNIT – I: Driver Information Systems:

Introduction, driver support systems – driver information, driver perception, driver convenience, driver monitoring. Vehicle support systems – general vehicle control, collision avoidance, vehicle status monitoring.

UNIT – II: Driver Assisting Systems:

Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition, driver assistance systems.

UNIT – III: Safety Systems:

Active and passive safety systems, Airbags, seat belt tightening system, collision warning systems, child lock, anti lock braking systems, traction control, Electronic Stability Programme. Crash worthiness of vehicle, vehicle crash testing, testing with dummies. **Security Systems:** Anti theft technologies, smart card system, number plate coding.

UNIT – IV: Comfort Systems:

Active suspension systems, requirement and characteristics, different types, power steering, collapsible and tiltable steering column, power windows, biometric systems. **Adaptive Control Systems:** Adaptive cruise control, adaptive noise control, anti spin regulation, cylinder cut- off technology.

UNIT – V: Electronic Engine Management:

The Feedback control carburettor, single point and multipoint injection system, working of electronic fuel injector, different types of electronic fuel injection systems like L, K, KE, LU, LH and Motronic, ME & MH systems.

TEXT BOOKS:

1. LjuboVlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.
2. Ronald K Jurgen, "Navigation and Intelligent Transportation Systems – Progress in Technology", Automotive Electronics Series, SAE, USA, 1998.

REFERENCES:

1. William B Riddens, "Understanding Automotive Electronics", 5th ed., Butter worth Heinemann Woburn,1998.
2. Bechhold, "Understanding Automotive Electronics", SAE, 1998.
3. Robert Bosch, "Automotive Hand Book", 5th ed., SAE, 2000.
4. Patent No. 20070284869, Automotive passenger restraint and protection apparatus.
5. Patent No. 20080011732, Passenger seat having occupant detector for automotive vehicle.
6. Patent No. 20070273166, System for detecting objects colliding with automotive vehicle

III Year II Semester	L	T	P	To	C
	3	1	-	4	4

AE 326 VEHICLE DYNAMICS

Course Description & Objectives:

Students undergoing this course are expected to apply fundamental knowledge of the students in automotive field in the areas of vehicle vibrations and describe the skills of the students in stability of vehicles and their effects, related with longitudinal, vertical & lateral dynamics.

Course Outcomes:

Upon the successful completion of the course, learners will be able to:

1. describe the basic fundamental of vibration.
2. analyze multi degree freedom system for mode shape in transmission linkages.
3. analyze the vehicle directional stability and roll behavior

4. enumerate the suspension systems, tyre dynamics & directional stability of the vehicle.
5. *analysis the vehicle dynamic by using statistical methods*

UNIT I: Basics of Vibration:

Classification of vibration, definitions, mechanical vibrating systems, mechanical vibration and human comfort. Modeling and simulation studies. Single degree of freedom, multi degree freedom systems, free, forced and damped vibrations. Magnification factor and transmissibility. Vibration absorber. Two degree of freedom system. Modal analysis.

UNIT II: Dynamics of Suspension & Tyres:

Requirements of suspension system. Spring mass frequency, wheel hop, Wheel wobble, wheel shimmy, choice of suspension spring rate. Calculation of effective spring rate. Vehicle suspension in fore and aft & roll axis. Human response to vibration, vehicle ride model. Tire forces and moments, rolling resistance of tires, relationship between tractive effort and longitudinal slip of tyres, cornering properties of tyres, ride properties of tyre.

UNIT III: Stability of Vehicles

Resistance, types of resistance, Load distribution, stability on a curved track slope and a banked road, calculation of tractive effort and reactions for different drives.

UNIT IV: Performance & Handling Characteristics of Vehicles:

Equation of motion and maximum tractive effort. Aerodynamics forces and moments. Power plant and transmission characteristics. Prediction of vehicle performance. Braking performance. Steering geometry. Steady state handling characteristics. Steady state response to steering input. Transient response characteristics. Directional stability of vehicle.

UNIT V: Basics of Car Aerodynamics:

Objects — Vehicle types of drag. Various types of forces and moments. Effects of forces and moments. Various body optimization techniques for minimum drag. Principle of wind tunnel technology. Flow visualization techniques. Test with scale models.

TEXT BOOKS:

1. Giri N.K – Automotive Mechanics, Khanna Publishers, 2002.
2. Rao J.S and Gupta. K “Theory and Practice of Mechanical Vibrations”, Wiley Eastern Ltd., New Delhi -2, 2002.
3. J. Y. Wong, “Theory of Ground Vehicles”, 3rd ed., John Willey & Sons, New York, 1997.

REFERENCES:

1. Heldt.P.M -"Automotive Chassis"- Chilton Co., New York- 1992
2. Ellis.J.R - "Vehicle Dynamics"- Business Books Ltd., London- 1991
3. Giles.J.G.Steering - "Suspension and Tyres", Illiffe Books Ltd., London- 1998
4. Ham B, Pacejka - Tyre and Vehicle Dynamics - SAE Publication - 2002

III Year II Semester	L	T	P	To	C
	4	0	-	4	4

AE328 SPECIAL PURPOSE VEHICLES (DEPT. ELECTIVE -II)

Course Description & Objectives:

To develop the basic knowledge of the students in design of the tractor body to give maximum comfort for the driver. To develop the skills of the students in the areas of off road vehicle safety design and operation

Course Outcomes:

On successful completion of this course students will be able to:

1. *understand the concept of general design of tractors, safety, crumple zone and crash testing.*
2. *know the concepts of cooling system, lubrication system and fuel system of a tractor.*
3. *familiarize the various types of farm tractor transmission systems*
4. *understand the various driver's visibility and cabin design.*
5. *know the different types of farm equipments.*

UNIT – I: General Design of Tractors:

Classification of tractors - Main components of tractor - Safety rules. **Fundamentals of Engine Operation :**Tractor controls and the starting of the tractor engines - Basic notions and definition - Engine cycles – Operation of multicylinder engines - General engine design – Basic engine performance characteristics.

UNIT – II: Engine Mechanism of Tractor:

Cylinder and pistons - Connecting rods and crankshafts - Engine balancing – Construction and operation of the valve mechanism - Valve mechanism components - Valve mechanism troubles.

UNIT – III: Cooling System, Lubrication System and Fuel System:

Cooling system - Classification - Liquid cooling system - Components, Lubricating system servicing and troubles - Air cleaner and turbo charger - Fuel tanks and filters – Fuel pumps.

UNIT – IV: Farm Tractor Transmission System:

Layout, Load distribution, Transmission & Drive line, Steering, Braking system, Wheels &Tyres, Hydraulic system, Auxiliary Systems, Draw bar, PTO Shaft.

UNIT – V: Farm Equipment:

Working attachments of tractors - Farm equipment - Classification – Auxiliary equipment - Trailers and body tipping mechanism.

TEXT BOOK:

1. E.L.Barger, J.B.Liljedahl,W.M.Carleton, E.G.Mckibben “Tractors & their Power Units”, 3rd ed., Chapman & Hall, 1989.

REFERENCES:

1. Rodichev and G.Rodicheva, “Tractor and Automobiles”, MIR Publishers, 1987.
2. Kolchin. A., and V. Demidov “Design of Automotive engines for tractor”, MIR Publishers, 1972

III Year II Semester	L	T	P	To	C
	4	0	-	4	4

AE 330 ELECTRONIC ENGINE MANAGEMENT SYSTEMS (DEPT. ELECTIVE - II)

Course Description & Objectives:

The objectives are to familiarize with the latest Automobile accessories and equipments

Course Outcomes:

On successful completion of this course students will be able to:

1. *know about the modern automobile accessories and engine management systems.*

2. *gain knowledge about various pid controls.*
3. *understand the concept of various sensors and actuators.*
4. *know about various si engine management systems.*
5. *know about various c.i. engine management systems.*

UNIT – I: Fundamentals of Automotive Electronics:

]Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Parameters to be controlled in SI and CI engines.

UNIT – II: Sensors and Actuators:

Inductive, Hall Effect, hot wire, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, mass air flow, crank shaft position, cam position, engine and wheel speed, steering position, tire pressure, brake pressure, steering torque, fuel level, crash, exhaust oxygen level (two step and linear lambda), knock, engine temperature, manifold temperature and pressure sensors.

UNIT – III: S.I. Engine Management:

Three way catalytic converter, conversion efficiency versus lambda. Layout and working of SI engine management systems like Bosch Monojetronic, L-Jetronic and LH-Jetronic. Group and sequential injection techniques. Working of the fuel system components.Advantages of electronic ignition systems.Types of solid state ignition systems and their principle of operation, Contactless electronic ignition system, Electronic spark timing control.

UNIT – IV: C.I. Engine Management:

Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system.Layout of the common rail fuel injection system.Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valve.

UNIT – V: Digital Engine Control System:

Cold start and warm up phases, idle speed control, acceleration and full load enrichment, deceleration fuel cutoff. Fuel control maps, open loop control of fuel injection and closed loop lambda control – Integrated engine control system, Exhaust emission control engineering, Electromagnetic compatibility – EMI Suppression techniques – Electronic dash board instruments – Onboard diagnosis system.

TEXT BOOKS:

1. William B Ribbens. Understanding Automotive Electronics, SAE 1998.

REFERENCES:

1. Robert Bosch. Diesel Engine Management, SAE Publications.

2. Robert Bosch. Gasoline Engine Managemen, SAE Publications.
Eric Chowanietz. Automobile Electronics by SAE Publications.

III Year II Semester	**L**	**T**	**P**	**To**	**C**
	4	0	-	4	4

AE 332 AUTOMOTIVE SAFETY (DEPT. ELECTIVE - II)

Course Description & Objectives:

To provide good exposure to automotive safety aspects including the understanding of the various safety equipments.

Course Outcomes:

On completion of the course, the students would be exposed to:

1. *various comfort features*
2. *recent technologies in automobile field*
3. *exterior and interior safety features and their necessity*

UNIT I: Introduction:

Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

UNIT II: Safety Concepts:

Active safety: driving safety, conditional safety, perceptibility safety, operating safety, passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT III: Safety Equipments:

Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety. **UNIT IV: Collision Warning and Avoidance:**

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V: Comfort and Convenience System:

Steering and mirror adjustment, central locking system , Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TEXT BOOKS:

1. Bosch, "Automotive Handbook", 8th Edition, SAE publication, 2011.
2. Powloski. J., "Vehicle Body Engineering", Business books limited, London, 1969.

REFERENCES:

1. Ronald.K.Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill Inc., 1999.

III Year II Semester	**L**	**T**	**P**	**To**	**C**
	-	-	3	3	2

AE334 MINI PROJECT

Course Description & Objectives:

Objective of the mini project is to enable student analytical and practical exposure by giving hands on experience with learned knowledge through different courses. It prepares the student to efficiently handle the main project for better output.

Course Outcomes:

By undergoing this course, the student will try to integrate and apply the knowledge gained through different courses into practical problems and to analyse the system for its productivity and feasibility.

III Year II Semester

L	T	P	To	C
-	-	3	3	2

ME439 HEAT TRANSFER LAB

Course Description & Objectives:

Through this course, students will study about the various heat transfer processes, so as to train the students practically to utilize this knowledge in industry.

Course Outcomes:

On completion of the course, the students would be able to perform experiments on heat conduction, convection and radiation. They will be able to identify the heat exchange properties of various metals.

List of experiments

1. Composite Slab Apparatus - Overall heat transfer co-efficient.
2. Heat Transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere.
4. Thermal Conductivity of given metal rod.
5. Heat transfer through pin-fin
6. Experiment on Transient Heat Conduction.
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection.
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Shell and tube heat exchanger.

III Year II Semester

L	T	P	To	C
-	-	3	3	2

HS304 PROFESSIONAL COMMUNICATION LABORATORY

Course Description & Objectives:

The course is aimed at improving written communication skills of undergraduate students and preparing them to meet professional challenges in the work spheres. This course will work on the relationship between professional writing and a personality that is able to meet the goals of an organization in creative and innovative ways.

Course Outcomes:

To enable students to write logical sentences and paragraphs, use appropriate diction, grammar and punctuation and to expose them to the world of business and business register. It also aims to make them compose clear and concise business messages and to produce business documents for mailing to external recipients or intra-organizational circulation. It aims to enable them to speak business English for handling various business situations.

UNIT – 1: Technical Writing:

Elements of Technical Writing : Sentence structure - reducing verbosity - arranging ideas logically – building coherence - paragraph level and document level - topic sentence - cohesive devices – transitionals – paraphrasing – précis-writing. Mechanics of Writing: Stylistic elements – the rapporteur- the purpose- the reader (audience) -elementary rules of grammar- choice of diction - elementary principles of composition - matters of form – punctuation - conventions of business communication -language and tone - weak links in business correspondence - ethical concerns in business writing.

UNIT-II: Reports:

Parts of the Report: Writing an abstract - features of a good abstract – approach - compare and contrast - cause and effect. Types of Technical Reports : Drafting a technical proposal - formal and informal proposals - factual reports, feasibility reports, survey reports – parts of a report - title page –declaration – acknowledgements – table of contents - abstract – introduction – conclusion – citations – references - appendices - oral reports and presentations.

UNIT-III: Letter-Writing:

Formal and informal letters - structure of formal letters - expressions of salutations, introductory and concluding paragraphs - different types of letters - sales letter - complaint letter - adjustment letter - letter to the editor - covering letter - claim letter – letter of condolence.

UNIT-IV: Business Correspondence:

E-mail – nature and scope - e-mail etiquette – Common Errors in composing e-mails – Quotations - Inviting quotations - sending quotations –placing orders. Office Communication - agenda - notice – circular. Effective Resume-Writing: Structure and presentation - defining career objective - projecting one's strengths and skill-sets. Summarizing - formats and styles - covering letter.

UNIT-V: Business Proposals:

Drafting business proposals - calculating profit and loss-averages - ratios and proportions – partnership - simple interest - compound interest - calculating volumes and areas. course of action - cause and effect- theme detection - making judgments - logical deductions - analyzing arguments – syllogisms - Venn diagrams - matching definitions -verbal reasoning - numerical reasoning - working out justifications.

REFERENCES:

1. Strunk , William, Jr.*The Elements of Style*, Fourth Edition,
2. Rozakis, Laurie, Ph.D, (2003). *English Grammar for the Utterly Confused*, McGraw-Hill
3. Sharma. C. (1978) *Business Correspondence & Report Writing*, Tata McGraw-Hill
4. Kirkman, John. *Good Style: Writing for science & technology*, Routledge Study Guides, second edition.
5. Monippally, Matthukutty. M. 2001. *Business Communication Strategies*. 11th Reprint. Tata McGraw-Hill. New Delhi.

VFSTR UNIVERSITY

IV Year - B.Tech

SYLLABUS

I SEM & II SEM

IV Year I Semester

L	T	P	To	C
4	-	-	4	4

AE 423 AUTOTRONICS

Course Description & Objectives:

Students will learn concepts and develop basic skills necessary to diagnose automotive electrical problems while, starting, charging, lighting systems, advanced automotive electrical systems etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. *recognise and understand the different wiring diagrams used in manufacturer's workshop manuals.*
2. *identify the various modules and sensors from the wiring diagrams.*
3. *determine the function and operation of the various modules and sensors and have a good knowledge of how they are used in the management of the vehicle control.*
4. *communicate with the customer and the technician as to the faults observed and how it can be rectified.*
5. *understand the various functions of the sensors and actuators in the field of automotive applications.*

UNIT – I: Introduction to automotive electrical systems:

Automotive generation, storage & distribution systems, wiring harness, circuit diagrams and symbols, 12/24/42 volt system, positive earth and negative earth, earth return and insulated return systems, Multiplexed wiring systems, Electromagnetic compatibility, Electromagnetic interference, Controlled Area Networks (CAN)

Battery : Types, Principle of lead acid battery, Constructional details, Recharging the battery, Battery ratings, Battery Performance, Battery capacities, Battery efficiency, Battery tests, Battery failures, Alkaline battery, maintenance free batteries, hybrid batteries

UNIT – II: Charging Systems & Regulators:

D.C. Generators, A. C. Generators, Magnetos Constant current & voltage systems, Current & voltage regulator, Semi conductor type regulator, Regulator for alternators

Starting Systems: Requirements of Starting system, starting system layout, selection of motor, matching battery, Drive mechanisms, Permanent magnet motors

UNIT – III: Ignition systems:

Introduction, types, Ignition coil, Distributor, Cam angle & Contact angle gap, Advance mechanisms, Ballast Resistance, Limitations of coil ignition,

Transistorized Ignition systems, Spark plugs, types, construction.
Lighting systems: Fundamentals, Headlight, types, lighting circuits, interior lighting, signaling, LED lighting, Gas discharge lighting.

UNIT – IV: Automotive Equipments& Accessories:

Fuel gauge, oil pressure gauge, Temperature gauges, Speedometer, Warning Lights, Electric Horn, Horn Relay, Wind Shield wipers, Heaters & defrosters, Electric windows.
Automotive Sensors & Actuators: Actuators, Air-flow rate sensor, angular position sensor, Throttle angle sensor, Temperature sensor, Knock sensor, Pressure sensor. Feedback for engine control, Solenoid actuators, motorized actuators.

UNIT – V : Automotive Electronic Systems:

Electronic Ignition systems, Electronic injection systems, Antilock brake system circuit, Traction control, Electronic control of automobile transmission, Active suspension, Engine management system, ESP 06.

Electric and hybrid vehicles: Types, Energy sources – batteries, Fuel cells, Solar and Hydrogen, Electric machines and controllers, Design considerations, challenges and recent developments.

TEXT BOOKS:

1. Tom Denton, 'Automobile Electrical & Electronic Systems', SAE International
2. Young, Griffithe, 'Automobile Electrical & Electronic Equipments', The English Language Book Co., London.
3. Bechfold SAE 1998, 'Understanding Automotive Electronics'.

REFERENCES:

1. V.A.W.Hilliers, 'Fundamentals of Automotive Electronics', 2nd ed., Hatchin, London, 1997.
2. Tomwather J. R., Cland Hunter, 'Automotive Computer & Control System', Prentice Inc. NJ.
3. Robert N. Brandy, 'Automotive Computers & Digital Instrumentation', 3rd ed., Prentice Hall Eaglewood, Cliffs, NJ., 1998.
4. P. L. Kohli, 'Automotive Electrical Equipments', 3rd ed., Tata McGraw Hill Pub. Co. Ltd., 2000.

IV Year I Semester

L	T	P	To	C
4	-	-	4	4

AE 425 AUTOMOTIVE EMISSION & CONTROL

Course Description & Objectives:

To develop the basic knowledge of the students in automobile engines pollution formation & control techniques, measurement techniques and to make them understand the social, cultural, global and environmental responsibilities of the professional engineer, and the principles of sustainable design and development.

Course Outcomes:

On successful completion of this course students will be able to:

1. *understand the emission and its effect on human health and environment.*
2. *know about the formation of pollutant in si engine.*
3. *understand the formation of pollutant in ci engine*
4. *have knowledge on emission control techniques.*
5. *understand the emission measurement techniques, emission standards and various test procedure*

UNIT – I: Introduction:

Emissions - sources of emission, effect of pollution on human health. Emission norms - Euro & Bharat emission regulations and emission test cycles.

UNIT – II: Emissions From SI and CI Engines:

Emission formation in SI and CI engines – causes for emissions, engine modifications to reduce emissions, role of fuels in engine emission, effect of fuel properties and additives on emissions, emissions from LPG, CNG, alcohols, bio fuels.

UNIT – III: Emission Measurement and Control Techniques:

Crank case emission control, fuel evaporation & control, EGR, intake temp control, air injected exhaust, thermal reactors, SCR, catalytic converters – types, catalytic mechanism, tuning of mechanical systems - A/F ratio control. NDIR analyzer, flame ionization detectors, chemiliuminescent analyzer, smoke meters, gas chromatograph.

UNIT – IV: Noise Control:

Identification of noise sources, quantification, control of air borne noise - use of noise absorber, barrier, different materials, criteria for the selection of materials, control of structure borne noise - treatments for vibration damping materials for hood liner and head liner, resonance and ill effects of resonance.

Characteristics of vehicle noise, sources of vehicle noise, engine noise, techniques for locating and measuring engine noise, engine noise control techniques, inlet and exhaust noise mechanism and control, noise from cooling system, transmission noise and tyre noise. Anechoi chamber.

UNIT – V: Vibration Control:

Introduction, vibration analysis, sources of vibration, damping of vibration, rubber mountings, vibration isolation and absorption. Constrained and extensive layer dampings. Engine and drivetrain vibrations, vehicle and chassis vibration.Application of plastics and composites in automobiles.

TEXT BOOKS:

1. John B Heywood, "Internal Combustion Engine Fundamentals", 2nd ed., McGraw Hill International ed.s, 1988.
2. Matthew Harrison, "Vehicle Refinement – Controlling Noise and Vibration in Road Vehicles", 4th ed., Elsevier Butterworth-Heinemann, Burlington, 2004.

REFERENCES:

1. Heinz Heisler, "Advanced Engine Technology", SAE 1995.
2. Robert Hickling and Mounir M. Kamal, "Engine Noise – Excitation, Vibration and Radiation", 2nd ed., Plenum press, New York, 1982.
3. "Automobiles and pollution" SAE Transaction, 1995.
4. Springer and Patterson, "Engine Emission", 2nd ed., Plenum Press, 1990.
5. White R G and Walkar J G, "Noise and Vibration", 4th ed., Ellis Horwood Ltd., 2000.

IV Year I Semester	L	T	P	To	C
	3	1	-	4	4

AE 427 AUTOMOTIVE SYSTEM DESIGN

Course Description & Objectives:

To analyze the stress and strain on transmission components; understand, identify and quantify failure modes for the parts and to impart knowledge on classification types, functions, materials used, constructional details, methods of manufacturing and troubles & remedies.

Course Outcomes:

Upon the successful completion of the course, learners will be able to

1. *select and design a suitable clutch for the drive system.*
2. *select suitable gear ratio and number of speeds to design the gear box for any system.*
3. *estimate the load, moment and stresses on frame members and suspension.*
4. *estimate the load, moment and stresses on front axle and steering system.*
5. *estimate the load, moment and stresses on final drive and rear axle*

UNIT – I: Considerations in design:

Statistics in design, design for natural tolerances, statistical analysis, mechanical reliability.

Design of clutches: Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, multi-plate clutch and centrifugal clutch.

UNIT – II: Design of gearbox and final drive:

Selection of gear ratios & final drive ratio, Design of gears, shafts, splines and housing, selection of bearings. Design of final drive & differential gearing, Selection of wheels and tyres.

UNIT – III: Design of brake, axle systems:

Design of hydraulic braking system, Internal expanding shoe brake and disc brake. Design of axles & propeller shafts: Design of front & rear axles, Design of propeller shafts for bending, torsion & rigidity, Design of universal joints and slip joints.

UNIT – IV: Design of suspension System:

General design considerations of suspension system, Design of leaf springs for automobile suspension system, Design considerations of Belleville springs, Elastomeric springs, Air (Pneumatic) springs.

UNIT – V: Optimization:

Introduction to design optimization of mechanical elements, adequate & optimum design, methods of optimization, Johnson's method of optimum design-Simple problems in optimum design like axially loaded members, shaft subjected to torsional and bending moments and other machine elements.

TEXT BOOKS:

1. Joseph E. Shigley& Larry D. Mitchell, 'Mechanical Engineering Design', Fourth ed., McGraw-Hill International Book Company, 2007.
2. R.C. Johnson, 'Optimum Design of Mechanical Elements', 2nd ed., John Wiley & Sons, 1997.

REFERENCES:

1. Patil S.P., 'Mechanical System Design', 2nd ed., Jaico Publishers, 1997.
2. M. F. Spotts& T.E. Shoup, 'Design of Machine Elements', Seventh ed., Pearson Education.
3. Bhandari V. B., 'Design of Machine Elements', 2nd ed., Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2000.
4. Julian Happian – Smith, 'An Introduction to Modern Vehicle Design', Butterworth Heinemann
5. Pandya N.C.& Shah C.S., 'Elements of Machine Design', Twelth ed., 1994, Charotar Publishing House.
6. J.S. Arora, 'Introduction to Optimum Design', 2nd ed., McGraw-Hill Book Company Ltd., 1998.

IV Year I Semester	L	T	P	To	C
	4	-	-	4	4

AE429 INDUSTRIAL ECONOMICS & MANAGEMENT

Course Description & Objectives:

To equip the student to make decisions in the industry considering the economic, managerial aspects.

Course Outcomes:

On completion of the course, the student would be able to:

1. *understand various aspects other than technical like financial, marketing, and industrial safety*
2. *know the labour acts that play a critical role in the successful product delivery.*
3. *appreciate the economics of engineering management for optimum product delivery.*

UNIT – I: Functions of Management:

Definition of Management,Characteristics, Objectives, hierarchy,Importance, Forecasting.Organizing – Process &Principles,types. Human Resource management functions.DouglasMcGregor's Theory X and Theory Y, Maslow's hierarchy of human needs.

UNIT – II: Engineering Economics:

Introduction to basic economics terms such as demand and supply, Time value of money, cash flows, depreciation, Types of depreciation, reasons for depreciation, Methods of computing depreciation, sinking fund method, Declining balance method, Investment decisions for capital assets, evaluation criteria for Investment decisions, Payback period, average rate of return.

UNIT – III: Financial Management:

Sources of Finance, financial statements, Balance sheet and P & L Account, Break even Analysis and its applications, accounting ratios. Marketing: Marketing Concepts – Objective –Types of markets, Market Segmentation, Market strategy- 4 P's of market, Market Research, Advertising.

UNIT – IV: Production Management:

Selection of site, plant layout – objectives, principles, types, merits & demerits of different types of layout, PERT / CPM, Work Study, Method study, Work Management.

UNIT – V: Materials Management:

Scope, advantages, functions of materials management, Purchasing objectives, Functions of Purchase department, Purchasing cycle, Purchase procedure, Inventory Control - ABC
Analysis, EOQ.

TEXT BOOKS:

1. Gene Burton and Manab, Thakur, "Management, Today – Principles and Practice" 2nd ed., Tata McGraw Hill Publishing Company, New Delhi, 2000.
2. O.P. Khanna, "Industrial Engineering & Management", 8th ed., DhanpatRai& Sons, New Khanna Publishers, New Delhi, 2006.

REFERENCES:

1. Keith Davis, "Human Behavior at Work Organizational Behavior", 2nd ed., Tata McGraw Hill Publishing Company, New Delhi, 2000.
2. J.P.Bose, S. Talukdar, "Business Management", 3rd ed., New Central Agencies (P) Ltd., 2007.
3. Philip Kotler, "Marketing Management", 2nd ed., Prentice Hall of India New Delhi.
4. JawaharLal, "Costing & Cost Control", 4th ed., Tata McGraw Hill, 2006.

IV Year I Semester

L	T	P	To	C
4	-	-	4	4

AE 431 AUTOMOTIVE AERODYNAMICS (DEPT. ELECTIVE - III)

Course Description & Objectives:

The subject aims to provide guidance to industry on reducing the aerodynamic drag in heavy truck vehicles, develop innovative drag reducing concepts that are operationally and economically sound and establish a database of experimental, computational, and conceptual design information

Course Outcomes:

On successful completion of this course students will be able to:

1. *evaluate basic fluid theory.*
2. *apply cfd to a range of problems.*
3. *understand lift, drag and down force definitions and calculations.*
4. *demonstrate a knowledge and understanding of aerodynamics in automotive field.*
5. *understand the principles and functions of wind tunnel.*

UNIT – I: Introduction:

Scope, historical developments, fundamentals of fluid mechanics, flow phenomenon related to vehicles, external and Internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics, engine cooling requirement, air flow to passenger compartment, duct for air conditioning, cooling of transverse engine and rear engine.

UNIT – II: Aerodynamic drag of Cars:

Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag profiles.

UNIT – III: Shape Optimization of Cars:

Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners.

UNIT – IV: Vehicle Handling:

Origin of forces and moments on a vehicle, lateral stability problems, methods to calculate forces and moments – vehicle dynamics under side winds, the effects of forces and moments, characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles.

UNIT – V: Wind Tunnels for Automotive Aerodynamics:

Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods.

TEXT BOOK:

1. Hucho W H, "Aerodynamic of Road vehicles", 2nd ed., Butterworth Co. Ltd., 1997.

REFERENCES:

1. Pope A, "Wind Tunnel Testing ", John Wiley & Sons, 2nd ed., New York, 1974.
2. Automotive Aerodynamic: Update SP-706, SAE, 1987.
3. Vehicle Aerodynamic, SP-1145, SAE, 1996.

IV Year I Semester	L	T	P	To	C
	3	1	-	4	4

ME 322 FINITE ELEMENT METHODS (DEPT. ELECTIVE - III)

Course Description & Objectives:

Course aims to equip the students with the Finite Element Analysis fundamentals, to introduce domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.

Course Outcomes:

Upon completing this course, the students will be able to:

1. *identify mathematical model for solution of common engineering problems.*
2. *formulate simple problems into finite elements.*
3. *solve structural, thermal and fluid flow problems.*
4. *derive element matrix equation by different methods and applying basic laws in mechanics and integration by parts.*
5. *solve complicated 3d structural problems for stress analysis under impact loads.*

UNIT – I: Finite Element Analysis:

Historical background - weighted residual methods-basic concept of fem - variational formulation of B.V.P.- Ritz method-finite element modeling - element equations - linear and quadratic shape functions - bar, beam elements - applications to heat transfer.

UNIT – II: Finite Element Analysis of 2D Problems:

Basic boundary value problems in 2 dimensions-triangular, quadrilateral, higher order elements - poissons and laplace equation - weak formulation - element matrices and vectors-application to solid mechanics, heat transfer, fluid mechanics.

UNIT – III: ISO-Parametric Formulation:

Natural co-ordinate systems - lagrangian interpolation polynomials - soparametric elements – formulation - numerical integration - 1D, 2D, triangular elements - rectangular elements - illustrative examples.

UNIT – IV: Solution to Plane Elasticity Problems:

Introduction to theory of elasticity-plane stress-plane strain and axisymmetric formulation principles of virtual work, consistent and lumped formulation-use of local co-ordinates, element matrices using energy approach.

UNIT – V: Special Topics:

Dynamic analysis – equation of motion - mass matrices - free vibration analysis - natural frequencies of longitudinal - transverse and torsional vibration - introduction to transient field problem - non linear analysis - use of softwares - h and p elements - special element formulation.

TEXT BOOKS:

1. Chandraputla, Ashok and Belegundu , "Introduction to Finite Elements in Engineering", 3rd ed., PHI Publishers, 2009.
2. S.S. Rao, "The Finite Element Methods in Engineering", 4th ed., Pergamon, 2005.

REFERENCES:

1. J.N. Reddy, "An introduction to Finite Element Method", 3rded., McGraw Hill, 2005.
2. Alavala, "Finite Element Methods", 2nd ed., PHI, 2008.
3. Kenneth H. Huebner, Donald L. Dewhirst, "The Finite Element Method for Engineers", 4th ed., John Wiley & Sons (ASIA), 2007.
4. C.S. Krishna Murthy, "Finite Element Analysis", 2nd ed., Tata MC graw Hill, 2005.

IV Year I Semester

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ME 423 ROBOTICS (DEPT. ELECTIVE - III)

Course Description & Objectives:

The objective of this course is to establish an understanding of robot anatomy, design and synthesis of manipulator mechanism, kinematics, end effector, trajectory planning, machine vision, real world interface and problem associated with their design.

Course Outcomes:

Students would be able to:

1. *get an idea to be familiar with the automation and brief history of robot and construction of a manipulator.*
2. *familiarize with the kinematics of robots and basics of robot control systems.*
3. *know about robot end effectors, their design and their pros and cons.*
4. *know about various Sensors, their applications in robots and a brief understanding of robot vision.*
5. *understand a wide knowledge about the various real world and industrial application or robot in the current days.*

UNIT – I: Concepts on robotics:

Definition of automation-programmable automation - flexible automation - Definition of a Robot - Basic Concepts - Robot configurations – characteristics of robots – accuracy and repeatability-load carrying capacity - Actuators - Basic robot motions - Point to point control - Continuous path control.

UNIT – II: Control systems:

Basic control system concepts – control system analysis – robot actuation and feed back,Manipulators – direct and inverse kinematics – the Denavit-Hartenberg Transformation Method – Coordinate transformation.

UNIT – III: End effectors:

End effectors. Types of Robot end effectors – Grippers, tools as end effectors – End effectors interfacing. Automated Manufacturing Work Cell – Concepts and Design.

UNIT – IV: Sensors:

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing – Image processing and analysis. Encoders - tachometers.

UNIT – V: Applications:

Application and characteristics of robots in machining - Welding – Assembly - Material handling -Loading and unloading – spray painting - inspection – forging -medical surgery - CIM.

TEXT BOOKS:

1. Spong M. and Vidyasagar M., “Robot Dynamics and Control”, 2nd ed., John Wiley & Sons, 2008.
2. Mikell P. Groover, Mitchell Weiss, “Industrial Robotics, Technology, Programming and Applications”, 2nd ed., McGraw Hill International, 2008.

REFERENCES:

1. K.S. Fu., R.C.Gonalez and C.S.G.Lee, “Robotics Control sensing, Vision and Intelligence”, 1st ed., McGraw Hill International, 2nd reprint 2008.
2. R.K. Mittal & I.J.Nagrath, “Robotics and Control”, 2nd ed., Tata McGraw Hill, 6th reprint 2007.
3. Saeed B.Niku, “Introduction to Robotics Analysis, Systems, Applications”, 2nd ed., PHI Learning Publication, 2009.
4. S.K. Saha, “Introduction to Robotics”, 2nd ed., Tata McGraw Hill, 2009.

IV Year I Semester	L	T	P	To	C
	4	-	-	4	4

AE 435 PRODUCT DATA MANAGEMENT & COLLABORATIVE PRODUCT COMMERCE (DEPT. ELECTIVE - IV)

Course Description & Objectives:

The subject introduces the various concepts involved in the successful launch of a new product starting from design to delivery and also the services required over the entire life cycle of an automobile product in particular.

Course Outcomes:

Upon the successful completion of the course, learners will be able to

1· *summarise the various trends affecting product decision*

2· *identify the requirements to create new product.*

3. *compare different techniques involved in design creation and design testing.*
4. *rephrase the methods of model creation and integration between software and hardware.*

UNIT – I: Introduction:

Product development process and functions-present market constraints-need for collaboration use of internet class technologies and data transfer, variants of e-commerce.

UNIT – II: Product Life Cycle:

Concept of product life cycle management and the benefits, value addition to customer. Lifecycle models, concepts on roles, users and project management, system administration, access control and its use in life cycle.

UNIT – III: Automating Business Process:

Work flows, life cycle-work flow integration, product configuration, product structure. configuration management and change management.

UNIT – IV: CAD Integration in PDM:

Use of CAD neutral visualization tools in product development, Examples, tools used for integration of CAD systems with PDM/PLM systems.

UNIT – V: ERP System:

Integration with PDM – use of I middleware in integrating business applications in product development. Software: PDM/CPC/PLM software and their comparison.

TEXT BOOKS:

1. Michael Grieves, “Product Life Cycle Management”, 3rd ed., Tata McGraw Hill, 2006.
2. David S Linthicum, “B2B Application Integration”, 1st ed., Addison Wesley, England, 2001.

REFERENCES:

1. Faisal Hogue, “E-Enterprise Business Models Architecture and Components”, 1st ed., Cambridge University Press, United Kingdom, 2000.
2. Alexis Leon, “Enterprise Resource Planning”, 2nd ed., Tata McGraw Hill, New Delhi, 2007.
3. Danier Amor, “The E-Business Revolution”, 2nd ed., Pearson Education Asia, New Delhi, PHI, 2002.
4. John W Gosnay and Christine M Mears, “Business Intelligence with Cold Fusion”, 2nd ed., Prentice Hall India, New Jersey, 2000.

IV Year I Semester

L	T	P	To	C
4	-	-	4	4

AE 437 TRANSPORT MANAGEMENT (DEPT. ELECTIVE – IV)

Course Description & Objectives:

Students undergoing this course are expected to manage a transport fleet and their related activities for minimizing operational cost and have the knowledge about the motor vehicle acts, insurance& taxation regulations etc.

Course Outcomes:

Upon the successful completion of the course, learners will be able to:

1. *apply the principles of personnel management*
2. *describe the various transport systems and advantages of motor transport.*
3. *assess the operating costs for transport vehicles and estimate the fare structure.*
4. *apply the motor vehicle act in fleet management*
5. *apply the various maintenance activities to vehicles*

UNIT – I: Motor Vehicle Act:

Short titles & definitions, Laws governing to use of motor vehicle & vehicle transport, Licensing of drivers & conductors, Registration of vehicle, State & interstate permits, Different types of RTO forms, Rules regarding construction of motor vehicles, Central Motor Vehicle Rules & amendments, Government administration structure - Organization & management of motor vehicle department, Traffic rules, Signals & controls, responsibility of driver, Public relations & public authorities, Accidents, Causes & analysis, Liabilities & preventive measures, Offences, penalties & procedures, Personnel, Authorities & duties.

UNIT – II: Taxation & Insurance:

Objectives, Bombay Motor Vehicle Taxation Act, Structure & methods of laving taxation, Onetime tax, Tax exemption & tax renewal. Insurance: Significance & types of insurance, Comprehensive, Third party insurance, Furnishing of particulars of vehicles involved in accident, Award of the claims tribunal, MACT (Motor Accident Claims Tribunal), Solatium Fund, Hit & run case, accident claims & survey report including post accident procedures, Duty of driver in case of accident, Surveyor & Loss Assessor.

UNIT – III: Passenger Transport Operation:

Structure of passenger transport organizations, introduction to road corporation act, Typical depot layouts, requirements, Problems on fleet management, Fleet maintenance, Bus & Crew Scheduling, significance of Motor Transport Workers act, personnel & training - training for drivers & conductors, Public relations, passenger amenities, advertisement work, Theory of fares, Basic principles of fare charging, Differential rates for different types of services, Depreciation & debt charges, operation cost, Revenues, Economics & records. Management Information System (MIS) in passenger transport operation.

UNIT – IV: Goods Transport Operation:

Structure of goods transport organizations, scheduling of goods transport, Freight calculations, Management Information System (MIS) in goods transport operation, storage & transportation of petroleum products.

UNIT – V: Advance Techniques in Traffic Management:

Vehicle & traffic navigation system, global positioning system, advanced traffic control devices, Intelligent Transport System.

TEXT BOOKS:

1. Motor Vehicle Act - Govt. of India Publications.
2. Santosh Sharma, "Productivity in Road Transport", 2nd ed., Association of State Road Transport Undertakings, New Delhi.
3. P.G.Patankar, "Road Passenger Transport in India", 2nd ed., CIRT, Pune, 2008.

REFERENCES:

1. S.K. Shrivastava, "Economics of Transport"
2. Transport Development in India, S. Chand & Co. Pvt. Ltd., New Delhi.
3. Gupte& Dighe, "Motor Vehicle Laws in Maharashtra", Hind Publications.
4. Bus Transport operation, L. Kitchin.

IV Year I Semester

L	T	P	To	C
4	-	-	4	4

AE 439 NEW GENERATION AND HYBRID VEHICLES (DEPT. ELECTIVE – IV)

Course Description & Objectives:

To illustrate the new generation vehicles and their operation and controls.

Course Outcomes:

Upon completion of this course the student will be familiar in the recent developments:

1. *pertaining to energy system, vehicle operation, and newer vehicles.*
2. *on the area of suspension systems, brakes, aerodynamics etc*

UNIT I: Introduction:

Electric and hybrid vehicles, flexible fuel vehicles (FFV), solar powered vehicles, magnetic track vehicles, fuel cells vehicles.

UNIT II: Power System and New Generation Vehicles:

Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

UNIT III: Vehicle Operation and Control:

Computer Control for pollution and noise control and for fuel economy – Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT IV: Vehicle Automated Tracks:

Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel, GPS.

UNIT V: Suspension, Brakes, Aerodynamics and Safety:

Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs-crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards.

TEXT BOOKS:

1. Heinz, “Modern Vehicle Technology” Second Edition, Bu
2. Bosch Hand Book, SAE Publication, 2000

REFERENCES:

1. Light weight electric for hybrid vehicle design.

2. Advance hybrid vehicle power transmission, SAE.
3. Noise reduction, Branek L.L., McGraw Hill Book company, New York, 1993.

IV Year I Semester	L	T	P	To	C
	-	-	3	3	2

AE 441 AUTOMOTIVE TESTING LAB

Course Description & Objectives:

Students undergoing this practical course are expected to know the fuel system equipments like Carburettors, and fuel supply and know the Ignition system, vacuum test, Valve clearance, ignition system, charging Nozzle testing.

Course Outcomes:

The students will be able to test and repairs carburettors for checking the various parameters, ignition system and nozzle testing for optimum working and servicing of alternator and starting system.

List of Experiments:

1. Engine component measurements.
2. Carburetor trouble shooting and servicing.
3. Ignition system trouble shooting and servicing.
4. Compression and vacuum test on petrol engine.
5. Valve clearance adjustment.
6. Nozzle testing and servicing.
7. Battery testing.
8. Servicing of alternator and starting system trouble shooting
9. Morse test.
10. Exhaust gas emission measurement on diesel and petrol engine.

IV Year I Semester

L	T	P	To	C
-	-	3	3	2

AE 443 AUTOTRONICS LAB

Course Description & Objectives:

Students undergoing this practical course are expected to know the electrical equipments like starter motor, and alternator and the batteries, wiring system, lighting system, ignition system, charging system. They would understand the basics of electronics, rectifiers, filters and logic gates.

Course Outcomes:

The students will be able to test and repair batteries for various parameters, starter motor, Alternator and electronic ignition system for correct working and rectifiers, head light, filters, A/D convertors for optimum operation.

List of Experiments:

1. Demonstration of automotive electrical and electronic systems layout
2. Demonstration of battery charging & battery testing
3. Demonstration and testing of alternators
4. Demonstration & testing of starting motors
5. Demonstration of electronic ignition system
6. Demonstration of dash board panel instruments & controls
7. Demonstration of headlight beam alignment
8. Testing of auto electrical components on multifunction tester
9. Testing of CDI coil, spark plug and armature
10. Demonstration of microcontroller 8051
11. Demonstration of electric bike and hybrid vehicle
12. Demonstration of ECU diagnostic system

IV Year I Semester

L	T	P	To	C
-	-	3	3	2

AE 445 DESIGN ANALYSIS AND SIMULATION LAB

Course Description & Objectives:

To develop the practical knowledge in the field of automobile component designing and to impart the fundamental knowledge in designing and drafting.

Course Outcomes:

On successful completion of this course students will be able to understand the complete methodology of design &drafting and develop skills in designing the automobile engine components using software like AutoCAD.

List of experiments:

1. **Drafting:** Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script, DXE AND IGES FILES.

2. **Part Modeling:** Generation of various 3D Models through Protrusion, revolve, shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators. Design simple components.

3.
   a) Determination of deflection and stresses in 2D and 3D trusses and beams.

   b) Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.

   c) Determination of stresses in 3D and shell structures (at least one example in each case)

   d) Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.

   e) Steady state heat transfer Analysis of plane and Axisymmetric components.

4.

a) Development of process sheets for various components based on tooling Machines.

b) Development of manufacturing and tool management systems.

c) Study of various post processors used in NC Machines.

d) Development of NC code for free form and sculptured surfaces using CAM packages.

e) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.

f) Quality Control and inspection.

IV Year II Semester

L	T	P	To	C
3	1	-	4	4

AE 422 AUTOMOTIVE AIRCONDITIONING

Course Description & Objectives:

The subject aims to discuss principles and the various processes of air conditioning, the thermodynamics involved and optimal design of the various subsystems and methods to distribute conditioned air in the space.

Course Outcomes:

On successful completion of this course students will be able to:

1. *understand the laws of thermodynamics and basic refrigeration cycles.*
2. *know about the refrigerants, refrigeration equipments.*
3. *understand the psychrometric tables and charts, processes, combinations and calculations.*
4. *have knowledge on heating and cooling load calculation.*

UNIT – I: Review of Thermodynamics:

Laws, General equations, Processes, Equations applied to processes, definitions & methods of refrigeration. Basic Refrigeration Cycles: Carnot cycle, Reversed Carnot cycle, Simple Vapour compression cycle, sub-cooling, superheating, Liquid to suction vapour heat exchanger, Calculations and performance of above cycles, Actual vapor compression cycle.

UNIT – II: Refrigerants:

Classification, requirements of refrigerants like Thermodynamic, physical, & chemical. Comparison among commonly used refrigerants, Selection of Refrigerants, Effect on Ozone depletion and global warming, Alternative Refrigerants. Refrigeration Equipments: Compressor, Condenser, Evaporator, Expansion devices, Types & performance characteristics, selection, methods of charging and leak testing.

UNIT – III: Psychrometry:

Moist air as a working substance, Psychrometric properties of air, Use of Psychrometric tables and charts, Processes, Combinations and Calculations, ADP, Coil Condition line, Sensible heat factor, Bypass factor. Comfort: Thermal exchange between human body and environment, factors affecting comfort, effective temperature comfort chart, ventilation requirements, outside & inside design conditions.

UNIT – IV: Heating and Cooling Load Calculation:

Representation of actual air conditioning process by layouts and on psychrometric charts, Load analysis RSHF, GSHF, ESHF, Enumeration and brief explanation of the factors forming the load on refrigeration and air conditioning systems, load calculation of automobile vehicle for comfort and transport air conditioning. Energy conservation in air conditioning systems.

UNIT – V: Air Distribution System:

Re-circulated air, Ventilation air, duct system, principle of duct sizing and air distribution, it's norms, diffusers, dampers, layout, duct systems.

TEXT BOOKS:

1. S.C. Arora & Domkundwar, "A Course in Refrigeration and Air Conditioning", 2nd ed., Dhanpatrai& Sons, 2009.
2. Dossat, "Principles of Refrigerations", 2nd ed., Wiley Eastern, 2006.

REFERENCES:

1. Manohar Prasad, "Refrigeration and Air Conditioning", 2nd ed., New Age, 2002.
2. C.P. Arora, "Refrigeration and Air Conditioning", 3rd ed., Tata McGraw Hill 2009.

IV Year II Semester	**L**	**T**	**P**	**To**	**C**
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AE 424 ALTERNATIVE FUELS AND ENERGY SYSTEMS (DEPT. ELECTIVE – V)

Course Description & Objectives:

This subject gives an idea about the depleting nature of the fossil fuels and the importance of tapping some alternatives to that and the various alternatives like solar, wind energy and the energy generation from hydrogen, fuel cells, bio conversion are introduced and a study about their production is given.

Course Outcomes:

On successful completion of this course students will be able to:

1. *understand the fossil fuel and its effect on human health and environment.*
2. *know about the use of alternative fuels and solar thermal system.*
3. *understand the hydrogen gases and fuel cells.*
4. *have knowledge on solar photovoltaic systems.*
5. *understand the wind energy techniques, bioconversion applications.*

UNIT – I: Fossil fuel:

Impact of fossil fuel based systems, World scenario of Energy Resources, Indian Scenario of Energy Resources - new and renewable energy – sources and features.

Introduction to Alternate Fuels**:** Need for alternate fuel, availability and properties of alternate fuels, general use of alcohols, LPG, hydrogen, CNG.

UNIT – II: Use of alternative fuels:

Modification of engines required for use of alternative fuels. Engine performance and emission characteristics, Limitations and advantages.

Solar Thermal System: Solar potential, Solar radiation spectrum, Solar radiation geometry, Solar radiation data, Radiation measurement, Technologies of thermal energy collection, Types of Solar Collectors, Collection efficiency.

UNIT – III: Hydrogen:

Properties of hydrogen with respect to its utilization as renewable forms of energy, sources of hydrogen, production, transportation, storage, application & economics of hydrogen**.**

Principle, Types, Full cell for Automotive application (PEM), PEM fuel cell stack construction, performance.

UNIT – IV: Solar Photovoltaic systems:

Operating Principle, Photovoltaic cell concepts, Photo-cell materials, Cell module array, Series and parallel connections, Applications & applications related to automobiles. Hybrid vehicles.

UNIT – V: Wind Energy:

Wind parameters and wind data, Power from wind, Site selection, Wind energy conversion systems and their classification, Construction and working of typical wind mill, characteristics of wind generators, Design considerations for wind mills.

Bioconversion: Introduction, biological & biochemical conversion, Energy plantation, Combustion and fermentation, anaerobic digester, Biomass gasification, Pyrolysis, various applications of Biomass energy, Bio-fuel – Relevance, types, and applications.

TEXT BOOKS:

1. B. P. Pundir, "Engine Emissions", 2nd ed., Narosa Publications, 1998.
2. E.F. Oberts, "Internal Combustion Engine and Air Pollution", 3rd ed., Harper & Row Publisher, New York, 2000.

REFERENCS:

1. A.W. Judge, "Carburetion and Fuel Injection System", 4th ed., Motor Manual, Vol. 2, The Caxton Pub. Co. Ltd., London.

2. H.H. Willard and Others, “Instrumental Method of Analysis”, 2nd ed., CBS Publishers & Distributors, Delhi, 2002.
3. J.G. Giles, “Vehicle Operation & Testing” (Automotive Vehicle Technology Vol. 7), McGraw Hill, 1997.
4. G.B.S. Narang, “Automobile Engineering”, 4th ed., CBS Publishers & Distributors, Delhi, 2004.
5. John k Pearson,” Improving air quality”.
6. Richard L.Bechfold, “Alternative Fuels Guide Book”, SAE International, Warrendale, 1997.

IV Year II Semester	L	T	P	To	C
	4	-	-	4	4

AE 426 MOTOR SPORT ENGINEERING (DEPT. ELECTIVE – V)

Course Description & Objectives:

The course should enable the students to gain knowledge in introduction to motorsport engineering and able to list out the events and competitions. It will also enable them to develop interest about the national and international events.

Course Outcomes:

The students shall be able to:

1. *Understand the advantages of motorsports industry.*
2. *Brief about the events and competitions*
3. *Take part in national and international events*
4. *Apply knowledge to design and built the vehicle as per the rules and regulations.*
5. *Execute and make themselves as a flagship engineer in motorsport industry.*

UNIT 1 – Introduction to Motorsport Engineering:

The history of motorsport engineering-Review of motorsport engineering-Pioneers of Motorsport engineering -Motorsport technology evolution review-Secrecy in Motorsport engineering

UNIT 2 – List of Motorsport Competitions for Students:

A brief look at all the events students can take part to develop their skills - Formula SAE - Baja SAE - SAE Super mileage.

UNIT 3 – Professional Motorsport Events:

The various types of professional motorsport events that take place around the world - Cars – Formula One, World rally championship, Touring car championship, GP2, GP3, World Endurance Racing Championship, dirt track racing, NASCAR, Indy Car, Cross Country rallies, drag racing - Motorcycles – MotoGP, Superbike, Endurance, Motocross, Supermoto, Freestyle, Trials, Cross-country rallies, Speedway, Board track, drag racing.

UNIT 4 – Rules and Regulations of Motorsports:

All about the most important book for a motorsport engineer – the rule book - About – the world governing bodies of the sport - Why the rule book keeps changing - How to interpret the rule book- Rules for car races - Rules for bikes races

UNIT 5 – Career in Motorsports:

A sneak peek into all the awesome jobs- Motorsport Engineer Race Driver / Rider – Test Driver / Rider - Design engineer - Race technician -Aerodynamics Engineer - Race official / steward.

TEXT BOOKS:

1. Andrew Livesey. Basic Motorsport Engineering: Publication Date: 17 Feb 2011 ISBN-10: 0750689099 ISBN-13: 978-0750689090

REFERENCES:

1. Smith's Fundamentals of Motorsport Engineering by Josh Smith Publication Date: 26 April 2013 ISBN-10: 1408518082, ISBN-13: 978-1408518083 Edition: New edition

2. Hillier's Fundamentals of Motor Vehicle Technology Book 1Sixth Edition by Alma Hillier Publication Date: 17 Mar 2012 | ISBN-10: 1408515180 | ISBN-13: 978-1408515181 | Edition: 2

3. www.motorsport.com

4. www.motorsportwebsites.co.uk

5. www.motorsportmagazine.com

IV Year II Semester

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3	1	-	4	4

ME 326 COMPUTATIONAL FLUID DYNAMICS (DEPT. ELECTIVE - V)

Course Description & Objectives:

Students will be taught to appreciate how computers are used to perform millions of calculations required to simulate the interaction of fluids and gases with the complex surfaces used in engineering.

Course Outcomes:

1. *understand the process of developing a geometrical model of the flow, applying appropriate boundary conditions, specifying solution parameters, and visualizing and analyzing the results.*
2. *become conscious of the limitations of cfd and develop an appreciation for the factors limiting the accuracy of cfd solutions.*
3. *to develop an understanding for the major theories, approaches and methodologies used in cfd and apply it to numerically solve the governing equations for fluid flow*
4. *to build up the skills in the actual implementation of cfd methods (e.g. boundary conditions, turbulence modelling etc.)*
5. *understand and apply finite difference and finite volume methods to fluid flow problems*
6. *understand how to assess stability and conduct a grid-convergence assessment.*

UNIT – I: Governing Equations and Boundary Conditions:

Basics of computational fluid dynamics – Definition and overview of CFD, need, advantages, problem areas, Governing equations of fluid dynamics – Continuity, Momentum and Energy equations –– Physical boundary conditions – Time-averaged equations for Turbulent flow - Turbulence -Kinetic -Energy Equations – mathematical behavior of PDEs in CFD: Elliptic, Parabolic and Hyperbolic equations.

UNIT – II: Discretization and Solution Methodologies:

Methods of Deriving the Discretization Equations - Taylor Series formulation – Finite difference method – Control volume Formulation – Detailed treatment of Finite Difference method, explicit and implicit methods, errors and stability analysis.

Solution methodologies: The Lax-Wendroff Technique, MacCormack's Technique, Space marching, Direct and iterative methods, Thomas algorithm, Relaxation method, Alternating Direction Implicit method.

UNIT – III: Heat Conduction:

Finite difference and finite volume formulation of steady/transient one-dimensional conduction equation, Source term linearization, Incorporating boundary conditions, Finite volume formulations for two and three dimensional conduction problems.

UNIT – IV: Convection and Diffusion:

Finite volume formulation of steady one-dimensional convection and Diffusion problems, Central, upwind, hybrid and power-law schemes - Discretization equations for two dimensional convection and diffusion.

UNIT – V: Calculation of Flow Field:

Representation of the pressure gradient term and continuity equation - Staggered grid - Momentum equations - Pressure and velocity corrections - Pressure - Correction equation, SIMPLE algorithm and its variants.

TEXT BOOKS:

1. Versteeg, H.K, and Malalasekera, W., “An Introduction to Computational Fluid Dynamics: The Finite Volume Method”, 2nd ed., Longman Publication, 2004.
2. John D. Anderson Jr, “Computational Fluid Dynamics-The Basics withApplications”, 6th ed., Mcgraw Hill, 2009.
3. Anderson, D.A.,Tannehill, I.I., and Pletcher, R.H., Computational Fluid Mechanics and Heat Transfer, 2nd ed., Hemishphere Publishing Corporation, 1997.

REFERENCES:

1. C. Hirsch, “Numerical Computation of Internal and External Flows”, Volumes I and II, 2nd ed., John Wiley & Sons, 2007.
2. Subas, V.Patankar “Numerical heat transfer fluid flow”, 2nd ed., Hemisphere Publishing Corporation, 2004.
3. Muralidhar, K.,andSundararajan,T., “Computational Fluid Flow and Heat Transfer”, 2nd ed., Narosa Publishing House New Delhi, 2011.
4. Fletcher C.A.J. “Computational Techniques for Fluid Dynamics”, Volume I

IV Year II Semester

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4	-	-	4	4

EE 319 LINEAR CONTROL SYSTEMS (DEPT. ELECTIVE - VI)

Course Description & Objectives:

This course is to explore the modeling of linear dynamic systems via differential equations and transfer functions utilizing input-output representations; analysis of control systems in the time and frequency domains and using transfer function and state-space methods

Course Outcomes:

On completion of the course, the students would be able to:

1. *able to formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs*
2. *able to analyze the words transient & steady state performance of a system.*
3. *able to understand the stability of an electrical, electronics and other physical systems*
4. *able to design controllers, compensators and control systems*

UNIT – I: Introduction:

Concepts of Control Systems - Open Loop and closed loop control systems and their differences - Different examples of control systems - Clasification of control systems.

Mathematical Models of Physical Systems: Differentical equations - transfer functions and block diagram representation of systems considering electrical systems as examples Block diagram algebra -Representation by Signal flow graph - reduction using Mason's gain formula - translational and rotational mechanical systems.

UNIT – II: Feed-Back Characteristics:

What is Feedback? Effects of feedback - reduction of parameter variations by use of feedback-Control over system dynamics - by the use of feedback. **Elements of Control Systems:** DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

UNIT – III: Time Response Analysis:

Standard test signals - Time response of first order systems - Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications - Steady state response - Steady state errors and error constant. **Concepts of stability:** The concept of stability, Routh stability criterion

UNIT – IV: Root Locus Technique:

The root locus concept - construction of root loci. **Frequency Response Analysis:** Introduction, Frequency domain specifications - Bode diagrams - Determination of Frequency domain specifications from the Bode Diagram - Phase margin and Gain margin - Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots and Nyquist stability criterion

UNIT – V: Design and Compensation Technique:

Introduction and Preliminary design considerations - Lead, Lag, Lead-lag. PID controller. **State Space Analysis of Continuous Systems :** Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization - Solving the Time Invariant state Equations - State Transition Matrix.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, 2nd ed., New Age International (P) Limited, 2010.
2. Katsuhiko Ogata, “Modern Control Engineering”, 3rd ed.,Prentice Hall of India Pvt. Ltd., 1998.

REFERENCES:

1. B. C. Kuo, “Automatic Control Systems”, 8th ed., John wiley and son’s, 2003.
2. John wiley, “Control Systems Engg”., 3rd ed., NISE, 2000.

IV Year II Semester	L	T	P	To	C
	4	-	-	4	4

ME 328 MECHATRONICS (DEPT. ELECTIVE - VI)

Course Description & Objectives:

This course gives an overview of Mechatronics systems and their components for evolving hybrid technologies in various applications.

Course Outcomes:

On completion of the course, the student would be able to:

1. *understand basics of signal conditioning.*
2. *know the modelling concepts and response systems.*

3. *know the operation procedures for various actuators in mechanical and electrical systems.*
4. *understand the basics of PLCs in real world situations through case studies.*

UNIT – I: Introduction:

Introduction: to Mechatronics - Multi disciplinary Scenarios, Systems for Measurement and Control. Microprocessor based controllers, Response of Systems.

UNIT - II: Signal Conditioning:

The op-amp, protection, filtering, Wheatstone bridge, digital signals, multiplexers, Data acquisition, Digital signal processing, pulse modulation, displays, magnetic recording, measurement systems, Testing calibration.

UNIT – III: System Modeling & Dynamic Response of Systems:

Introduction to Mathematical Modeling, Building Blocks of Mechanical Systems, Electrical Systems, Fluid Systems and thermal systems. Engineering Systems: Rotational, translational, Electro-Mechanical & Hydraulic-Mechanical. Performance measures of first order & second order systems, Transfer function.

UNIT – IV: Actuation and Operations:

Actuation to Hydraulic and Pneumatic Systems, Mechanical Systems, Electrical Systems, Mechanical Switches, Solid State Switches, Operation of Solenoids, AC, DC & Stepper Motors.

UNIT – V: Microprocessors & PLC's:

Introduction to digital logic - logic gates - applications of logic gates - sequential logic - Applications - Basic structure of PLCs - selection of a PLC - case studies of mechatronics systems - Microprocessor systems - microcontrollers.

TEXT BOOKS :

1. W. Bolton, "Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering" 3rd ed., Pearson Education, 2009.
2. Appuu Kuttan K K, "Introduction to Mechatronics" 2nd ed., Oxford Press, 2009.

REFERENCES:

1. NitaigourPremchandMahalik, "Mechatronics Principles, Concepts and Applications" 2nd ed., Tata McGraw Hill, 2008.
2. David G Alciators, Michael B. Histand, "Mechatronics and Measurement Systems" 3rd ed., Tata McGraw Hill,2009.

IV Year II Semester

L	T	P	To	C
4	-	-	4	4

ME 433 NANO TECHNOLOGY (DEPT. ELECTIVE - VI)

Course Description & Objectives:

This course is intended to develop interest among the students in the area of nano technology and to initiate research inclination.

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. *understand how basic nanosystems work;*
2. *have a sound grounding and expert knowledge in multidisciplinary areas of nanoscience*
3. *use physical reasoning to develop simple nanoscale models to interpret the behavior of such physical systems*
4. *analyse and critically evaluate ideas/information/data and apply relevant scientific principles to solve problems by, for example, creating hypotheses, testing theories and predictions, designing and carrying out experiments and analysing reported data*
5. *be prepared to work in a high tech work force or pursue a research higher degree in nanotechnology*
6. *have a sound grounding in and expert knowledge of the basic sciences relevant to employment or further study in the traditional sciences*
7. *appreciate that there are the relationships and connections across the sciences and non-science disciplines are core to nanotechnology and understand such relationships and connections*
8. *understand the major issues in producing a sustainable nanotech industry.*

UNIT – I: Genesis of Nano Technology:

Introduction - Nano Science - Nano technology - Nano materials - Scope of applications - topics from nature - Basic principles of Nano science and technology - Basics of quantum mechanics - Quantum Nano structures.

UNIT – II: Fabrication of Nano Materials:

Introduction - Nano materials - Properties of Nano materials - Techniques used in Nano technology - Top - Down approach - Bottoms-up approach -

Tools used in Nano technology - Electron Micro Scope - Atomic Force Microscope (AFM). Synthesis of Nano materials.

UNIT – III: Carbon Nano Tubes (CNT):

Introduction - Preparation - Properties - Classification - Fullerens - Applications of Carbon Nano Tubes.

UNIT – IV: Domain Application of Nano Technology:

Introduction - Applications of Nano technology - Environment and Energy - Textiles - Agriculture - Electronics & Communication - Computers - Medicine - Space technology.

UNIT – V: Projected use & Implications of Nano Technology:

Introduction - Assessment of opportunities - Bottlenecks in implementation of Nano technology - Exploration and Economical concerns of Nano technology - Current research activity.

TEXT BOOKS:

1. Mark Ratner, “Nano technology”, 3rd ed., Pearson Education, 2008.
2. ManasiKarkare, “Nano Technology Fundamentals and Applications”, 1st ed., I.K. International Publishing House, 2008.

REFERENCES:

1. T. Pradeep, “Nano The Essentials”, 3rd Reprint, McGraw-Hill Education, 2009.
2. A.K. Badyopadhyay, “Nano materials”, 1st ed., New age International Publications, 2009.

I

YEAR

B.Tech.

TEXTILE TECHNOLOGY

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computer and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16TF101 - Textile Fibers
- 16CH102 - Material Science and Technology

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L-9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L-9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L-9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L-9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L-9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.
11. Solving first order O.D.E.
12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.
3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fiber which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*

✓ *Study the wavelengths of light sources and lasers.*

✓ *Estimate the efficiency of a given solar cell.*

✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*

✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non- linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to:

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

- ✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*
- ✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*
- ✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*
- ✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*
- ✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**
  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory
  Practice : Introduction to phonetics (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory
  Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory
  Practice : Situational conversations – Role - Plays (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit)) Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs
- Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions (from Energy Unit) Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory
  Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**
  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 “*Mindscapes* - English for Technologists and Engineers”, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, “A Textbook of English Phonetics for Indian Students”, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. “Spoken English: A Self-Learning Guide to Conversation Practice”, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine Your English”, 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, “Effective Technical Communication”, Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to:

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

✓ *Assemble and disassemble the personal computer system.*

✓ *Install different desktop operating systems.*

✓ *Use the basic text processing, simple data analysis and data presentation tools.*

✓ *Configure network parameters.*

✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools.
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, “Introduction to Computers”, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L-10, T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L-8, T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0’s & 1’s as input and the array should consist of all 0’s first and then 1’s.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student’s information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

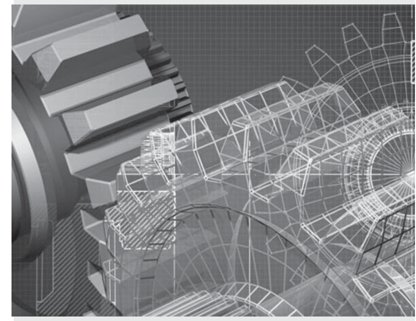
TEXT BOOK:

1. Ajay Mittal, “Programming in C - A practical Approach”, 1^{st} edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, “Introduction to C Programming”, 2^{nd} edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, “The Complete Reference”, 4^{th} edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, “Programming in ANSI C”, 4^{th} edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

- ✓ *Identify UPS requirements for a given load.*
- ✓ *Provide a Lighting scheme for specific working environment.*
- ✓ *Design a composition of Heating element for a particular application.*
- ✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*
- ✓ *Provide an earthing for Domestic Outlet.*
- ✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks,

Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of

cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, "Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, "Electrical engineering - Electrical machines and Appliances Theory", 1 st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, "How Stuff Works", 1 st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, "Basic Mechanical Engineering", 1 st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to:

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*

✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*

✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Listing – Following long conversations / Interviews

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

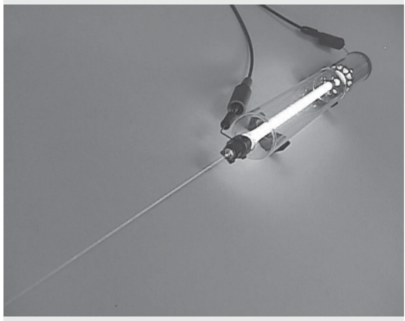
PRACTICE: Objective PET Units 25 – 30

TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, “Objective PET”, Student’s Book with Answers, 2^{nd} edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, “Introduction to PET”, Oxford University Press.



16HS110 ENGINEERING PHYSICS LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

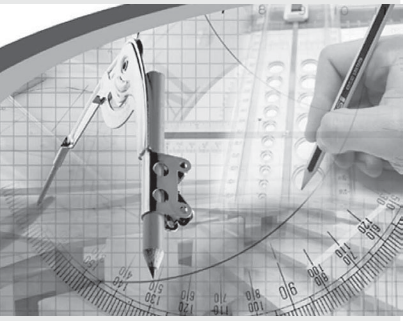
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments, field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- carry out the basic operations of matrix algebra.
- use row operations to reduce a matrix to echelon form, normal form.
- determine consistency of a system linear equations.
- compute eigen values and eigen vectors.
- evaluate double integrals and triple integrals.
- evaluate double integrals in polar coordinates.
- utilize Cartesian and polar coordinates to find area.
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals.

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9, T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L-9, T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L-9, T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L-9, T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L-9, T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

✓ *Analyse the total hardness of water sample.*

✓ *Understand the basic principles involved in various batteries.*

✓ *Understand the mechanisms of corrosion and various controlling methods.*

✓ *Synthesize various polymers.*

✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K. S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M. R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an "International language of Engineers". It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to:

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT - 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT - 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT - 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT - 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT - 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

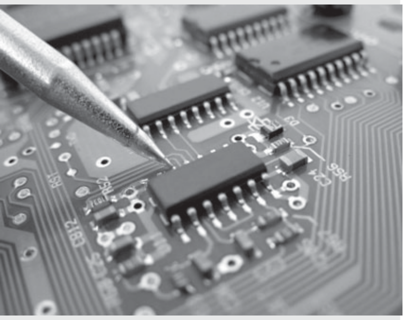
1. N.D.Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal , C.M.Agrawal "Engineering Drawing" , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC, AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*

✓ *Develop a simple loop generator.*

✓ *Design a voltage regulator using Zener diode.*

✓ *Design a half wave rectifier using PN junction diode.*

✓ *Design a full wave rectifier using PN junction diodes.*

UNIT - 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT - 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT - 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT - 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT - 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V. K. Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D. P Kothari, "Basic Electrical and Electronics Engineering", 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, "Integrated Electronics", McGraw Hill, 1979.
2. A. K. Thereja and B.L. Thereja, "Electrical Technology", Vol.– II, S Chand Publications, 2007.
3. U. Bakshi & A.Bakshi, "Basic Electrical Engineering", 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to:

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to:

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES: Environmental studies - Definition scope and its importance, Need for public awareness; Natural resources - Forest resources, Deforestation, Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources, Land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY: Ecosystem - Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems; Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forest community, Bio-villages; Green technology for sustainable development; Life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental protection act; Environmental Impact Asssssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation - Food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions; Role of youth in the development, Promoting activities, Youth as initiators, Field work/environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment, Common plants, Insects, Birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik and CP Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016
2. Benny Joseph, “Environmental studies”, 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008.
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004.
7. Kurian Joseph and R. Nagendram, “Essentials of environmental studies”, Pearson Education Pt Ltd, Delhi, 2007.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

16TF101 TEXTILE FIBERS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5		45	-	-	-

Course Description and Objectives:

This course provides an essential knowledge to study properties and applications of textile fibers. The objective of the course is to introduce stem and leaf fibres such as jute, hemp, flax, banana. It also includes the basic concept of fibre structure and principles of man-made fiber spinning.

Course Outcomes:

The student will be able to:

- define basic terminologies related to textiles.
- classify the textile fibers into different groups.
- understand the process of extraction of the natural fibers.
- understand the principles of spinning of man-made fibers.

SKILLS:

- ✓ *Examine the suitability of any fiber for textile applications.*
- ✓ *Identify a given natural textile fibers.*
- ✓ *Identify a given man made textile fibers.*
- ✓ *Find the application of given fiber based on its properties.*
- ✓ *Identify monomer required and type of polymerization for the given manmade fiber.*

UNIT - 1 **L-8**

INTRODUCTION TO TEXTILES : Textile elements defined Textile fibre, staple fibre, filament; yarn: spun, continuous filament, monofilament and multifilament, flat and textured yarn; single, ply and cabled yarns; thread; fabric: woven, knitted and non-woven with their classifications.

UNIT - 2 **L-8**

FLOW CHART FOR TEXTILE MANUFACTURING PROCESSES FROM FIBRE TO FABRIC : Detailed Classification of textile fibers – Distinction between Natural and Man Made Fibers , Properties expected of an ideal textile fibre: Essential and desirable properties

COTTON: Morphology, Physical & Chemical properties. A Brief note on Latest type of Cottons: Organic & Bt..

UNIT - 3 **L-9**

WOOL: Morphology, Physical and Chemical Properties –Brief study on frictional properties of wool, heat of wetting.

SILK : Types of Silk, Grianage Centers, Introduction to rearing of silk, cocoon, stifling (Methods), Storage, Sorting, cooking, brushing, reeling, degumming and weighting

JUTE AND FLAX : Retting methods, Structure and Properties, applications.

UNIT - 4 **L-10**

BASIC CONCEPTS OF FIBRE STRUCTURE : Definition of orientation, properties and schematic representations of highly, moderately and poorly-oriented fibres, examples of such fibres; definition of crystallinity, schematic representation of

fibre with crystalline and amorphous contents, outline of influence of crystallinity on fibre properties; crystallinity values of some common natural and man-made fibres Principles of fibre forming polymers–glass transition temperature Melting temperature.

PRINCIPLES OF SPINNING : Principles of wet-spinning, dry spinning and melt-spinning of man-made fibres, typical examples of fibres so spun, principle of drawing and its importance, outline of POY and FOY made fibres.

UNIT - 5 **L-10**

REGENERATED FIBRES : Polymer source, spinning method, physical and chemical properties and uses of natural-polymer fibres: Viscose rayon, modal, lyocell, acetate and bamboo fibre

SYNTHETIC FIBRES : Names of raw materials and spinning technique/s used, name of polymer, physical and chemical properties and uses of synthetic fibres: nylon 6, polyester, acrylic and polypropylene.

ACTIVITIES:

- *Choose a fibre and its blend for a shirting, suiting,upholstery and for various such applications.*
- *Identification of types of fiber in blended yarn like in p/c blend.*
- *Design of fabric for apparel use using flex and other stem fiber.*
- *Milling and felting of wool.*
- *Degumming and reeling of silk from silk cocoon.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Microscopic test of fibers.
2. Burning test of fibers.
3. Chemical test of fibers.
4. Feel test of fibers.
5. Determination of fibres in blended yarn.
6. Classification of specific manmade fiber out of different manmade fibers.
7. Classification of specific natural fiber out of different natural fibers.
8. Determination of specific cellulosic fiber out of different cellulosic fibers.
9. Determination of specific protein fiber out of different protein e fibers.
10. Identification of fiber using UV spectrophotometer.

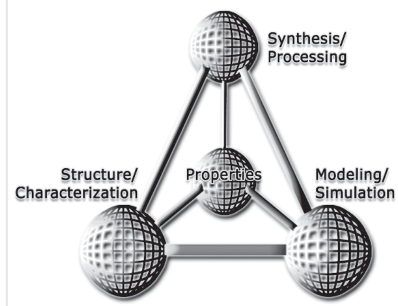
TEXT BOOKS:

1. J. Gordon Cook, "Hand Book of Textile Fibers", Vol 1 & 2, 5th Edition, Wood Head Publishers, London, 2005.
2. Gohl, Vilensky, "Textile Science", 2nd Edition, Mahajan Book Publishers, Ahemedabad, 2003.

REFERENCE BOOKS:

1. S. P. Mishra, "Fibre Science and Technology", New Age International Publishers, New Delhi, 2000.
2. Tammanna & N. Sonwalkar, "Handbook of Silk Technology", Wiley Easterrn Limited, New Delhi, 2002.
3. A. A. Vaidya, "Production of Synthetic Fibers", Prentice Hall of India, New Delhi, 2005.

16CH102 MATERIALS SCIENCE AND TECHNOLOGY



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
8		60	-	10	-

Course Description and Objectives:

This course will emphasize the structure-property relationships of engineering materials. The objective of this course is to provide knowledge in basic principles of material science and also to study structure of materials at all length scales.

Course Outcomes:

The student will be able to:

- understand crystal structure of various materials and techniques used for structure determination.
- understand the influence of defects on the properties of materials
- understand the fundamentals of equilibrium phase diagrams.
- gain knowledge on various fabrication techniques used for manufacturing common engineering materials.

SKILLS:

- ✓ *Identify the type of material: ceramic, polymer, metal or composite.*
- ✓ *Select materials with suitable properties for a given application.*
- ✓ *Predict the type of fracture/failure in a material.*
- ✓ *Read and draw conclusion from binary phase diagrams.*
- ✓ *Suggest manufacturing methods for metals, ceramics and polymeric materials.*
- ✓ *Determine basic mechanical properties of materials using universal testing machine.*

ACTIVITIES:

- *Testing the type of failures.*
- *"Gee Whiz": Wonder presentations.*
- *Analysis of load test results.*
- *Study of micro structures of materials.*
- *Segregation of the given materials.*
- *Identification of phases in the given phase diagram.*

UNIT - 1 **L-9**

BONDING IN SOLIDS: Inter atomic forces and potential energy, Types of bonds: primary and secondary, Variation in bonding character and resulting properties

CRYSTAL STRUCTURE : Classification of crystal systems – SC, BCC, FCC & HCP crystal structures with examples, Atomic packing factor, coordination number, determination of miller indices of planes & directions of cubic and hexagonal crystals, linear and planar densities, separation between successive planes, Crystal structure determination: Bragg law, powder method.

UNIT - 2 **L-10**

CRYSTAL DEFECTS: Point defects, Dislocations: edge, screw and mixed, burgers vectors, energy of dislocation, motion of dislocation, dislocation density. Grain boundary, stacking faults and twin boundary.

PHASE DIAGRAMS: Gibb's phase rule & terms involved – Reduced phase rule, tie line and lever rules, Two component systems–invariant reactions – Eutectic system & Iron-Carbon system.

UNIT - 3 **L-9**

MATERIALS FABRICATION TECHNIQUES: Fabrication of Metals: forming operations, casting, Fabrication of Ceramics: particulate forming processes, cementation. Forming techniques of Plastics: compression, transfer and injection molding, extrusion, blow molding.

MECHANICAL PROPERTIES: Stress-strain relations of various solids – Elastic, Anelastic, Visco-elastic and plastic deformations in solids, creep and fatigue, fracture: Brittle and Ductile, fracture toughness, ductile to brittle transitions.

UNIT - 4 **L-8**

ELECTRICAL & SEMICONDUCTING PROPERTIES: Ohm's Law, Electrical Conductivity, Electronic and Ionic Conduction, Energy Band Structures in Solids, Classification of solids based on band models, Electron Mobility, Electrical Resistivity of Metals, Intrinsic Semiconduction, Extrinsic Semiconduction, The temperature dependence of Carrier Concentration, Factors That Affect Carrier Mobility.

UNIT - 5 **L-8**

DIELECTRIC AND MAGNETIC PROPERTIES: Dielectric behavior: capacitance, polarization, frequency dependence of dielectric constant, dielectric strength. Types of magnetism, Ferromagnetism-Domain theory-hystersis behavior, ferrimagnetism, soft and hard magnets – application of magnetic materials.

TEXT BOOKS:

1. W. D. Callister, "Materials Science and Engineering: An Introduction," 8th ed., John Wiley & Sons Inc, 2009.
2. V.Raghavan, "Materials Science and Engineering:A First Course", 5th ed., PHI Learing Pvt. Ltd., 2013.

REFERENCE BOOKS:

1. L. H. VanVlack, Elements of Materials Science and Engineering, 6th ed., Addison Wesley, 1989.
2. W.F. Smith and J. Hashemi, Foundations of Materials Science and Engineering, 4th ed McGraw-Hill, 2005.
3. D. R. Askeland, Science and Engineering of Materials, 5th ed., Thomson Engineering, 2005.
4. J.F. Shackelford, Introduction to Materials Science for Engineers, 6th ed., Prentice Hall, 2004.
5. Kelly, G. W. Groves, and P. Kidd, Crystallography and Crystal Defects, Wiley, 2002.
6. N.W. Dowling, Mechanical Behavior of Materials, 3rd ed., Prentice Hall, 2006.
7. P. Haasen and B. L. Mordike, Physical Metallurgy, 3rd ed., Cambridge University Press, 1996.

II

YEAR

TEXTILE TECHNOLOGY

B.Tech.

I SEMESTER

16HS202	-	Probability and Statistics
16EL102	-	Softskills Laboratory
16TF201	-	Technology of Manufactured Fibers
16TF202	-	Yarn Manufacturing
16TF203	-	Fabric Manufacturing
16TF204	-	Fashion, Art, Design and Accessories
16TF205	-	Pattern Engineering
16TF206	-	Fashion Illustration Laboratory
16TF207	-	Accessories Design and Surface Ornmentation Lab

II SEMESTER

16EL103	-	Professional Communications Laboratory
16TF208	-	Garment Construction Techniques
16TF209	-	Technology of Knits and Design
16TF210	-	Fabric Structure and Design
16TF211	-	Textile Wet Processing
	-	Department Electives
	-	Department / Open Electives

COURSE CONTENTS

I SEM & II SEM

16HS202 PROBABILITY AND STATISTICS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	35	4	10	2	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation and regression and their applications, probability, theoritical distributions and testing of hypothesis.

The objective of this course is to enable the student to understand and apply statistical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L-9**

STATISTICS: Basic Definitions, Frequencies, Graphical Representation, Histogram, Ogive curves, Measures of Central tendency, Arithmetic mean, Median, Mode, mean deviation, standard deviation, Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT - 2 **L-9**

CURVE FITTING, CORRELATION & REGRESSION : Least squares method, curve fitting (straight line and parabola only). Covariance, Correlation, Types, Pearson's Coefficient of correlation, Rank correlation, Spearman's rank correlation. Regression, Regression lines.

UNIT - 3 **L-8**

PROBABILITY : Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L-8**

DISTRIBUTIONS: Random variables, Discrete and Continuous variables, Introduction to Distributions.

BINOMIAL DISTRIBUTION : Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION : Definition, Mean and Standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION : Definition, Normal curve, Mean and Standard deviation, Median, Mode, Normal Distribution applications.

UNIT - 5 **L-12**

SAMPLING METHODS : Population and Sampling, Parameters and Statistics, Types of sampling. Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion, T-distribution for small sample, difference between means of small sample, Chi square test for goodness of fit, Chi square test for test of independence.

TEXTBOOKS:

1. *Miller and Freund*, Probability and Statistics for engineers, 8th edition, Pearson publishers, 2013.
2. H. K. Dass & Er. Rajanish Verma, Higher Engineering Mathematics, S. Chand & Co., Third revised edition, 2014.

REFERENCE BOOK:

1. *S.C. Gupta* and *V.K. Kapoor*, "Fundamentals of Mathematical Statistics", Sultan Chand & Co., New Delhi, 2005.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	15	-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, Preparing Resume, Group Discussion, and Interview Skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The Student will be able to:

- formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs equip with requisite professional and inter-personal skills.
- they will possess the ability to think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- through identification and introspection on individual strengths and weaknesses.
- students will emerge with improved levels of self-awareness and self-worth, for greater efficacy at workplace.

SKILLS:

✓ *Communicate and understand the difference between soft skills and hard skills,*

✓ *Learn professionalism and Employability skills.*

✓ *Plan Career by drawing their SWOT, Setting the Goal, learn the importance of Time and Stress Management.*

✓ *Learn Vocabulary, Situational English, Group Discussion, Reading Comprehension and Listening Comprehension which are essential for all competitive examinations.*

✓ *Prepare Resume and learn how to face interview.*

✓ *Learn Gender sensitive language, Good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication…*
- *SWOT analysis,*
- *Stephen covey Time Management matrix*
- *Stress Management techniques*
- *Vocabulary flash cards*
- *Situational Dialogues*
- *Group Discussion*
- *Resume preparation*
- *Mock Interview.*
- *Reading comprehension activities*
- *Listening comprehension Activity by watching the American accent video*
- *Emotional intelligence, etiquette quiz*

UNIT - 1 **L-4. P-4**

A) COMMUNICATION:

Need for effective communication - the process of communication, levels of communication, flow of communication, choice of diction and style with reference to setting (formal, semi-formal or informal); communication networks, barriers to communication, miscommunication, noise and ways to overcome the barriers.

B) SOFT SKILLS:

Difference between soft and hard skills, need for soft skills, professionalism, employability skills

C) CAREER PLANNING:

Job vs. career, Goal setting, SWOT analysis, planning and prioritization, four quadrant time management system, self-management, stress-management.

ACTIVITY: Johari Window for SWOT analysis; Setting a SMART goal using the provided grid; Writing a Statement of Purpose (SOP).

UNIT - 2 **L-4. P-4**

A) VOCABULARY BUILDING:

Word etymology, roots, prefixes & suffixes, synonyms & antonyms, collocations, one-word substitutes, analogies, idioms and phrases, contextual guessing of unfamiliar words, task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student) – vocabulary exercises with hand-outs – Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day)

B) FUNCTIONAL ENGLISH:

Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student)

C) GROUP DISCUSSION:

Articulation and flow of oral presentation, dynamics of group discussion, intervention, summarizing and conclusion, voice modulation, content generation, Key Word Approach (KWA), Social, Political, Economic, Legal and Technical Approach (SPELT), View Point of Affected Part (VAP), language relevance, fluency and coherence.

ACTIVITY: Viewing a recorded video of GD & Mock sessions on different types of GD topics-controversial, knowledge, case study (including topics on current affairs)

UNIT - 3 **L-4. P-4**

A) RESUME-WRITING:

Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, preparing the resume, writing an effective covering letter.

B) FACING INTERVIEWS:

Interview process, understanding employer expectations, pre-interview planning, opening strategies, impressive self-introduction, answering strategies, other critical aspects such as body language,

grooming, other types of interviews such as stress-based interviews, tele- interviews, video interviews, frequently asked questions (FAQs) including Behavioural and HR questions and the aspect looked at by corporate during interviews

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **L-4. P-4**

A) READING COMPREHENSION:

Reading as a skill, techniques for speed reading, understanding the tone, skimming and scanning, appreciating stylistics, impediments for speed reading, eye fixation, sub-vocalization, critical reading, reading based on purpose, reading for information, reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas. (Hand-outs). Newspaper activity with students divided into 4 groups. Each group looks at critical component of communication such as Listening, Speaking, Reading and Writing enabling them to be better communicators as well as be more aware about the current affairs, which help in Group Discussion.

B) LISTENING COMPREHENSION:

Listening as a skill, different types of listening, active and passive listening, top-down approach, bottom-up approach, understanding the non verbal cues of communication; intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **L-4. P-4**

IMPACT OF LANGUAGE ON PERSONALITY:

Gender sensitive language in MNCs, cultural sensitivity, social awareness, emotional intelligence, good manners, self-grooming, positive body language, accepting and handling responsibility, assertiveness, problem solving, negotiating skills, networking and creating a good first impression.

Seven essential skills for a team player; attentive listening, intelligent questioning, gently persuading, respecting other’s views, assisting others, sharing, participating actively.

ACTIVITY: Johari Window, Games and Case studies.

REFERENCE BOOKS:

1. *Edward Holffman,* ***Ace the Corporate Personality****, McGraw Hill,2001*

2. Adrian Furnham, ***Personality and Intelligence at Work***, Psychology Press, 2008.

3. John Adair Kegan Page, "***Leadership for Innovation"*** 1st edition, Kogan, 2007.

4. M.Ashraf Rizvi, "***Effective Technical Communication",*** 1st edition, Tata McGraw Hill, 2005.

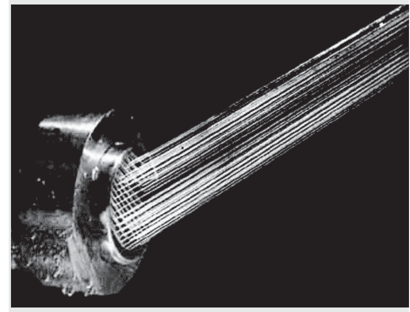
5. Krishna Mohan & NP Singh, "***Speaking English Effectively"*** 1st edition, Macmillan, 2008.

6. ***Soft Skills Material*** of **Infosys** Under the Academic Initiative of Campus Connect

7. Dr. S.P. Dhanvel***, English and Soft Skills,*** Orient Blackswan, 2011.

8. Rajiv K. Mishra, ***Personality Development***-, Rupa & Co. 2004.

16TF201 TECHNOLOGY OF MANUFACTURED FIBRES



Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	20	-	-	-	-

Course Description and Objectives:

This course offeres the knowledge of different principles of forming man made fibers. It also includes the concepts of micro fibers and texturising of man made fibers. Objective of this course is to enable the student to understand the concepts of manufacturing man made fibers, thier properties and applications.

Course Outcomes:

The student will be able to:

- find the structure property relation of synthetic fibres.
- understand the importance of synthetic fibres in textile industry.
- know the various types of spinning principles.
- understand the texturizing and its importance.
- describe about the various developments in man made fibers.

SKILLS:

✓ *Differentiate and identify various man made fibers.*

✓ *Analyze the structure of different fibers by using x-ray pattern.*

✓ *Analyze the texturisation of man made fibers.*

ACTIVITIES:

- *Collect different types of man made fibers.*
- *Find the different applications in which man made fibers are widely used.*
- *Analyze the fibers structure through SEM, optical microscope, FTIR.*
- *Selection of different routes for manufacturing of man made fibers.*

UNIT - 1 **L-10**

INTRODUCTION TO FIBER STRUCTURE : Micellar theory, Continuous theory, Fringed micelles theory, Fringed fibrils theory, Modified fringed micellar theory; Important operations in the production of synthetic fibres, Principles of fibre forming polymers, Parameters influencing the quality; Degree of order, Degree of localization of order, Length/ width ratio of localized units, Degree of orientation, Degree of polymerization; Methods of investigating fibers - X-Ray diffraction, IR, NMR, Thermal Analysis, Optical microscopy, Electron microscopy, Scanning Electron microscopy.

UNIT - 2 **L-8**

MELT SPINNING : Detailed note on elements of melt spin equipment, Polyester manufacture - Trans esterification, Polycondensation, Side reactions, Properties and Applications; Polyamides - Manufacture of Nylon 6, nylon 66, (manufacture monomers various routes for PET and nylon); Surface modification of polyester cause and effect, Recent developments in polyesters like CDP, EDP, CFDP, APP; Spin finishes - Ideal spin finish, Properties, Application and removal, Constitution of spin finish.

UNIT - 3 **L-8**

SOLUTION SPINNING : Introduction, Process variables for solution spinning, Dry spinning, Wet spinning, Salient features of solution spinning, Rheology of Wet & Dry Spinning, Development of fiber structure and morphology during solution spinning, Comparison, Brief note on dry jet wet spinning; Manufacture of Rayons - Viscose, Acetate and Cuprammonium – Physical and chemical properties, A brief note on recent developments in viscose manufacturing (Lyocell fibre).

UNIT - 4 **L-9**

MANUFACTURING : Properties and applications of of Acrylics, Mode acrylics, PVA, Poly Vinyl Chloride and Polyvinyl alchohol, Polypropylene fibres; Drawing - Condition, Phenomena of necking, Drawing behavior of thermoplastic polymer, Influence of drawing on structure and property; Micro fibres - Detailed study of production, Properties and applications of micro fibres, Problems in processing of micro fibres in weaving.

UNIT - 5 **L-10**

TEXTURISING : Draw backs of flat filament yarns, Definition and concept of texturising, Classification and characteristics of textured yarns, False Twist Texturising - Scientific principle in twist texturising, Methods of production of stretched(single heater) by conventional methods, Draw Texturising concept, Air Jet Texturising and its principle; Brief introduction about Other methods of texturising - BCF Processes and Yarns, Edge crimping, Stuffer box crimping, Knit-de-knit, Gear Crimping, Chemical Texturising.

TEXT BOOKS:

1. V. B. Gupta, “Technology of Manufactured Fibres”, 3rd edition, Chapmen and Hall, New York, 2004.
2. A. A. Vaidya, “Production of Synthetic Fibers”, Prentice Hall of India, New Delhi, 2005.

REFERENCE BOOKS:

1. S. P. Mishra, “Fibre Science and Technology”, New Age International Publishers, New Delhi, 2000.
2. H.V.Srinivasmurthy, “Textile Fibers”, Textile Association of India Publication, 1988.

16TF202 YARN MANUFACTURING

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	10	20	-	-	-	10

Course Description and Objectives:

This course deals with the concepts, production calculations, different types of available machines and various developments in yarn manufacturing process. This course is aimed to impart fundamental knowledge required to understand yarn manufactuing process.

Course Outcomes:

The student will be able to:

- select the different fiber properties required for spinning different counts.
- understand different types of yarn manufacturing machines and their principles.
- calculate production capacities of carding, comber and ring frame.

SKILLS:

✓ *Optimize the factors affecting yarn properties.*

✓ *Identify the various key factors in yarn manufacturing process.*

✓ *Set the parameters for the production of cotton, synthetic and blended yarns.*

✓ *Differentiate the carded, combed and core cover yarns.*

ACTIVITIES:

- *Collect technical specifications of yarn preparatory machines.*
- *Prepare spin plan for carded and combed yarns for a given count.*
- *Prepare flow chart for carded and combed yarn manufacturing process.*
- *Observe spinning parameters by visiting a spinning mill.*

UNIT - 1 **L-10**

GINNING AND BLOW ROOM : Ginning Objectives, pre and post ginning equipments and working principles of Gins, Factors affecting ginning performance, brief note on Pressing and baling of cotton. Need for Mixing and Blending, objectives, Fibres commonly blended (Different types of Blends) Introduction to Opening and Cleaning: Working principle of a typical blow room, Accessories in blow room.

UNIT - 2 **L-9**

CARDING AND DRAW FRAME : Chute feeding, Introduction to Carding - Objectives, Zones, Role of each element, Card settings, High production cards, Latest Developments in carding; Draw Frame - Objects, basic concepts of drawing, Principle of Roller drafting, Different drafting systems, Methods of roller weighing, Coiler mechanism, Study of Modern Draw frame, Auto levelling in carding & Draw frame (open loop and closed loop) Production calculations.

UNIT - 3 **L-8**

COMBER : Introduction to combing, Hooks theory, Combing preparatory requirements, passage of material through comber, Functions and setting of each part, Combing principle, cycle of combing Back ward and Forward combing, Working of modern combers, Production calculations, Combing efficiency.

UNIT - 4 **L-9**

SPEED FRAME : Objects, Need of speed frame, Detailed study of mechanisms (Drafting, Twisting and bobbin building) of speed frame, Constructional details, Driving arrangement, Calculation of draft, Twist & production, Recent Developments.

UNIT - 5 **L-9**

RING FRAME : Objects, Passage of material, Functions of parts, Specifications of R/F, Drafting, Twisting & winding, Brief study of spindles, Ring & travellers, Calculation of draft, Twist & production. Ring data/ ISM(Individual spindle Monitoring), Post spinning operations, Ring doubler, Two for one twister, Brief note on reeling.

TEXT BOOKS:

1. W. Klein, “Series of Short Staple Spinning”, Wood head publishers, 2005.
2. T. K. Pattabhiraman, “Essential Facts of Practical Cotton Spinning”, Mahajan Publisher, Ahmedabad, 2005.

REFERENCE BOOKS:

1. Venkatsubramani, “Spun Yam Technology, Vol-III”, SSM Institute Publications. Komarapalyam, 2003.
2. T.V.Ananthan, “Tablets on Combing, Speed Frame, Ring Frame”, TAI Publications, 2003.
3. A. R. Khare. “Elements of Combing”, Mahajan Book Publishers, Ahmedabad, 2003.

16TF203 FABRIC MANUFACTURING

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	-	-	5	10

Course Description and Objectives:

This course offers the basics of fabric manufacturing and their preparatory processes includes winding, warping, sizing and post sizing operations. The objective of this course is to make students familiar with the process of fabric manufacturing.

Course Outcomes:

The student will be able to:

- distinguish the needs of weaving preparatory processes such as winding, warping, sizing and post sizing operations.
- explain the formation of continuous length of fabric in shuttle looms.
- understand the basic concepts in shuttle-less weaving machines.

SKILLS:

- ✓ *Distinguish the weaving preparatory machines.*
- ✓ *Prepare size reciepe for given yarn.*
- ✓ *Optimize weaving process parameters.*
- ✓ *Identify yarn faults in yarn before and after winding.*
- ✓ *Distinguish sized and un-sized yarns.*
- ✓ *Selection of looms based on end product.*

ACTIVITIES:

- *Observing weaving parameters by vising weaving mill.*
- *Collection of technical specifications of winding, warping, sizing machines.*
- *Drawing and denting of warp in hand loom.*
- *Comparison of shuttle-less looms technical specifications.*
- *Preparation of peg plan for given design.*

UNIT - 1 **L-8**

WINDING & WARPING : Introduction to Fabric Manufacture - Need for Weaving preparatory process. Drum and precision Winding, Essentials features of drum winders, Tensioner, Yarn clearers, Splicing, Common package faults, Production calculations.

Warping - Classification, Working of beam and sectional warping machine, Calculations for production, Features of modern warping machines.

UNIT - 2 **L-9**

YARN SIZING - Objects, Types of sizing, Sizing materials, Size reciepes for different yarns, Size paste preparation, Multi-cylinder Sizing Machine, Different zones, Construction of Sow box, Concept of drying - Wet splitting, Brief note on Beam winding, Types of combs, Sizing faults and remedies; Calculations in sizing, Post sizing operations.

UNIT - 3 **L-9**

SHUTTLE WEAVING : Introduction to weaving, Classification of loom motions, Shedding, Picking - Cone under pick, Over pick; Beat-up mechanism, 7 wheel Take-up, Negative and positive Let-off, Auxillary motions - Warp stop motions, Temples, Weft stop motion; Introduction to dobby and jacquard shedding, Loom production calculations.

UNIT - 4 **L-10**

PROJECTILE & RAPIER WEAVING : Limitations of ordinary looms, Classification of shuttle-less weaving machines. Projectile picking motion , picking phases, Torsion rod details, Receiving unit , Selvedge weaves, Sley drive, Multi color weft insertion.

Principle of rapier weft insertion through various mechanisms such as single rapier, Double rapier, rigid and flexible, Rapier heads, Rapier drive, Selvedge formation, Field of application & commercial viability.

UNIT - 5 **L-9**

JET & NARROW WEAVING : Air Jet weft Insertion, Stages of weft insertion, Main nozzles designs, Relay nozzle designs, Quality of Air, Water Jet Weft Insertion - Picking mechanism, Weft insertion elements, Loom settings, Influence of yarn characteristics, Features of water jet looms, Comparison with air jet. Introduction to Multiphase Weaving, Fabric defects & remedies; Introduction to narrow fabric weaving.

TEXT BOOKS:

1. A.T.C Marks, Robinson, “Principles of Weaving”, The Textile Institute, 2011.
2. M. K. Talukdar, D. B. Ajgonkar, “Weaving Machines, Materials & Methods”, Textile Institute, 1998.

REFERENCE BOOKS:

1. S.C Adanur, “Handbook of Weaving”, CRC publications, 2008.
2. A. Ormerod, “Modern Preparation & Weaving Machines”, BWE Publications, 1983.
3. K. T. Aswani, “Plain Weaving Motions”, M/S Mahajan book publishers, Ahmedabad, Gujarat, 2007.

16TF204 FASHION, ART, DESIGN AND ACCESSORIES

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	10	-	10	5	5

Course Description and Objectives:

This course offers introduction to fashion, art and design, consists of basic definition of fashion, classification and its type, types of design, elements of designing, traditional textiles of India and role of garment accessories. The objective of this course is to provide insights into fashion designing and technology.

Course Outcomes:

The student will be able to:

- define and discuss fashion, art and design related terms.
- understand the classification and types of fashion.
- describe different types of traditional textiles of India.
- explain the aesthetic and functional purpose of commonly used garment accessories.
- discuss key factors in the design of typical leather and ornamental fashion accessories.

SKILLS:

✓ *Trace origin of any clothing and costume.*

✓ *Identify the nature of fashion for the leading fashion brands.*

✓ *Give the styling techniques and material requirement for the traditional costume.*

✓ *Identify the different textile techniques of traditional India.*

✓ *Select material for garment accessories based on aesthetic and functional requirements.*

✓ *Select material for leather accessories based on aesthetic and functional requirements.*

ACTIVITIES:

- *Making of mood board for particular theme.*
- *Selection of design and color from mood board.*
- *Design of clothing based on mood board.*
- *Accessories designing using ribbons, braids, laces, appliqués, buttons, zippers, snap fasteners etc.*
- *Showcase of ornamental accessories as per specific theme.*

UNIT - 1 **L-10**

INTRODUCTION TO FASHION, ART AND DESIGN : Definition of fashion, art, design, Costume and clothing, Origin and history ; Importance of clothing, Factors to be considered in the selection of clothing; Evolution of dress from paintings, Cuttings, Sculpture and wood carvings.

Classification and Types of Fashion - Factors effecting fashion, Business of fashion, Theories of fashion; Study of leading fashion designers – French, Italian, American, Indian and English.

UNIT - 2 **L-9**

DEFINITION OF FASHION DESIGNING : Concepts of design, Types of design, Elements of design, Principle of designing, Role of fashion designers.

COSTUMES OF ANCIENT CIVILIZATIONS: History of Indian costumes – Mughal and post-Mughal periods; Traditional costumes of different states of India; Costumes of ancient civilizations - Egypt, Greek, Roman, English, French empires during Renaissance 1500 –1600 AD; Overview of costumes of Pakistan, Sri Lanka, Burma, China, Japan and Africa.

UNIT - 3 **L-9**

TRADITIONAL TEXTILES OF INDIA : History of embroidered, hand-woven, dyed, printed and painted textiles of India; Floor coverings: Carpets and durries; Colored textiles – Bandhani, Patola, Ikkat, Pocchampalli; Woven textiles Brocades, Jamavar, Paithani, Jamdani, Chanderi, Maheshwari, Kanjivaram, Kota, Baluchari, Dacca Muslin, Himrus and Amrus; Printed textiles – Chintz, Sanganeri; Painted textiles – Kalamkari; Shawls of Kashmir.

UNIT - 4 **L-8**

GARMENT ACCESSORIES : Introduction to fashion accessories – classification of various accessories; Selection of materials, Design, Functional and aesthetic performance and their advantages; Ribbons, Braids, Laces, Appliqués, Buttons, Zippers, Snap fasteners, Hooks and eyes, Hook and loop tape; Eyelets, Neck tie, Scarves, Stoles, Umbrella, Socks, Stockings, Veils.

UNIT - 5 **L-9**

LEATHER ACCESSORIES : Selection of materials, Design, Functional and aesthetic performance and their advantages; Various styles of footwear, Belts, Gloves, Hand bags, Hats, Wallets, and other personal leather goods; Concepts of patternmaking techniques and the production process of these accessories.

ORNAMENTAL ACCESSORIES : Selection of materials, Design, Functional and aesthetic performance and their advantages; The various styles: Pendants, Waist bands, Wrist bands, Necklaces, Head bands, Bows, Sunglass, Wrist watches, Rings, Ear rings, Bangles, Bracelets and anklets.

TEXT BOOKS:

1. G.Russel, B.Nicholas, “Traditional Indian Textiles”, Thames and Hudson, London, 1991.
2. J. Peacock, “Fashion Accessories – The Complete 20th Century Source Book”, Thames and Hudson Publication, 2000.

REFERENCE BOOKS:

1. G.S Churye, “Indian Costume”, Prakashan Pvt. Ltd., Bombay, 1995.
2. R. Bhargav, “Design Ideas and Accessories” Jain Publications Pvt. Ltd., 2005.
3. P. Tortora, “Encyclopedia of Fashion Accessories”, Om Books Publication, 2003.
4. Elaine Stone, “Fashion Merchandising – An Introduction”, 5th edition, McGraw-Hill, 1990.

16TF205 PATTERN ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	10	-	20	-	-

Course Description & Objectives:

This course offers concepts of pattern making for a specific garment. It starts with workroom practices that form the basis for garment cutting, making of basic body slopers with dart manipulation, sleeves and collars. The objective of this course is to impart the knowledge and skill of converting designs, sketching into a product.

Course outcomes:

The student will be able to:

- understand various pattern making tools in the workroom.
- perform the drafting of basic body slopers and dart manipulation.
- understand the pattern drafting for sleeves, collars, yokes and cuffs.
- use these basic the principles and styles of grading for men's and women's garments.

SKILLS:

✓ *Selection of measurements for a given design.*

✓ *Design the bodice blocks for skirt, torso and sleeves.*

✓ *The dart manipulation for the particular fit.*

✓ *Draft standard size block patterns for men, women.*

✓ *Grading of shirt, trousers, jacket, waistcoat.*

ACTIVITIES:

- *Taking measurements using flat pattern methods.*
- *Design darts using slash and spread, pivotal methods for apparel.*
- *Pattern making for plain, puff and bell types of sleeves.*
- *Pattern making for peter pan, cape roller and sailor collars.*
- *Grading of basic bodice.*

UNIT - 1 **L-10**

WORKROOM PRACTICES : Patternmaking tools, Pattern paper, Workroom terms and definitions, Industrial form and pattern production terms; Figure Analysis - Head theory, Seven and a half and eight; Measuring Techniques - Introduction, Measurement charts, Tools required for measuring process, Measuring the form, Pin marking the armhole, Circumference measurement, Horizontal balance line (HBL), Strap measurement, Vertical measurements, Horizontal measurements, Standard measurement chart; Flat pattern methods - Bespoke method and industrial method.

UNIT - 2 **L-8**

MAKING BASIC BODY SLOPERS (PAPER PATTERNS) : Bodice blocks, Skirt blocks, Torso blocks and sleeves; Dart Manipulation - Slash and spread, Pivotal methods, Designing with darts, Tuck darts, Pleats, Flares, Gathers and style lines.

SLEEVES: SET–IN–SLEEVES : Plain, Puff, Bell, Bishop, Circular and leg-o-mutton; Sleeves combined with bodice, Kimono, Dolman and Raglan.

UNIT - 3 **L-9**

COLLARS: Peter pan, Partial roll, Cape collar, Scalloped, Sailor, Square, Full roll convertible, Shawl and Shakespeare collars.

CUFF: Shirt cuff, Self-faced cuff, French cuff and contoured cuff.

UNIT - 4 **L-9**

YOKES : Preparing patterns for yokes - Partial, Yoke without fullness, Yoke with fullness and yoke supporting or releasing fullness.

GARMENT DRAFTS : Basic principles and methodologies used to draft standard size block patterns for men, Women, Namely for shirts, Trousers, Skirts, Blouses, Nightwear, Jackets and special dresses, etc.

UNIT - 5 **L-9**

PRINCIPLES OF GRADING : Master and basic grades - Basic back, Basic front, Basic sleeve, Basic collar, Basic cuff and basic facing; Styles of Grading - Men's size chart, Grading of shirt, Trousers, jacket, Waistcoat, Displacement of bust dart to side seam, Armhole and neck, Women's size chart, Multi-track grading.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Preparation of patterns for making of

1. Baba suit
2. Baby frock
3. Round Neck T- Shirt
4. Romper
5. Salwar and Kameez
6. Blouse
7. Skirt and Top
8. Brassier and Panties
9. Nighty
10. Men's Shorts
11. Men's Formal Shirts
12. Men's Formal Trousers
13. Jeans

TEXT BOOKS:

1. J Helen Armstrong, "Pattern Making for Fashion Designers" 4th edition, Prentice-Hall, New Jersey, 2006
2. C Schaeffer, "The Complete Book of Sewing Shortcuts", Sterling Publishing (NY), 1981.

REFERENCE BOOK:

1. G. Cooklin, "Master Patterns and Grading for Women's Outsize", Blackwell Scientific Publications,1995.

16TF206 FASHION ILLUSTRATION LAB

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	20	10	-	-

Course Objectives:

The objective of this course is to develop among the students the basic creative and manipulative skills necessary for fashion design through various shading techniques.

Course Outcomes:

The student will be able to:

- sketch the various elements and principles of designing.
- examine the human body structure (anthropametry) to design clothing.
- draw fashion figures and visually communicate apparel design details.
- demonstrate an understanding of the colour theory using various colour schemes.
- illustrate different styles of garment components and reproduce them to fit on to fashion figures.

LIST OF EXPERIMENTS Total hours: 30

Illustration of the following:

1. Lines and strokes using pencil shading techniques; lettering and numbering styles.
2. Elements of design.
3. Principles of design.
4. Different postures of human head, hand, leg and feet.
5. Different hair styles.
6. Sketching of lay figure using head theory.
7. Preparation of Prang's colour wheel.
8. Preparation of different colour schemes.
9. Rendering different fabric textures.
10. Sleeves, cuffs, and necklines.
11. Skirts, pockets, trousers, and skirt tops

16TF207 ACCESSORIES DESIGN AND SURFACE ORNMENTATION LAB

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	30	-	10	10	10	-	5

Course Objectives:

The objective of this course is to Illustrate and construct different styles of various fashion accessories using different materials.

Course Outcomes:

The student will be able to:

- demonstrate the basic embroidery stitches
- explain and embellish the fabric surface using decorative embroidery works, applique work and patch work.
- learn the basics of paint brush strokes and color mixing techniques and demonstrate fabric painting through various techniques.

LIST OF EXPERIMENTS Total hours: 30

1. Designing and production of Earrings, bracelets, necklaces using materials like colored papers, buttons, fabric scraps, coloured beads and stones.
2. Designing and Construction of handbags, purses and gloves.
3. Designing and Construction of headband, bows, cap and waistband
4. Basic Embroidery stitches:

   Running, satin, long and short, chain, stem, herringbone, cross stitch, knotted stitch, fishbone, wheat, couching, buttonhole
5. Special embroidery stitches:

   Bead work, sequin work, zardosi, aari work, badla worK.
6. Decorative surface embellishment:

   Cutwork, drawn thread work, eyelet and mirror work, shadow work, ribbon work and Kundan work.
7. Appliqué work and Patch work.
8. Fabric Painting:

   Colour theory, mixing techniques, basic paint brush strokes
9. Fabric Painting:

   Stencil painting, spray fabric paint, sponges and stamp painting
10. Tie and Dye and Batik Work.
11. Illustration of skirts, pockets, trousers, and skirt tops.

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	42	6	12	3	2

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

Students will be able to:

- having gone through the course, students would be equipped to clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- this will equip them to stand out both in the professional setting as well as for further pursuits in the academic world.
- Since this certification looks at LSRW (Listening, Speaking, Reading and Writing) components in great detail, we hope to equip students to confidently and successfully attempt all the 4 critical components.

SKILLS:

- ✓ *Understand and use grammar rules in writing; sentences, paragraphs, paraphrasing,*
- ✓ *Write business emails, memos, letters, reports and proposals*
- ✓ *Comprehend business articles, and documents*
- ✓ *Expressions in Professional context, and acquire presentation skills like one minute talk and pair discussion in professional context*
- ✓ *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT - 1 **L-3, P-3**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage) **Elements of Technical Writing**: Sentence structure, reducing verbosity, arranging ideas logically, building coherence, paragraph level and document level, topic sentence, cohesive devices, transitional words, paraphrasing and précis-writing. **Mechanics of Writing:** Stylistic elements, the rapporteur, the purpose, the reader's viewpoint (audience), elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, weak links in business correspondence, ethical concerns in business writing, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication

UNIT - 2 **L-5, P-5**

BUSINESS CORRESPONDENCE: E-mail: nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and minutes of the meeting, notice, circular and memo

Letter-Writing: Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiring, claim letter – letter of apology etc], introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts ofa report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusion and recommendations, citations, references and appendices)

UNIT - 3 **L-2, P-6**

SPEAKING: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), features of a good power point presentation (making the PPT), delivering the presentation effectively, telephone etiquettes, delivering seminar/proposal/ report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations

UNIT - 4 **L-4, P-10**

READING: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **L-2, P-5**

LISTENING: Specific information in business context, listening to telephonic conversations/messages and understanding the correct intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion, enable active listening

TEXT BOOKS: BEC

1. Guy Brook Hart (2014): Cambridge English Business Bench Mark: Upper Intermediate, Second Edition: CUP.
2. CUP (2002) Cambridge: BEC VANTAGE: Practice Tests, CUP

ONLINE REFERENCE BOOKS:

1. http://www.cambridgeenglish.org/exams/business-certificates/business vantage/preparation/
2. https://www.youtube.com/watch?v=qxFtn9pGaTI.

ACTIVITIES:

- *Basic grammar practice, Framing paragraphs on topics allocated,*
- *Paraphrasing an article or a video in your own words Finding topic sentences in newspaper articles*
- *Finding out new words from a professional viewpoint Understanding the meaning and its usage*
- *Perusing samples of well prepared proposals and reports*
- *Draft different proposals/ reports on topics assigned.*
- *Watching videos/listening to audios of business presentations*
- *Classroom activities of team and individual presentations*
- *Using PPTs, mock exercises for BEC speaking.*
- *Presenting (speaking) the written components completed in Unit-I.*

16TF208 GARMENT CONSTRUCTION TECHNIQUES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	10	10	10	-	-

Course Description and Objectives:

This course offers the knowledge required for constructing garments by learning various types of seams, stitches and sewing threads, method of construction of different types of sleeves and collars. The objective of this course is to provide basic knowledge and skill required for construction of garment.

Course Outcomes:

The student will be able to:

- differntiate various types of seams, seam finishes, stitches and sewing threads.
- learn techniques involved in the construction of garment closures.
- perform the construction of garment yokes, fullness and hem etc.

SKILLS:

✓ *Design the stitching methods used for pockets, plackets, waist bands and cuffs.*

✓ *Construct pockets, yokes and collars for a given garment.*

✓ *Select the right accessories for construction of garment.*

✓ *Stitch different types of plackets to acceptable quality levels.*

UNIT - 1 **L-9**

SEAM AND STITCHES : Seams - Definition, Types of seams, Seam quality, Seam performance, Factors to be considered in the selection of seam, Seam finishes, Seam defects; Stitches - Definition, Stitch classes, Stitch parameters, Factors to be considered in the selection of stitches, Stitching defects.

UNIT - 2 **L-9**

SEWING THREAD, SLEEVES AND COLLARS : Sewing thread - Types, Construction, Sewing thread quality, Selection of sewing thread; Types of fabrics - plaid and napped fabrics.

Sleeves and collars - Types of sleeves, plain, puffs, gathered, bell, bishop, circular, leg-o-mutton, Magyar sleeves dolman, kimono; Collars – Classification, full, flat, roll, partial roll, puritan collar, sailor collar, square collar, rippled collar, scalloped collar, mandarin, convertible, tie, shawl reverse and notch collar.

UNIT - 3 **L-10**

YOKES AND FULLNESS : Yokes - Definition, Selection of yoke design, Different styles of yoke, Simple yoke, yokes with or without fullness, midriff yokes, Methods of attaching yokes.

Fullness - Definition types; Darts - single, double, pointed darts, tucks, pin tucks, cross tucks, piped tucks, shell tucks, Pleats - knife pleats, box pleats, invertible box pleats, kick pleats, flare, godets, gathers, shirrings, single or double frills, ruffles; Hemming Techniques - Definition, Factors to be considered in the selection of hems, Types of machine stitched hem, Hand stitched hem; Neckline Finishes - Preparation and uses of True Bias, Facings, and Binding.

UNIT - 4 **L-9**

POCKETS AND PLACKETS : Plackets -Types, two piece plackets, continuous plackets, kurtha plackets, shirt cuff placket.

Pockets - Types, patch pocket, patch with lining / flap, front hip, set-in seam, slash pocket with flap-single lip, double lip. Waistband: one-piece, two-piece and tailor waistband, elastic applied; Cuffs - Types, square shape, round shape.

UNIT - 5 **L-8**

FASTENERS : Introduction and construction techniques of garment closures; Applications of zippers, Types of button and button holes and their applications, Types and applications of hooks and eye snaps; Velcro, Eyelets, Cords.

ACTIVITIES:

- *Draw and construct the yoke, collar and pockets.*
- *Prepare Various stitches used for making the garment.*
- *Collect sewing threads used for various garments.*

LABORATOTY EXPERIMENTS

Course Outcomes:

The student will be able to

- Construct different types of seams, seam finishes, darts, tucks and pleats to acceptable quality levels.
- Construct different neckline finishes such as bias binding, facing and collars to acceptable quality levels.
- Stitch various types of pockets to acceptable quality levels.
- Construct different types of sleeves to acceptable quality levels.

LIST OF EXPERIMENTS Total hours: 30

Preparing samples of

1. basic seams, seam finishes.
2. darts, tucks and pleats.
3. plackets - continuous bound placket, 2 piece placket.
4. plackets - fly opening and zipper.
5. necklines - bias facing, bias binding and shaped facing.
6. collars - peter pan collar, shirt collar.
7. collars - shawl collar, sailor collar.
8. pockets - patch, bound and front hip pocket.
9. sleeves - plain, raglan kimono.
10. sleeves - puff, bell sleeve.

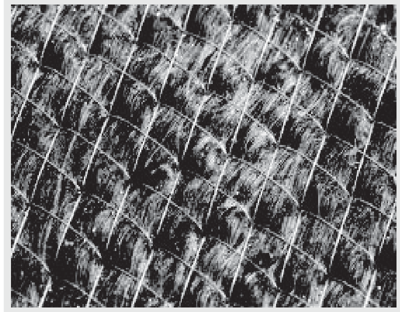
TEXT BOOK:

1. C. B. Shaeffer, “The Complete Book of Sewing Shortcuts”, Sterling Publishing Company, 1981.

REFERENCE BOOKS:

1. C. Gerry, “Garment Technology for Fashion Designers”, Blackwell Science Ltd., 1997.
2. Laing, J Webster, “Stitches and Seams”, Woodhead Publishing Ltd., 1998.
3. L. Aitken, “Step by Step Dress Making Course”, BBC Books, 1992.

16TF209 TECHNOLOGY OF KNITS AND NON-WOVENS



Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	-	-	10	-

Course Description and Objectives:

This course provides an overview on knitting elements followed by warp knitting and weft knitting. Then it introduces manufacturing techniques of different types of nonwoven fabrics. It also includes the application of different types of knitted and nonwoven fabrics. This course is aimed at offering basic concepts required for manufacturing knitted and nonwoven fabrics.

Course Outcomes:

The student will be able to:

- understand the role of knitting machine elements in fabric manufacturing.
- differentiate between pain, rib and interlock types of basic knitted structure.
- understand the role of cam setting and hence the patterning in weft knitting.
- describe loop formation and lapping movements fro warp knitting.
- compare the different techniques of fiber web manufacturing.
- know the bonding of fibre web using different techniques.

SKILLS:

- ✓ *Identify different types of knitted structures and their applications.*
- ✓ *Selection of different types of nonwoven fabrics for specific applications.*
- ✓ *Prepare binder for chemical bonding applications.*
- ✓ *Select needle type and its specifications for needle punched fabric as per application.*
- ✓ *Analyse type of fibre suitable for thermal bonding.*

ACTIVITIES:

- *Identification of face, back side and type of knitted fabric by visual observation.*
- *Analysis of SMS non woven composite fabric for surgical mask.*
- *Identification and analysis of nonwoven fabric used in carry bags.*
- *Designing of needle punched fabric for filtration application.*
- *Selection of knitting machine gauge based on tightness factor.*

UNIT - 1 **L-9**

INTRODUCTION TO KNITTING : Comparison of woven, nonwoven and knitted fabrics, Fundamental terms of knitting technology, Elements of knitting machine, Various zones in knitting machine and their significance. Classification of weft knitting structures and machines,

WEFT KNIT STRUCTURES: Plain or single jersey, rib, interlock and purl, loop and needle diagrams to illustrate basic structures.

A brief note on straight bar and flat knitting machines.

UNIT - 2 **L-9**

PATTERNING IN WEFT KNITTING: Scope and need, Arrangements in cam for knit, miss stitch and tuck stitch, Requirements for hosiery yarn-a brief note on common defects, A brief note on straight bar and flat knitting machines knitting dynamics: A brief note on forces acting on the needle, linear and nonlinear cams, needle breakages.

INTRODUCTION TO WARP KNITTING: elements, a brief note on driving arrangements for guide-bars, needle bars and sinker bars, basic lapping movements in warp knitting, Loop formation in Tricot and Raschel knitting machines.

UNIT - 3 **L-9**

Classification and definition of Nonwoven, Nonwoven manufacturing techniques, Dry laid webs – fibre selection, fibre preparation, web formation, layering,

WET LAID NONWOVEN: Raw materials and fibre preparation, common defects, production process, hydro-former, cylinder mould machine, Roti-former, Special features and applications,

AIR LAID NONWOVEN: Raw materials, production process, Rando-webber, Cicopee web formation method, Applications.

POLYMER-LAID WEB FORMATION: Basic production process of spun-laid technique. Melt blown nonwovens - Melt blown fabric production –Characteristics and properties of melt blown Fabric.

UNIT - 4 **L-9**

MECHANICAL BONDED WEBS: Introduction to needle punching – Passage of material through needle loom – Feeding system, Batt formation, Drafting, Pre-needling and final needling;

compared specification of needle,Texturing needles- Application of needle punching.

STITCH BONDED NONWOVEN: stages of production –Maliwatt and Malivlies process-applications.

HYDRO ENTANGLED NONWOVENS: Principle, Specific energy coefficient– Hydro entanglement process technology: Pre-wetting, Support surface, Dewatering, Nozzles, Injector, Drying - Applications.

UNIT - 5 **L-9**

CHEMICAL BONDED NONWOVEN: Latex binder –Bonding technology – Saturation, Foam bonding, Spray bonding, Print bonding, Powder bonding, Application of chemical bonded nonwoven.

THERMAL BONDED NONWOVENS: Binder, Binding fibres, Binding powder, Binding webs, Methods of thermal bonding – Hot calendaring, Belt calendaring, Oven bonding, Ultrasonic bonding, Radiant heat bonding.

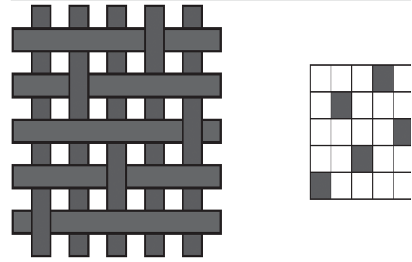
TEXT BOOKS:

1. S. J. Russel, "Handbook of Nonwovens", 1st edition, Wood Head Publishing in Textiles, 2006.
2. D. J. Spencer, "Knitting Technology", 2nd edition, Wood Head Publishing Company, England, 2008.

REFERENCE BOOKS:

1. Turbak, "Nonwoven Process Performance & Testing", 2nd edition, Tappi Press, Woodhead Publishing, Cambridge, 1993.
2. W. Albrecht, "Nonwoven Fabric Construction Synthetic Fibres", JWS Publications, 2007.
3 W B. Azagoankar, "Knitting Technology", Mahajan Textile Publishers, 5th edition, 2006.

16TF210 FABRIC STRUCTURE AND DESIGN



(a) Flat view (b) Weave design

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	-	20	-	20	-	-

Course Description and Objectives:

This course introduces the significance of basic elements of fabric designing, basic weaves with their derivatives and applications. It also includes the concepts of designing of compound weave structures. Objective of this course is to offer basic concepts of representation and drawing of fabric weaves.

Course Outcomes:

The student will be able to:

- draw the design elements viz. drafting, lifting and reed plan for given weave.
- analyze basic design parameters of different fabrics.
- interpret the design elements for a given structure
- understand the manufacturing techniques for a different weave structure
- describe the color and weave effect.

SKILLS:

✓ *Draw the weave notation for given fabric structure.*

✓ *Selection and arrangement of number of heald frame as per drafting plan.*

✓ *Measure and calculate designing parameters viz. thread density, crimp, count.*

✓ *Identify the manufacturing requirements for a given weave structure.*

✓ *Draw the color pattern from warp and weft color plan.*

ACTIVITIES:

- *Analysis and designing of weaves, drafting and lifting plan for shirting fabric, upholstery.*
- *Analysis and designing of weaves, drafting and lifting plan for any compound structured fabric .*
- *Manufacturing of woven fabric from drafting and lifting plan.*
- *Drawing weave notation for any weft knitted fabric.*
- *Manufacturing of warp knitted fabric based on design.*
- *Draw-in and denting operation for basic weaves.*

UNIT - 1 **L-9**

INTRODUCTION TO FABRIC STRUCTURE : Method of weave notation – Elements of fabric structure: design, draft, denting and peg plan and their interrelation - Warp faced,weft faced, equifaced weaves, – Classification of weaves .

PLAIN WEAVE : Modification of plain: as warp rib, weft rib, matt, fancy matte, stitched hopsack, Sateen and satin: Characteristics, Possible moves, Modification of floating weaves.

UNIT - 2 **L-9**

INTRODUCTION TO TWILLS : Characteristics of Twills, Twill angle, Twist and twill interaction, Twill modification: wavy, herringbone, combined, broken, steep, flat, skip twills.

FANCY WEAVES : Honey comb-Huck-A-Back-Mockleno: Basic designs, Distorted thread effects (warp and weft way). Colour and weave effects: Effect produced by simple colour and weave combinations.

UNIT - 3 **L-9**

ADVANCED FABRICS : Extra thread figuring – Bed fords and welts or piques – Backed cloths: reversible and wadded backed cloths.

DOUBLE CLOTHES : Principles of stitching, reversible, wadded, inter changeable double cloths Treble cloths: principle of stitching.

WEFT PILES : Plushes & corduroys, A brief note on Warp plies, Velvets.

UNIT - 4 **L-8**

TERRY PILES : Terry motion, Terry ornamentation, Dobby striped & Check effects in Terry.

GAUZE & LENO : Principle, Sheds formed in Leno, Designs for simple leno.

KNIT STRUCTURE NOTATION : Knit stitch, Float stitch, Tuck stitch, Symbolic (graph paper) representation of stitches, Diagrammatic representation of stitches.

UNIT - 5 **L-10**

DERIVATIVES OF PLAIN KNIT : Le Coste, Cross tuck, Satin, Knitted twill, Ornamentation of rib structure 2X2 rib structure, Half cardigan, Full cardigan, Derivatives of inter lock structures; Ponte-di-Roma, Ottoman rib, Bourrelet, TEXI-pique, Milano rib, Swiss Pique.

REPRESENTATION OF WARP KNIT STRUCTURES : Point paper, Chain-link notation, Single fabrics: Chain stitch, Tricot lap, Extension of 1-and-1 lapping, Full tricot, Lock knit, Reverse lock knit, Satin, Loop raided fabrics, Queen’s cord, Sharkskin.

LABORATOTY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

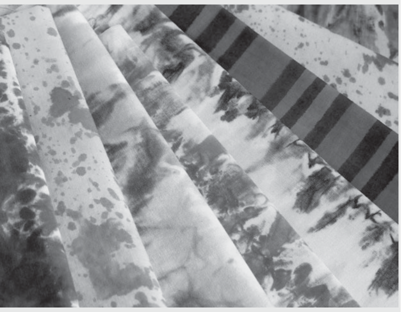
1. Identification of basic features of fabrics and Need for Analysis.
2. Analysis of different types of warp faced, weft faced and equifaced plain fabrics.
3. Analysis of different types of Twill fabrics.
4. Analysis of different types of Sateen fabrics.
5. Selection of Reed and Pick for different simple fabrics.
6. Preparation of stripes and checks using 2 or more colors with and with out plain weave.
7. Preparing of designs for shirting and Suiting from different blended materials.
8. Preparation of patterns for bed sheet, upholstery, furnishing fabrics.
9. Analysis of data for compound structures.
10. Analysis of extra warp and extra weft and other complex structures.
11. Planning of loom equipment to produce simple and complex fabrics.

TEXT BOOKS:

1. Z.J. Groscicki, "Watson's Textile Design and Colour", Newness – Butter & Worths, Mahajan Book Publishers, Ahmedabad, Gujarat, 4th Edition, 2006.
2. Z.J. Groscicki, "Watson's Advanced Textile Design", Mahajan Book Publishers, Ahmedabad, Gujarat, 4th Edition 2006.

REFERENCE BOOKS:

1. Robinson and Marks, "Woven Cloth Construction", Mahajan Book Publishers, Ahmedabad, Gujarat, 2008.
2. John Reed, "Fabric Structure and Design", Veritas Publications,Hong Kong, 2007.
3. Nisbeth, "Grammar of Textile Design", Mahajan Book Publishers, Ahmedabad, Gujarat, 2007.
4. David J.Spencer, "Knitting Technology", Wood Head Publishing, 2nd edition, 2008.



16TF211 TEXTILE WET PROCESSING

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	15	-	-	-	10

Course Description and Objectives:

This course introduces the fundamental concepts in dyeing of various fibers and its bonding with different classes of dyes. It also includes methods and different styles of printing. Finally it deals with finishing of textile and need for effluent treatment plant . Objective of this course is to impart fundamental concepts of chemical processing of fabric.

Course Outcomes:

The student will be able to:

- understand grey fabric preparation for processing.
- know the dyeing of fabric using different classes of dyes.
- differentiate different methods and styles of printing.
- understand the importance of finishing and different types of finishes.
- aware of importance of effluent treatment plant.

SKILLS:

✓ *Select the preparatory process for grey fabric preparation.*

✓ *Identify suitable classes of dyes for the selected fibers.*

✓ *Printing of the different fabrics with suitable dyes as well as pigments.*

✓ *Compare the shade of original sample with dyed sample by using Computer Color Matching system.*

✓ *Find usefullness of particular finish for the specific application.*

UNIT - 1 **L-9**

GREY PREPARATION : Singeing, Desizing and its types, Scouring - Purpose and process, batch, semi-continuous and continuous methods of scouring. Bleaching of cotton goods with sodium hypochlorite, hydrogen peroxide and sodium chlorite. Mercerization - objects and principle of mercerization, yarn mercerization, fabric mercerization.

UNIT - 2 **L-9**

DYEING : Fundamentals, Classification of colorants, Difference between dye and pigment, Common terms used in textile coloration, Different kinds of dye-fibre bonds for common fibres, Dyeing of cotton with direct, reactive, vat dyes, Dyeing of wool and silk with acid and basic dyes, Dyeing of polyester with Disperse dyes, Principle of computer-aided color matching.

UNIT - 3 **L-9**

PRINTING : Methods of printing - Principles of block printing, roller printing, flat-bed and rotary-screen printing, and transfer printing techniques. Styles of printing - Principles of direct, discharge and resist styles of printing, printing with reactive dyes, Printing with pigments, study of chest and rotary screen printing machines for knitted goods.

UNIT - 4 **L-8**

FINISHING : Classification of textile finishes - Mechanical finishes: calendaring and its types, mechanical shrinking (Sanforising), Compacting of knitted fabric. Outline of functional and aesthetic finishes - wrinkle-free finishing of cotton fabric (resin finishing), UV-protective finish, antimicrobial finish, flame-retardant finish, water-repellent finish, soil release finish.

UNIT - 5 **L-10**

PROCESS HOUSE EFFLUENT AND ITS TREATMENT : Nature of effluents in chemical processing, Effect of waste water discharge on the environment, Government standards for textile chemical process effluent discharges, Treatment of dye house effluent, operations in an ETP and methods for removal of color in dye house effluent, azo dyes and major banned amines, guidelines for eco-friendly processing.

ACTIVITIES:

- *Interpretaion of of computer colour matching data.*
- Dyeing of fabric with natural dye using different mordants.
- *Identification of various defects within the dyed and printed fabrics.*
- *Collection of different finished samples in regular use.*
- *Analysis of tirupur case study for ETP.*

LABORATORY EXPERIMENTS

Course Outcomes:

Upon completion of this course, the student will be able to

- Perform the grey fabric preparation for processing.
- Perform the dyeing and different classes of dyes used.
- understand different methods of printing, styles of printing.
- understand the importance of computer color matching.

LIST OF EXPERIMENTS Total hours: 45

1. Scouring of cotton using alkali-boiling method.
2. Bleaching of cotton using hydrogen peroxide.
3. Dyeing of cotton with direct dyes & Reactive cold brand dyes.
4. Dyeing of cotton with Hot brand reactive dyes.
5. Dyeing of cotton with vat dyes.
6. Dyeing of silk, wool or nylon fabric with acid dyes.
7. Determination of color fastness to washing, Light and rubbing.
8. Printing of cotton with reactive dyes using blocks and screens.
9. Direct printing of cotton with pigment colors using screens.
10. Discharge and resist styles of printing on cotton.
11. Printing of polyester with disperse dyes.
12. Dyeing of cotton fabric with pigments using padding method and the dyeing of cotton fabric with vat dyes by the pad-jig method.
13. Dyeing of polyester using a lab-scale HTHP machine and dyeing of knitted fabric in a lab-model winch machine.
14. Computer-aided color matching.

TEXT BOOKS:

1. C. V. Koushik and A. I. Josico, “Chemical Processing of Textiles – Grey Preparation and Dyeing”, NCUTE Publication, New Delhi, 2004.
2. V. A. Shenai, “Technology of Finishing”, Sevak Publications, Mumbai, Nitra, 1995.

REFERENCE BOOKS:

1. V. A Shenai, “Technology of Textile Processing – Vol. III, IV, V, VII and VIII”, Sevak Publications, Mumbai, 1995.
2. J. W. Palmer, Textile Processing and Finishing Aids: Recent Advances, Mahajan Book Distributors, 1996.

VFSTR UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

III Year B.Tech. Textile Technology I - Semester

L	T	P	To	C
4	0	-	4	4

TT317 TEXTILE TESTING–I

Course Description & Objectives:

This objective of this course is to understand different testing methods for fibres and yarns.

Course Outcomes:

1. *Students will able to understand basic testing of fibres and yarns.*
2. *The student will also understand the basic property of materials and characterization techniques.*

UNIT I - Introduction to Textile Testing:

Objectives of testing – determination of Sample size for testing & Selection of samples for testing – Sampling errors – Point estimations of mean and variance Interval estimation of mean and variance – Number of tests – Significance test: t test , Z test and ANOVA with application to textile. Random and Biased sample – Length and extent biased samples – zoning technique for raw cotton

UNIT II - Fibre Testing-I

Measurement of Regain and Moisture content – Corrections for regains – Numerical examples. Hygrometers: Hair and Digital hygrometer – Factors affecting the regain – Effect of moisture on fibre properties – Drying oven – Shirley moisture meter.**Fibre Dimensions:** Fibre length measurement – Fibre sorter methods – Analysis of Sorter diagrams – span length –Fibrograph and uniformity index | Fibre fineness –important of fineness- measurement by gravimetric, microscope, vibroscope – air flow methods – Principle – WIRA Fineness meter for cotton– Sheffield Micronaire

UNIT III - Fibre Testing-II

Determination of Maturity of cotton – Maturity ratio – Maturity count – Measurement of maturity of cotton fibres, Terminology related to Tensile properties of Textiles – Measurement principles CRL CRE and CRT –

Measurement of Fibre strength – Pendulum lever principle – Stelometer, strain gauge principle – Instron Tensile Tester. Latest Testing instruments like AFIS, HVI and their use – Measurement principle and different modules with data analysis

UNIT IV - Yarn Testing-I

Yarn Dimensions: Yarn numbering system – Measurement Linear density by skein gauge, wrap reel Beesley's yarn balance –wist factor – Effect of twist on yarn and fabric properties – Measurement of Twist by direct, continuous, tak-up twist and twist to break methods – Measurement of yarn strength by Single yarn test and lea test –CSP and RKM.Importance of yarn friction in textile industry – General mechanism of friction – laws of friction – Measurement of friction by various methods –Yarn-on-Yarn Friction – Bartlett smith and Thompon's inter fibre friction method – Uster Zweigle Friction Tester

UNIT V - Yarn Testing-II

Measurement of hairiness by Shirley yarn hairiness tester, Zweigle G565 and Uster tester 3 hairiness meter – Evenness testing of silvers - rovings and yarns – Analysis of periodic variations in mass per unit length – Index of irregularity – limit irregularity – addition of irregularities – Eveness Tester (Uster evenes teste) - Random occurring faults (Uster classimat) - Spectrogram - variance length curves analysis The causes and effects of irregularity.

TEXT BOOKS:

1. Keshavan and Angappan, "Physical Testing", Vol- I & II, SSMITT Publications, Komarapalyam,1993.
2. J.E.Booth, "Principle of Textile Testing", Butterworths Publisher, London.

REFERENCE BOOKS:

1. Arindam Basu, "Textile Testing", Sitra Publishers, Coimbatore, 2004
2. "I S I Hand book of Textile Testing" –Indian Standard Institution, New Delhi 1981.
3. "Fabric Assessment by Mechanical Sensing Methods", Textile Progress, Edited by Bishop, Vol – 28, 1996.

III Year B.Tech. Textile Technology I - Semester

L	T	P	To	C
4	0	-	4	4

TT 319 TECHNOLOGY OF PREPARATORY AND DYEING

Course Description & Objectives:

The main aim of this course is to give the detailed idea about textile wet processing. From the preparatory process to coloration of the textile fibre, yarn and fabrics are discussed in detail. The measurement of colour and whiteness is also covered.

Course Outcomes:

1. *Students will able to understand the importance of wet processing of textile yarn and fabric.*
2. *They will able to find the effect of different process chemistry and machine related to the process.*
3. *They will know the characterization of the processed fabrics.*

UNIT I - Introduction, Singeing & Desizing

Introduction to Wet Processing: Requirements of water for dye house, calculation based on fabric G S M, Wetting, contact angle, detergency, types of surface active agents | **Singeing:** Objects, need, sorts signed, methods, problems | **Desizing:** objects, methods: conventional and enzymatic.

UNIT II - Scouring & Bleaching

Scouring: Objects, scouring loss % and its effect on fabric properties, conventional and modern methods. Scope of quality control aspects in textile wet processing

Bleaching: Need and sorts bleached, objects, methods, combined scouring and bleaching, machines & quality control, Washing machines, recycling of water.

UNIT III - Mercerizing & Dyeing

Mercerization: Need and sorts mercerized, Parameters and their effect on the product changes in cellulose after mercerization, methods of mercerization, Liquid ammonia mercerization - quality control aspects.

Introduction to Dyeing: Chemical constitution colour and its elements, Physical chemistry of dyeing, parameters of dyeing, theories of dyeing, Kinetics of dyeing Classification of dyes.

UNIT IV - Dyeing Process & Effuelent Treatment

Dyeing of Natural & Man Made Fibres: Dyeing of 100 % fibres selection of dyes and dye shade, effect of parameters of dyeing on fabric properties, application of Direct, Reactive, Basic, Acid, metal complex, Dyeing with Disperse, Vat, Sulphur dyes (dyeing procedures only).

Processing of Textile Effluents: Need for effluent treatment, collection, examination, characteristics of effluents arising of cotton, wool, silk and man made fibre fabrics, concepts of BOD and COD, Treatment methods, primary treatment, secondary biological treatments, tertiary treatment methods, recovery and reuse of waste water.

UNIT V - Color Theory

Colour Measurements: Relation between light and dye, dye and eye. Light, colour and electromagnetic spectrum, Theories of colour vision, Colour primaries and colour mixing – Additive and subtractive, Colour specification – Munsell colour order system, Ostawald colour system, CIE system, CIE lab System, Hunter lab, Tristimulus values, Standard observer, Metamerism and Dichroism. Sample preparation for CCM Application to textile processing, Advantages & limitations of CCM, Colour difference, Assessment of whiteness, yellowness and brightness, Recipe formulation

TEXT BOOKS:

1. V. A. Shenai, "Technology of Mercerising", M/s Mahajan Books Publishers, Ahmedabad, Gujarat, 1997.
2. A K Roy Choudhury, "Textile Preparation and Dyeing" Science Publishers, January 9, 2006.

REFERENCE BOOKS:

1. E.R.Trotman, "Dyeing and Chemical Technology of Textile Fibres", 3rd ed., Griffin Publications, SBT Bomboy, Ahmedabad, 1992.
2. V.A.Shenai, "Technology of Bleaching", Vol - 3, Sevak Publication, Bombay, 1984.

III Year B.Tech. Textile Technology I - Semester

L	T	P	To	C
4	0	-	4	4

TT 321 FABRIC STRUCTURE AND DESIGN

Course Description & Objectives:

The main aim of this course is to understand and indentify various structure of the fabric with their applications.

Course Outcome:

1. *Students will able know and identify variety of fabrics with its loom equipment planning accordingly.*
2. *Students will also be able to understand various structure of the fabric in detail.*

UNIT I - Introduction To Fabric Structure

Method of weave notation – elements of fabric structure –Fabric Structure & Texture compared- Warp faced,weft faced, equi faced weaves, fabrics, constructions Selection of Reed and its importance-design, draft, denting and peg plan – their inter relation – classification of weaves – modification of plain: as warp rib, weft rib, matt, fancy matte, stitched hopsack – classification of plain clothes.

UNIT II - Twills & Fancy Structures

Characteristics of Twills, twill angle, twist and twill interaction, Twill modification: wavy, herringbone, combined, broken, steep, flat, skip twills, sateen and satin, modification of Floating weaves – fancy weaves: honey comb-Huck-A-Back-Mock-leno: Basic designs, distorted thread effects (warp and weft way).

UNIT III - Fabric Structure & Design

Crepe Weave:Different methods of construction – colour and weave effects: Theories of colour, Effect produced by simple colour and weave combinations– classification of advanced fabrics – extra thread figuring – bed fords and welts or piques – backed cloths: reversible and wadded backed cloths.

UNIT IV - Advance Fabric Structures-I

Double Clothes: Principles of stitching, reversible, wadded, inter changeable double cloths - treble cloths: principle of stitching – weft piles: plushes & corduroys, A brief note on Warp plies, Velvets.

UNIT V - Advance Fabric Structures-II

Terry Piles: Terry motion, Terry ornamentation, Dobby striped & Check effects in Terry-Gauze & Leno: principle, Sheds formed in Leno, Designs for simple leno - Damasks and brocades: twilling jacquard, method of developing a design for Damask (Planning for Loom production).

TEXT BOOKS:

1. Z.J. Groscicki, "Watson's Textile Design and Colour", Newness – Butter & Worths, M/s Mahajan Book Publishers, Ahmedabad,Gujarat, 2006.
2. Robinson and Marks, "Woven Cloth Construction", M/s Mahajan Book Publishers, Ahmedabad, Gujarat, 2008.

REFERENCE BOOKS:

1. Kibbe, "Fabric Structure and Design", E.L.B.S.Publications, Moscow, 2008.
2. John Reed, "Fabric Structure and Design", Veritas Publications,Hong Kong, 2007.
3. Nisbeth, "Grammar of Textile Design", M/s Mahajan Book Publishers, Ahmedabad, Gujarat, 2007.

III Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT 323 ADVANCED YARN MANUFACTURING

Course Description & Objectives:

This Course Teaches The Students About Fundamental Concepts Of Different New Spinning Techniques And Texturising Methods.

Course Outcomes:

At the completion of this course, the student should be able to

1. Understand the concepts and differentiate the advantages of new spinning processes.
2. Evaluate the different spinning systems w.r.t yarn structures and properties.

UNIT I - Rotor Spinning

Limitations of ring spinning – principles of open end spinning – principles of rotor spinning – opening roller specifications for cotton and synthetics – Tangential and radial feeding – back doubling concept - external and internal suction device – rotor groove geometry – their influence on design parameters and dimensions of rotor – spinning performance doffing tube and false twist effect – take up and package formation – auto piecing systems – rotor yarn properties – calculation of twist, machine constant and production.

UNIT II - Twistless, Self Twist & Airjet

Twist-less spinning – Tekja process – TNO, TWILO. **Self twist spinning** – Repcospinning – developments

Air-jet / Vortex spinning – principle of formation of wild, core wild, wrapper, wrapper wild fibers – machinery details – yarn structure and properties.

UNIT III - Friction, Siro Spinning

FRICTION SPINNING: Introduction – frictional forces – mechanism of friction spinning – DREF-I, II , III, V, 2000 and 3000. Yarn structures, properties and end uses.

Comparison between Ring, rotor, Air-jet and friction yarns

SIRO SPINNING principle – comparison between SIRO yarn and double yarn.

COMPACT SPINNING – methods – yarn structure and properties

UNIT IV - Texturising Part-I

Texturing – Objects – importance – textured filament and spun yarns comparison.

Methods of texturising – false twisting principles – process variables – study of draw texturing machines – raw material POY – quality – creel zone – twisting zone and winding zone – role of draw ratio and D/Y ratio and their selection – properties of draw textured yarns Stuffer box crimping – Edge crimping – knit & de-knit process – gear crimping – friction texturing.

UNIT V - Texturising Part -II

Air texturing – methods and developments – Properties and applications of air textured yarns.

Texturamat and dynafil – M.Thermal stress tester – quality control in texturising – textured yarn defects.

TEXT BOOKS:

1. C.W .Lawrence, "Technology of Yarn Production", Wood Head Publishers, London, 2000.
2. P.R.Lord & Cherian Iype, "Theory of Yarn Production",Wood Head Publishers,Wales,U.K, 2005.

REFERENCE BOOKS:

1. W..Klein, "NEW SPINNING SYSTEMS", Textile Institute Manchester, 1990.
2. J W S Hearle, L Hollick and D K Wilson, "Yarn texturing technology", CRC Press, Woodhead Publishing, 2000, ISBN 0-8493-1310-4.

III Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT325 PHYSICAL PROPERTIES OF TEXTILE FIBRES (ELECTIVE-I)

Course Description & Objectives:

Physics plays a large part in textile technology and study of the structure and physical properties of fibres, yarns, and fabrics forms is called textile physics, which is an essential part of the education of any textile technologist. The present course deals only with the fibre properties, augmented by an introduction to fibre structure.

Course Outcomes:

1. *Students will able to understand the importance of fibres characterization.*
2. *They will know different fibre characterization technique.*
3. *They will able to know the effect of different external effect on structure and property of fibres.*

UNIT I - Fibre Structure

Introduction to fiber structure – Micellar theory, continuous theory, fringed micelles theory, fringed fibrils theory, modified fringed micellar theory – fine structure of natural, fine structure and cross-section of regenerated and synthetic fibres, Importance of studying fine structure, requirements for fibre formation (Definitions of parameters which characterize most important features) – Degree of order, degree of localization of order, length/width ratio of localized units, degree of orientation, Degree of polymerization

UNIT II - Characterization Techniques And Density

Brief introduction of Methods of investigating textiles – X – Ray diffraction, IR, NMR, Thermal Analysis, Optical microscopy, Electron microscopy, Scanning Electron microscopy.

Fibre density – Measurement, Relation between density and order - Equilibrium absorption of water, Relation between regain and RH, Comparison of relation between regain and RH of various textile fibres (influence of temperature)- Heat of sorption – measurement of sorption.

UNIT III - Moisture And Tensile Properties

Diffusion of moisture, penetration into a dry fibre, conditioning of mass of fibres, Retention of liquid water, Swelling – introduction to theories of moisture sorption, effect of hydrophilic groups – Absorption in crystalline and non-crystalline regions, Hysteresis – a molecular explanation. Tensile properties – factors determining the results of tensile experiments, load elongation and stress-strain curves.

UNITIV - Mechanical Conditioning And Static Electricity

Effects of variability – Introduction to elastic recovery – Mechanical conditioning, time effect – Creep, Flexural, Torsional Rigidity – Significance of Dielectric Properties for Textiles-measurements-effect of moisture and temperature - static electricity-significance.

UNIT V - Heat Setting

Heat Setting of Textile Fibres: Introduction to heat Setting, need, objectives, types of setting, mechanism of temporary and permanent set, physics of setting, set between fibres, set with in the fibres, synthetic fibre structure and setting, measuring efficacy of setting. Thermal conductivity- structural changes in fibre on heating.

TEXT BOOKS:

1. W.E.Morton and J W S Hearle, "Physical Properties of Textile Fibers", The Textile Institute, Manchester, 1994.
2. J.E.Booth, "Principles of Textile Testing", Butterworths, London, 1987.

REFERENCE BOOKS:

1. J.Happy, "Fiber Structure", Elsevear Edition, Amsterdam, (Vol 3), 1984.
2. J.W.S.Hearle, "Moisture Relations in Textiles", The Textile Institute Manchester, 1976.
3. J W S Hwarle and L W C Mdes, "The Setting of Fibers and Fabries", Merrow Publications, Manchester, 1973.
4. S.K. Mukhopadhyay, "Advances in Fiber Science", Published by the Textile Institute, 1992.

III Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT327 PROCESS & QUALITY MANAGEMENT IN TEXTILES (ELECTIVE-I)

Course Description & Objectives:

With increasing the demand of quality and higher production, it is very important to control the process parameters. The course deals with the identification of key variable and their control.

Course Outcomes:

1. *From this course students would be able to learn process control at different departments in textile industry to achieve better quality of fabric.*
2. *To understand the need of PQC*

UNIT I - Process Control In Blow Room, Card & Draw Frame

Introduction to Process Control: Meaning, Applications to whole Textile Production from fibre to fabric – Process Parameters controlling production, quality – Introduction to quality control: Tools available, selection and interpretation.

PQC in Blow Room, Card & Draw Frame: Raw Material Management: Importance, need of instrumental evaluation, traditional methods of cotton selection, importance of cost in raw material, cotton marketing, linear programming for mixing, bale management yarn engineering & raw material. Blow Room: Control of mixing quality – control of yarn realization (Records and Accounting) – Control of waste and Waste extraction study - cleaning in Blow room (Individual and Overall cleaning efficiency of Blow room). Card: Waste extraction at card, Nep study & control, Snap Study card. Draw Frame: Breakage study, Stop motion checking, Use of NILO meter, Drafting rollers pressure checking (Carbon paper technique).

UNIT II - Process Control In Comber, Simplex & Ring Frame

Comber & Comber Preparatory: Significance & importance of good lap for comber, evaluation of comber performance, fractionating efficiency of comber, comber waste analysis, influence of various factors on combing performance-5 minute test, headwise and Overall waste at Comber. Speed Frame: Breakage study at Simplex. Ring Frame: Breakage study, Snap study, & Idle spindle study, Analysis of Snap efficiency and reasons for low snap efficiency. Measurement and analysis of productivity means to improve productivity, control of yarn quality: count, strength and their variability, yarn unevenness and imperfections, yarn faults and package defects, implementation of process control in cotton spinning.

UNIT - III PQC WINDING, WARPING & PIRN WINDING:

Process & Quality Control in Winding Scope, Optimizing of Yarn tensioning and clearing (settings for different kinds of yarns) Producing good package, Snap and breakage study, unwinding tension and optimum guide distance, Breakage and snap study in Auto coner (formats) Approach to control of productivity, Requirements of dye package.

Process & Quality Control in Warping: Scope, breakage study, Effort to minimize the breakage rate, quality of warper beams, breakage study in warping (norms), productivity, warping defects and remedies. Process & Quality Control in Pirn Winding: Scope, GO-NOGO gauge, Minimizing the end breaks, improving the build of the yarn, control of speed, productivity – Pirn quality checking report.

UNIT IV - Pqc In Sizing & Loom Shed

Process & Quality Control in Sizing: Scope, choice of size receipe and measurement of size pick up, control in size preparation, Lappers study, breakage study, control of size pick up, controlling sizing conditions, stretch control in various zones, moisture control, Migratory behavior study (ATIRA technique) quality of sized beams, positive feed to sow box, productivity, Dead loss and its control, hard waste and its control, Testing of Size Ingredients, testing of sized yarn - Selection of reeds and healds, care of reeds, effect of reed parameters on weaving performance.

Approach to Process & Quality Control in Loom Shed: (Non– auto and Auto loom shed) scope, control of speed, breakage and snap study in loom shed, determination of labour allotment (ATIRA procedure) Norms for breakage rate, No. of looms/operative, control of efficiency (concept of calculated and expected efficiency), control of loom stoppages (due to warp and weft break, shuttle change etc.)

UNIT V - Process & Quality Control In Chemical Processing

Scope, functions of control house, grey cloth inspection, Process control measures in Bleaching and mercerizing (method to estimate the concentration of caustic and silica in peroxide bleach, absorbency of bleached cloth, Cuprammonium fluidity, ash content, barium activity no. luster no. fastness of bleaching), Process control in dye house: parameters for process control in different forms of dyeing (yarn and fabric), test method to determine the caustic and Hydros conc. In vat dye liquor, Process control in Printing and Finishing: Scope, Approach to process control, test for the suitability of thickner in the print paste formation, iodine absorption test for the evaluation of degree of resign cross linking, fastness properties of dyed and printed goods to wash, light perspiration and water, Fastness to rubbing, hot press, Optimal brightness test for the uniformity of cross linking, assessment of degree of heat setting in polyester by Iodine absorption method.

TEXT BOOKS:

1. Process and Quality Control in Spinning – ATIRA
2. Process and Quality Control in Weaving – ATIRA
3. V. A. Shenai, "Evaluation of Textile Chemicals", Sevak Publications, 1980.

REFERENCE BOOKS:

1. Dr. V. K. Kothari, "Testing & Quality Management", AFL Publication, 2006.
2. Mairio Bona, "Textile Quality Physical Method of Product & Process Control", COMMETT Program of EEC.
3. "Quality Control in Spinning" – SITRA Publication.
4. Monograph Series - BTRA.
5. Dr. K. R. Salhotra, "Process Control in Spinning", Institute of Textile Technology, 2002.
6. End Breaks in Ring Spinning – ATIRA
7. A. Barella, "Yarn Hairiness", Textile Progress, Vol 13, No 1, Textile Institute, 2006
8. "Tablets on Chemical Processing", TAI Publication.

III Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT329 MECHANICS OF TEXTILE MACHINERY (ELECTIVE-I)

Course Description & Objectives:

This course deals with the mechanisms of textile machinery and humidification of the textile plants.

Course Outcomes:

At the completion of this course, the student should be able to

1. *Understand the different Concepts in various services required in Textile manufacturing.*

2. *Understand different gearing mechanisms and calculate the output speeds through various channels*
3. *Understand and design Cams and tappets for different applications*
4. *Understand terminology and concepts in Humidification systems*
5. *Understand terminology and concepts in Compressor systems*

UNIT I - Introduction to mechanics

Introduction – equations of motion – motion in a circle – transmission of motion by wheel gearing – Textile applications from fibre to finished fabric – Balancing of revolving and reciprocating masses. Belt drives – Flat and V-belts comparison – belt slippage, effect of belt thickness – effect of initial tension – effect of centrifugal force – horsepower transmitted – rope and chain drives – brief note on fast and loose pulley , jockey or rider pulley , grooved pulleys etc

.

UNIT II - Mechanisms & its applications in Textiles

Determination of speed ratio in planetary mechanisms – applications in textile industry – stepped pulleys – designing method – applications in textile industry – Mechanics of yarn winding – study on breaks and clutches – Applications of clutch and break in textile production. Feed regulation motion in Scutcher , - designing of cone drums for blow room and speed frame – construction of displacement – velocity and acceleration diagrams – kinetics of shedding – picking power for picking, picking as an elastic mechanism and beat – up: eccentricity of slay , derivation for 'e', displacement, velocity and acceleration of slay .

UNIT III - Cams & Secondary motions

Construction of cams and tappets – heart shaped, 3 leaved – plain, twill tappets – derivation to show that the frictional force 'F' is directly Proportional to the distance of weight from the fulcrum in negative let off motion – Backrest mechanisms – angular velocity of warp beam.

UNIT IV - Humidification

Humidification in Textile Mills: Need for humidification in T extile Mills, Ambient conditions required in various departments of a textile mill, Psychrometry - definition, use of psychrometric charts, various psychrometric processes like cooling, heating, humidification, dehumidification, etc. Aspects of evaporating cooling method & refrigerative cooling method, S tudy of arrangement s & layout of standard humidification methods for spinning, weaving & knitting processes – Return air ducts, Return Air Plenum, Filters, Return Air fans, Dampers, Supply Air Fans, Washers, Eliminators, Supply Air Plenum, Supply Air Duct, Diffusers etc. Study of the construction of each component, Return Air & Supply Air openings in the department, Automatic controls in humidification plants, Study of recent developments in humidification plant used in spinning, weaving, knitting departments.

UNIT V - Pumps, Compressors & Fans used in Textile Mill

Pimps: Classification & characteristics of various types of pumps, Study of types of pumps used in textile mills.

Compressors: Compression methods, intermittent, continuous, Classification of compressors & brief study of construction, working, advantages, limitations of each type, Compressed air requirement in Textile mills, Compressor accessories such as reservoir, dryer, lubrication system, filters, cooling towers, etc.

Fans: - Classification, construction & working of different classes of fans, Centrifugal, Axial flow & Radial flow, Fan capacity , power & efficiency , Fan selection, Pneumatic conveying of materials in textile mills.

TEXT BOOKS:

1. J.E.Booth, "Textile Mathematics", Vol. I, II, & III , The Textile Institute, Manchester , 1976.
2. W.A.Hanton, "Mechanics for Textile Students", Butterworths, London, 1976.

REFERENCE BOOKS:

1. W.A.Hanton, "Mechanisms of Textile Machinery", Ellis Horwood Limited, London 1976.
2. Sengupta, "Weaving Calculations", Mahajan Publishers, Ahemdabad, 1976.
3. Keshavan, "Fabric Formation", SSMITT Publications, Komarapalyam 1988.
4. Arora & Domkundwar, "Conditioning & Refrigeration", 2nd ed.,MGH, 1959.
5. G. B. Ramakrishnani, "Manual of Humidification", Batliboi Ltd., 1963.

III Year B.Tech. Textile Technology - I - Semester

L	T	P	To	C
-	-	3	3	2

TT 331 TEXTILE TESTING– I LAB

Course Description & Objectives:

This objective of this course is to understand practical concepts of different testing methods for fibres and yarns.

Course Outcomes:

1. *Students will able to perform basic testing of fibres and yarns.*
2. *The student will observe various fibre and yarn properties practically*

LIST OF EXPERIMENTS

1. Identification of textile fibers under microscope (Demonstration).
2. Determination of fiber maturity by NaOH swelling method and differential dyeing techniques.
3. Determination of fiber length by Bear Sorter and Interpretations by other methods.
4. Determination of fiber fineness by ATIRA fineness tester.
5. Determination of fiber strength by Stelometer.
6. Determination of yarn count by Beesley's yarn balance.
7. Determination of yarn count by Wrap reel.
8. Determination of single and plied yarn twists.
9. Determination of moisture content of cotton material.
10. Determination of Single Yarn Strength.
11. Determination of CSP and CCSP of Yarns
12. Determination of Regain of different fibers.
13. Determination of ginning percentage.
14. Determination of fiber length by Hallo and Butterfly Method.

III Year B.Tech. Textile Technology - I - Semester	L	T	P	To	C
	-	-	3	3	2

TT 333 TECHNOLOGY OF PREPARATORY AND DYEING LAB

Course Description & Objectives:

The main aim of this course is to make coloured fabric from grey fabric. This process includes different preparatory as well as dyeing of different fabric by different dyes. The students will perform experiments of their own to make coloured fabric.

Course Outcomes:

1. *Students will able to understand the importance of wet processing of textile yarn and fabric.*
2. *They will able to find the effect of different process chemistry and machine related to the process.*
3. *They will know the characterization of the processed fabrics.*

LIST OF EXPERIMENTS

1. Grey Fabric Inspection and defect Analysis from Processing point of view.
2. Conventional & Enzymatic Desizing of cotton and effect of desizing fabric properties.
3. Conventional Scouring of cotton and effect on fabric properties.
4. Bleaching and Optical Whitening agents treatment of cotton and effect on fabric properties.
5. Combined desizing, scouring and bleaching of cotton fabric
6. Bleaching and Optical Whitening agents treatment of wool and effect on fabric properties.
7. Mercerisation of cotton and effect on fabric properties.
8. Dyeing of Cotton with direct dyes and effect on fabric properties.
9. Dyeing of Cotton with reactive dyes and effect on fabric properties.
10. Dyeing of silk and Wool with acid dyes and effect on fabric properties.
11. Dyeing of polyester with disperse dyes and effect on fabric properties.
12. Dyeing of acrylic with basic dyes and effect on fabric properties.

III Year B.Tech. Textile Technology - I - Semester

L	T	P	To	C
-	-	3	3	2

TT 335 FABRIC STRUCTURE AND DESIGN LAB

Course Description & Objectives:

The main aim of this course is to understand and indentify various structure of the fabric.

Course Outcomes:

1. *Students will able know and identify variety of fabrics with its loom equipment planning accordingly.*
2. *Students will also be able to identify different structure of the fabric.*

LIST OF EXPERIEMENTS

1. Identification of basic features of fabrics and Need for Analysis.
2. Analysis of different types of warp faced, weft faced and equifaced plain fabrics.
3. Analysis of different types of Twill fabrics.
4. Analysis of different types of Sateen fabrics.
5. Selection of Reed and Pick for different simple fabrics.
6. Application and Identification of ISI standards.
7. Preparation of simple patterns using Pigment and Light theory of color on geometric base.
8. Preparation of complex patterns using Pigment and Light theory of color on all over base.
9. Preparation of stripes and checks using 2 or more colors with and without plain weave.
10. Preparing of designs for shirting and Suiting from different blended materials.
11. Preparation of patterns for bed sheet, upholstery, furnishing fabrics.
12. Preparing of curtain clothes on all over concept with different basis using drop devices.
13. Analysis of data for compound structures.
14. Planning of loom equipment to produce simple and complex fabrics.
15. Analysis of plain, dobby patterns using computer aided textile design.
16. Analysis of extra warp and extra weft and other complex structures.

III Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT322 TEXTILE TESTING – II

Course Description & Objectives:

This objective of this course is to understand different basic and advanced testing methods for fabric.

Course Outcomes:

1. *Students will able to understand basic testing of fabric with some special test of technical fabric.*
2. *The student will also understand the basic property of materials and characterization techniques.*

UNIT I - Fabric Diamensions And Strength

Scope of fabric testing – Importance of fabric testing – Standards for tests – classification of fabric properties, Properties of fabrics as Tailor made – Fabric dimensions like length, width, fabric weight, threads/inch (Densimeter) – crimp measurements– Measurement of thickness. **Tensile Testing of and Fabrics:**, classification of Tensile testers and working along with adjustments to suit the material under test – Automation in tensile testers –Methods for testing tensile strength of fabric – Tearing and factor affecting tearing strength– The Elmendorf tearing tester,

UNIT II - Fabric Abrasion And Stifness

Methods for testing burst strength by Hydraulic diaphragm method, Factors affecting abrasion resistance – The Martindale abrasion tester– Pilling resistance of fabrics – ICI pilling box tester –pilling evaluation subjective and objective (by image capturing). Fabric stiffness: Bending, shear and compression properties of fabrics –Methods for testing fabric shearing compression– Measurement of bending by Shirley stiffness tester and hanging loop method

UNIT III - Fabric Handle And Comfort

Fabric drape and handle – Measurement of Drape by drapameter– Crease and wrinkle behavior – Measurement of crease recovery. Air permeability – –

Air, water and water vapour transmission through fabrics – measurement of WVT by cup method and sweating garded hot plate method – Wicking Test: longitudinal and traverse – Wettability of textile fabrics. Water repellency: spray rating– Bundesmann water repellency test –WIRA shower test .

UNIT IV - Thermal Resistance And Fastness Of Fabric

Thermal resistance of fabrics – Togmeter – Fabric Friction tester. Fabric Friction measurement by simple and i nclined plane test– Flammability – Terminology related with flammability – Measurement of flammability by inclined plane method-Assessment of color fastness – Measurement of Fastness to Washing, Light, Perspiration, Rubbing for dyed goods.

UNIT V - Advance Testing

Diamensional stability: Hygral expansion, relaxation shrinkage, swelling shrinkage, Felting shrinkage, Measurement of Dimensional stability- – Fabric low stress mechanical properties, FAST and KES-F. Brief Introduction to special tests for technical textiles: moisture management tester – Wet Barrier Tester–Puncture Test–Cone Drop Test–Tension creep–Radiant Heat Transmission Tester–Thermal insulation tester TIV –Limited Oxygen Index Tester–Instrument for Run test–Surface Resistance Tester.

TEXT BOOKS:

1. J.E.Booth, "Principle of Textile Testing", Butterworths Publisher, London.
2. Arindam Basu, "Textile Testing", Sitra Publishers, Coimbatore, 2004.

REFERENCE BOOKS:

1. V.K.Kothari, "Developments in Textile Testing", I B Publishers , NewDelhi.
2. Jinlian HU, "Fabric testing", The Textile Institute, Woodhead Publishing Limited, 2008.
3. "I S I Hand book of Textile Testing" –Indian Standard Institution, N. Delhi 1981.
4. "Fabric Assessment by Mechanical Sensing Methods", Textile Progress, Edited by Bishop, Vol – 28, 1996.
5. W.E.Morton and J.W.S. Hearle, "Physical Properties of Textile Tribunes", The Textile Institute, Manchester, 1994.

III Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT 324 TECHNOLOGY OF PRINTING AND FINISHING

Course Description & Objectives:

Main objective of this course is to study thoroughly the printing and finishing of textile fabric. Different methods and style of printing has been discussed. The after finishing becomes the final product. The evolution and durability of the process is also discussed.

Course Outcomes:

1. *Students will able to understand the importance of printing and finishing (value addition) of textile yarn and fabric.*
2. *They will able to find the effect of different process chemistry and machine related to the process.*
3. *They will know the characterization of the processed fabrics.*

UNIT I - Textile Printing And Process

Introduction of Printing: Differences between printing and dyeing styles of printing Direct, Discharge and Resist styles of printing Methods of printing, Block , roller, screen and transfer methods Defects in printing and their remedies.

Printing Paste: essential ingredients and their functions, Types and properties of thickening agents Rheology of printing paste, methods of measuring it.

Printing Procedure: preparation of fabric for printing, preparation of printing paste, printing, drying after printing, dyestuff fixation final treatment (washing off).

UNIT II - Style Of Printing

Brief discussion on printing recipes direct, discharge and resist styles of printing, Printing of cotton and viscose Rayons, Wool and Natural Silk, Nylon, Polyester and its blends, Arcylics.

UNIT III - Textile Finishing And Easy Care Finish

Introduction to Finishing: Objectives of finishing, drying of textile with emphasis on stenter drying, calendaring, different types, raising and shearing.

Shrinking Process: Mechanism of shrinkage pre shrinking of cotton goods and machines used.

Crease: Mechanism for crease formation. Wash and wear finish, Durable press finish, Brief description of DMU, DMEU, DMDHEU and DMEDHEU, Dimethylol ethyl carbonate, Dimethlolethyl triozone, non formaldehyde anti crease agents.

UNIT IV - Softening And Special Finish

Special Finishes: water proof finishes, water repellent finishes, flame proof, flame retardant finishes, moth proof, mildew finish, softening and silicon finishes. stiffening agents, Soil release finish, Anti static finish, Anti pilling finish.

UNIT V - Finishing Of Wool And Colour Fastness

Finishing of woolen goods, felting of wool, milling, defelting of wool, setting of woolen goods, crabbing, potting, decatising and heat setting of synthetic fibres.

Colour Fastness of Dyed and Printed Goods: General Principle of colour fastness testing, sample preparation, multifibres, grey scale, conditions of viewing and illumination. Colour Fastness to washing, Rubbing, Perspiration, Light, Sublimation, Bleaching with hypochlorite and Peroxide, atmospheric ozone, Dry-cleaning and saliva.

TEXT BOOKS:

1. V.A.Shenai, "Technology of Printing", Sevak Publication, 1998.
2. A K Roy Choudhury, "Textile Preparation and Dyeing" Science Publishers, January 9, 2006.

REFERENCE BOOKS:

1. J.T.Marsh, "Introduction to Textile Finishing", Textile Trade Press, England,1996.
2. L.W.C.Miles, "Textile Printing", Dyers Company Publication Trust, 1998.
3. V.A.Shenai, "Technology of Finishing", Sevak Publication,1996.
4. R.S.Prayag, "Technology of Finishing", Shree J.Printers,1998.

III Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT326 TECHNICAL TEXTILES

Course Description & Objectives:

Main objective of this course is to study new evolving field of textiles for its technical applications.

Course Outcomes:

1. *Students will able to understand utilization of textiles for functional use.*
2. *They will know in detail the manufacturing, property and application of textile other than apparel*

UNIT I - General Technical Textiles

Classification of textiles according to tailor made, brief note on technical yarns, fabrics, and fabric structures, scope of industrial textiles, influence of man-made fibre, manufacturing techniques of industrial textiles, Industrial sewing threads and their manufacture, Nomenclature, textiles in agriculture, diary and horticultural applications, textiles in cigarettes, Paper machine clothing, structure and manufacture of former, drier and wet felts, Requirements of these felts, Textiles in conveyor belting, power transmission.

UNIT II - Textiles For Defense & Survival

Requirements, parade clothing, Canvas for defence, Combat clothing, Water vapour permeable clothing, Breathable clothing, Camouflage systems, Deceptions, Decoys, Types and methods, Colour and patterns, Camouflage for UV, IR, antiradar and multiple spectral camouflages, cut resistant Conductive Textiles, Protective clothing for extremely cold region, sleeping bags, Ballistic protective armours and accessories, Aerospace Textiles, Fabrics for nuclear, biological and chemical protection.

UNIT III - Medical & Transportation Textiles

Brief study of applications of textiles in medical field : Classification, Sutures, surgical drapes, masks, Hospital textiles, Textiles for Orthopeadcs, Intelligent bio medical textiles, Textiles in Transportaion**:** tyre cord ,cross section of passenger tyre, Manufacture of tyre cords, types of tyres, Textiles in automobiles, Textiles in electrical and parachute applications, hose canvas, duck fabrics, Air bags.

UNIT – IV - Advance Textiles-I

High Performance Fibres: Manufacture, properties and applications of Basalt, ultra high modulus fibres like aramid and carbon. **Textiles in Filtration and Sports:** Textiles in filtration media, methods of filtration, selection of textiles for filtration, Coated fabrics and high performance coated fabrics, fabric structure for coated fabrics, coating materials and methods, Textiles in acoustical applications, Textile materials in sports and recreations: scope,

UNIT V - Advance Textiles-II

Textiles in Construction: Geotextiles, Requirements, Properties, Functions - Applications, biodegradable Geo Textiles, testing of Geo Textiles. Architectural fabrics: Building structure, application of GT in vertical dams, Roofing materials, Awnings and Canopies. **Textiles in Composites:** Textile Reinforced Composites, Knitted fabric reinforcements, High performance pp composites, Hybrid yarns for composites.

TEXT BOOKS:

1. Horrocks A. R., Anand S.C., "Handbook of Technical Textiles", 2nd ed., Woodhead Publishing, Cambridge, 2000.
2. Adanur S., "Handbook of Industrial Textiles", 2nd ed., Technomic Publication, Lancaster, 2001.

REFERENCE BOOKS:

1. Kanna M.C., Hearle, O Hear., "Design and Manufacture of Textile Compo ites, Textile Progress", Manchester, April 2004.
2. Scott, "Textile for Production, Textile Progress", Manchester, October 2005.
3. Shishoo,"Textile in sports, Textile progress", Manchester, August 2005.
4. I. Holme, "Electrostatic Charging of Textiles", Textile Progress Vol.28, No.1, The Textile Institute Publication, 2000.
5. S.M. Maini, "Barrier Fabrics for Protection Against Aerosols", The Textile Progress, Vol. 26, No.1, The Textile Inst. Publication, 2000.
6. Fung W., Collins & Aikman, "Textiles in Automotive Engineering", 2nd ed., Wood Head Publishing ltd., UK, 2000.

III Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT328 SHUTTLE LESS WEAVING

Course Description & Objectives:

This course deals with the shuttleless weaving machines and their technologies. Now a day's industries are using shuttle less weaving machines which have good features.

Course Outcomes:

1. *At the completion of this course, the student should be able to:*
2. *Understand shuttleless weaving machines such as projectile, rapier, air&water jet weaving and multiphase weaving.*
3. *Understand their technological changes*
4. *Understand how the these machines effect on productivity and quality etc.*

UNIT I - Introduction to Shuttleless weaving

Introduction: Limitations of shuttle loom with respect to weaving process, engineering aspects & environmental aspects, Classification of shuttleless weaving machines based on the weft insertion rate – selection of looms based on the sorts and quality required - conditions required for high speed weft insertion – requirements for shuttles weaving in Winding, Warping, Sizing and Post Sizing operations - Selvedges and their requirements, (Different types of selvedges found on modern looms)- Techno - economic aspects of modern weaving – Common types of shedding motions, let-off motions, take-up motions found on modern looms.

UNIT II - Projectile & Rapier Weaving

Projectile Weaving Machine: Weft insertion stages – tuckin selvedge formation - Projectile picking concept, picking motion, picking phases, Projectile acceleration & retardation, torsion rod details, Projectile preparation for picking, selvedge motion, Receiving unit, MIS, pick finding, Multi colour weft insertion, weft stop, warp stop, whip roller, weft brake etc. Fabric defects & remedies.

Rapier Weaving Machine: Classification of rapiers – Makes of rapiers and classification - Concept of Dewas & Gabler rapier systems – Principles of different single & double rapier weft insertion systems (Drives), their comparison, Study of rapier heads, Rapier motion drive details, Details of rapier tape, head, guiding elements, Gripper openers, cutters, stroke adjustment, Specifications of rapier & head for various applications, Fabric defects & remedies, weft waste during selvedge formation.

UNIT III - Jet Weaving

Air Jet weft Insertion: Introduction & history, Classification of air jet weft insertion - stages of weft insertion - main nozzles designs, relay nozzle designs, configurations, Loom settings, Air supply & energy consumption, Air flow in nozzles & guide channel, performance of yarns in air jet insertion, Influence of yarn characteristics on weft insertion, application of air jet weaving, features of modern air jet weaving machines, Quality of Air.

Water Jet Weft Insertion: Introduction, Design, Requirements, Picking mechanism, weft insertion elements, loom settings, influence of yarn characteristics, features of water jet looms, applications of water jet weft insertion system, Comparison with air jet.

UNIT IV - Multiphase weaving

Introduction to Multiphase Weaving, features of modern multiphase weaving machines e.g. M 8300, Introduction to Circular Weaving &Triaxial Weaving, Properties & applications of tri-axial woven fabrics.

UNIT V - Narrow fabric weaving & Lables

Technology of Narrow Fabric Weaving: Shuttle looms, needle looms, warp feed systems from beams, creel, for elastomeric yarns, shedding, weft insertion systems, take up Applications of narrow fabrics, Manufacture of Labels.

TEXT BOOKS:

1.Marks A.T.C. & Robinson, "Principles of Weaving", The Textile Institute, 1976.
2.Prof. M.K. Talukdar & Prof.D.B. Ajgaonkar, "Weaving Machines, Materials & Methods", Textile Institute, 1998.

REFERENCE BOOKS:

1. S.C Adanur, "Handbook of Weaving", CRC, Publications, 2008.
2. A.Ormerod, "Modern Preparation & Weaving Machines", BWE Pub.,1983.

III Year B.Tech. Textile Technology II - Semester	L	T	P	To	C
	4	0	-	4	4

TT 330 INTELLECTUAL PROPERTY RIGHTS (ELECTIVE - II)

Course Description & Objectives:

This Course deals the fundamentals of IPR, need and how to use different tools of IPR in fashion and textile business. Patents, copyrights, trademarks, trade secrets etc are covered.

Course Outcomes:

1. *Students will able know the various tools of IPR*
2. *Understand the effect of IP*
3. *Various concepts and methods used by IPR Team in industries.*

UNIT I - Patent

Introduction to Intellectual Property Law – The Evolutionary Past - The IPR Tool Kit- Para -Legal Tasks in Intellectual Property Law Patents – introduction, economic impact of patent on system – Patent document – rights of a Patent – patent drafting – Patent duration - patent Registration Process – Post registration Procedures – Patent maintenance.

UNIT II - Copyright

Introduction to Copyrights – – Principles of Copyright Principles -The subjects Matter of Copy right – The Rights Afforded by Copyright Law – Copy right Ownership, Transfer and duration – Right to prepare Derivative works – Rights of Distribution – Rights of Perform the work Publicity Copyright Formalities and Registrations - Limitions - Copyright disputes and International Copyright Law.

UNIT III - Trademark

Introduction to Trade mark – Trade mark Registration Process – Post registration Procedures – Trade mark maintenance - Transfer of Rights - Inter partes Proceeding – Infringement - Dilution Ownership of Trade mark – Likelihood of confusion - Trademarks claims – Trademarks Litigations – International Trade mark Law.

UNIT IV - Trade Secret

Introduction to Trade Secret – Maintaining Trade Secret – Physical Secrurity – Employee Limitation - Employee confidentiality agreement - Trade Secret Law - Unfair Competation – Trade Secret Letigation – Breach of Contract – Applying State Law Geographical Indication – Introduction - Need – Clauses – Case studies.

UNIT V - Licensing & Franchising

IP Transactions - Transaction Opportunities and relevance of IP - Patent Brokering and acquisition - Due diligence LICENSING – Meaning, Types of Licensing, Important factors to consider when preparing a licensing agreement FRANCHISING - Meaning, Types of franchise system, Traditional licensing Vs Franchising, Advantages and disadvantages, Important factors to consider when preparing franchise agreement MERCHANDISING - Merchandising Vs Merchandising rights, Character and personality merchandising.

TEXT BOOKS:

1. Debirag E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. M.Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right" Serials Publications.

REFERENCES:

1. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
2. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw –Hill, New Delhi.
3. T. M Murray and M.J. Mehlman,Encyclopedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley & Sons 2000
4. P.N. Cheremisinoff, R.P. Ouellette and R.M.Bartholomew,Biotechnology Applications and Research, Technomic Publishing Co., Inc. USA, 1985
5. D.Balasubramaniam, C.F.A.Bryce,K. Dharmalingam, J. Green and K. Jayaraman, Concepts in Biotechnology, University Press (Orient Longman Ltd.), 2002
6. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd, 2006.

III Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT332 PERSONNEL MANAGEMENT & INDUSTRIAL RELATIONS (ELECTIVE - II)

Course Description & Objectives:

Main objective of this course is to understand about industry and individual psychology.

Course Outcomes:

1. *Students will able know the tasks and the effect of personnel management.*
2. *Understand the effect of industrial relations*
3. *Various concepts and methods used by personnel management in industries.*

UNIT I - Introduction

The field of personnel management: challenge of human relations, problem of human relations, scope of personnel management: managerial phases operative phases of personnel work; objectives, responsibility for personnel management, Personnel executive, education of personnel managers.

Perspective of personnel management: Importance of Perspective. Historical Changes. Cultural and Social Background, Technological Changes. The Role of Government, relations of Labor to Management. Concepts of Labor.

UNIT II - Personnel Problem And Policies

Present and Future Prospects: Approaches to Personnel Problems. Obstacles in the Path of Personnel Management, Factors Contributing to Better Relations; A Changing Philosophy.

Personnel Programming: Scope and Importance of Personnel Programming; Objectives: The Importance of Objectives. Classes of Personnel Objectives. Functions: Nature of Functions. Assignment of Responsibility. Personnel Policies: Nature. Example of Policies. Principles of Personnel Management: Nature. Suggested Principles. Application of Principles. Research Needs of Programming.

UNIT III - Industrial Psychology And Motivation

Introduction to Industrial Psychology: Industrial Psychology defined, meaning scope. Engineering Psychology : Tailors Scientific Management as a base for Engg. Psychology, Work culture and Ergonomics, Industrial Fatigue and methods to overcome.

Motivation: Meaning, Types of Motives, Maslow's and Herzberg's theory of Motivation. Morale: Meaning, Measurement, relation with Motivation, Morale Vs Production, Tips for Morale improvement. Attitudes & Job Satisfaction: Meaning of Attitudes and methods to find employee attitude: Meaning of Job Satisfaction, it s relation to productivity, job satisfaction and interpersonal, factors relating to job satisfaction and job dis-satisfaction.

UNIT IV - Counselling

Personnel Counselling: Meaning, need for counseling, Objective of counseling, Extent of counseling, Forms of Counselling, Steps in Counselling, Techniques of counseling.

Psychological Aspects of Labour Relations: Meaning, concept of Group dynamics, Impact of Hawthorne Experiments. Supervision & Leadership: Supervision: Roles and functions of supervisor, Tasks and processes of supervision, Leadership: Defined, Styles of Leadership, Blacke & Moutan's Managerial Grid, impact of leadership on production.

UNIT V - Industrial Relations And Laws

Industrial Relations: Terminology, Human relation, Industrial relation Vs Human relation, steps to improve human relation in industry.

Industrial Unrest: Manifestation of Unrest in organized and un-organised sector. Trade Union: Def, structure of trade union, objectives and functions of trade union, multi unionism and its pros and cons.

Labour laws: Trade union act 1926, Industrial disputes act 1957, Indian factories act 1948, Minimum wages act, Standing Orders etc. I L O: Objectives, Scope, functions, Structure, Contribution to labour world, Disciplinary Action Against a Worker, McGregor's Hot stove rule.

TEXT BOOKS:

1. Michael J. Jucius, "Personnel Management", The OHIO state university, Columbus, third edition, 1955.

2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.

REFERENCE BOOKS:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. Somasekhar B.V. and Dr. Rajmouli, "Textile Laws and Policy", A, PMR Publications, Secunderabad, 1997.
3. Charles D. Fleddermann, "Engineering Ethics", Pearson Education, Prentice Hall, New Jersey, 2004 (Indian Reprint).
4. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000.
5. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.

III Year B.Tech. Textile Technology II - Semester	L	T	P	To	C
	4	0	-	4	4

TT334 LEAN AND SIX SIGMA FOR TEXTILES AND APPARELS (ELECTIVE - II)

Course Description & Objectives:

Main objective of this course is to understand lean and six sigma techniques along with various statistical tools for textiles and apparels.

Course Outcomes:

1. *Students will able know the quality and quality control process.*
2. *Lean and six sigma in any process as well as textile industry will also be covered.*
3. *The student will also know the use of statistical advance technique to reduce cost and improve quality.*

UNIT I - Introduction

Introduction: Definitions: quality, quality control, quality planning, quality assurance, quality management, Total Quality Management (TQM) as per

ISO 8402 - Overview on TQM. The TQM axioms-Commitment, Scientific knowledge, Involvement and consequences of total quality.

Tools and Techniques In TQM: Statistical Quality Control – process capability and performance. Seven quality improvement tools. Taguchi method.

UNIT II – Basics Of Six Sigma

The Basics of Six Sigma: The Problem Solving Strategy Y = f(x), Critical to Quality Characteristics (CTQ's) Cost of Poor Quality (COPQ) Pareto Analysis (80:20 rule) steps to six sigma. Quality circles. Benchmarking – types. Quality Function Deployment (QFD). 5 S concept. Applications in Textiles in Apparel industries.

UNIT III – Lean

Essentials of Lean (6s) Strategies, Background, Statistical Theory of Lean (6s) Strategies, Normal and standard normal distribution, Lean Six Sigma and Principles: Elements of Lean Performance Measurements, Mathematical Modeling of Lean Six Sigma Relations. Creation of Six Sigma Infrastructure.

UNIT IV – Use of Six Sigma

Road Map to Lean (6s) Continuous Improvement: Continuous Improvement Engineering, Definition and Measurement: Phase 0 and Phase 1, Evaluation of Existing Process Sigma/Baseline Sigma, Data Analysis, Optimization and Improvement, Evaluation of New Sigma, Process Control.

UNIT V – Evolution of Integrated Lean Six Sigma

Evolution of integrated Lean Six Sigma Origin of implementing Lean Six Sigma, Six Sigma concepts in textile industry, Lean Six Sigma through ISO 9001:2008 standard based QMS in textile industry, L6QMS-2008 model, Case study in Lean Six Sigma for textile industry.

TEXT BOOKS:

1. Logothetics N, "Managing for Total Quality - From Deming to Taguchi and SPC", Prentice all Ltd., New Delhi, 1997.

2. Salman Taghizadegan, "Essentials of Lean Six Sigma" Elsevier, (2006).

REFERENCES:

1. S. Karthi, S.R. Devadasan, K. Selvaraju, N.M. Sivaram, C.G. Sreenivasa, "Implementation of Lean Six Sigma through ISO 9001:2008 based QMS: a case study in a textile mill" The Journal of The Textile Institute, 104:10, 1089-1100.

2. Salor J H, "TQM-FIeld Manual," McGraw Hill, New York, 1992

III Year B.Tech. Textile Technology - II - Semester	L	T	P	To	C
	-	-	3	3	2

TT336 TEXTILE TESTING - II LAB

Course Description & Objectives:

This objective of this course is to understand different basic testing methods for fabric.

Course Outcome:

1. *Students will able to perform basic testing of fabric.*
2. *The student will observe various fabric properties practically.*

LIST OF EXPERIMENTS

1. Testing the fabrics for bursting strength.
2. Determination of crease recovery angle of cotton, man-made and silk fabrics.
3. Determination of Drape co-efficient for textile fabrics.
4. Determination of fabric Tensile strength and elongation.
5. Determination of fabric Tear strength.
6. Determination of Ballistic strength of fabrics.
7. Testing of fabrics for pilling.
8. Determination of stiffness parameters of fabrics.
9. Study of dimensional stability of woven fabrics.
10. Determination of Air permeability of woven fabrics.
11. Wash fastness for different dyed and printed fabrics.
12. Determination of abrasion resistance of fabrics.
13. Blend analysis of fabric by chemical methods.

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L	T	P	To	C
-	-	3	3	2

TT 338 TECHNOLOGY OF PRINTING AND FINISHING LAB

Course Description & Objectives:

The main aim of this course is to make finished fabric from pre-treated fabric. This process includes different printing as well as finishing of different fabric by different dyes and chemicals. The students will perform experiments of their own to make finished fabric.

Course Outcomes:

1. *Students will able to understand the importance of printing and finishing (value addition) of textile yarn and fabric.*
2. *They will able to find the effect of different process chemistry and machine related to the process.*
3. *They will know the characterization of the processed fabrics.*

LIST OF EXPERIMENTS

1. Printing of cotton with reactive dyes by using screen printing
2. Printing of cotton with pigment colour by using screen printing
3. To print cotton fabric with resist style of printing using reactive dye as background
4. To print cotton fabric with discharge style of printing using reactive dye as background
5. To print polyester with disperse dye
6. To print Acrylic with basic dye
7. To modify the feel of a fabric by treatment with softening and stiffening agent
8. To impart crease recovery property to cotton by DMDHEU based finish and formaldehyde free system
9. Demonstration of dyeing of cotton on Jigger, winch, Padding mangle, Package dyeing, soft flow dyeing machine and garment dyeing machine.
10. Evaluation of light, wash, rubbing and fastness.
11. Demonstration of computer colour matching system.

VFSTR UNIVERSITY

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SYLLABUS

I SEM & II SEM

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	4	0	-	4	4

TT423 APPAREL PRODUCTION TECHNOLOGY

Course Description & Objectives:

This Course Teaches The Students About Fundamental Concepts Of Garment Merchandising that includes the types of merchandings, product development, sampling procedures, procurement techniques, costing and various channels of sourcing.

Course Outcomes:

At the completion of this course, the student should be able to

1. *Understand the structure of garment industries in India & Globally*
2. *Understand Different concepts and terminology of Garment manufacturing process.*
3. *Understand different concepts in Pattern Making, cutting technology, fusing technology etc*
4. *Understand different types of Stitches and seams*
5. *Understand different concepts in inspection and transportation and warehousing.*

UNIT I - Introduction & Cutting

The Garment Industry: Structure of the garment Industry , sectors of Industry , product types and organization, Apparel industry in India, Domestic industry , size of the industry , nature of the industry , its developments in recent years, Export industry: Size and nature of the industry.

Types of Fabric Packages – Types of Fabrics – One Way – Two Way Fabrics – Their effect on spreading TYPES OF SPREADING now, new & nud -– Methods of Fabric spreading – Spreading equipment – Computerized spreaders – Marker making –Marker efficiency – Factors affecting marker efficiency – Marker duplicating methods – Computer aided marker making.

UNIT II - Pattern Making & Cutting

Basic Pattern Making: Measurement Taking – Size chart and Measuring of Sizes, Definition of various garments parts & positions, Anthropometry – Process Of Standardizing The Sizes, Preparation of basic blocks, muslin pattern, commercial pattern, sizes and its understanding, , Spreading parameters, types of spreads, manual and automatic spreading. Introduction to Cutting Machines: Types and functions of cutting machines – straight knife, round knife, band knife, cutting machines – Notches, drills, die cutting machines – Computerized cutting machines –maintenance of cutting machines – common defects in cutting & their remedies.

UNIT III - Sewing Machine

Types of needles – Parts of needles and their function – Needle size - sewing thread – properties of sewing threads – ticket number – fabric sew ability . Seam quality – effect of stitch type on seam quality . Selection of seam and stitch. Federal classification of seam and stitches

Basic parts of sewing machine – Needle – Bobbin case /Bobbin hook, Loopers – Loop spreader – Threading fingers – Throat plate – Take-up devices – Tensioners – Feed dog – Pressure foot for sewing.

Sewing Technology: Feed systems, machinery and equipment, basic sewing machines, like general sewing, over locking, safety stitching, blind stitching, button holes, bar tacking, & button sewing, special sewing machines like three thread overlock with a microprocessor, Sewing problems, slipped stitches, staggered stitches, stitching pucker etc.

UNIT IV - Fusing & Pressing

Fusing Technology: Construction of Fusibles, Fusing process, Fusing machinery, quality control,

Pressing Technology: Classification, components of Pressing, machinery and equipment viz. Hand irons, dry iron, electric steam iron, under pressing, top pressing, scissors press, Carousel machines, Steam dolly, tunnel finishing, controls, handling systems, boiler room.

UNIT V - Trims & Production Technology

sSort note on buttons, zips, underlining, Hooks and ornamental materials, fly, kissing, lap; Button and buttonholes, hooks and eye snaps, Velcro and other accessories.

Garment Finishing and Inspection: Attaching buttons, marking, sewing labels, cleaning, final touch, fitting quality, live models, measurements, viewing the garments, quality standards.

Production Technology: Manual systems, making through, section system, progressive bundle system, straight line system, unit production system, quick response sewing system.

TEXT BOOKS:

1. Gerry Cooklin & Marshell, "Introduction to Clothing Manufacture", 6th Enlarged Edition, Blackwell Publications, USA, 2007.
2. Natalie Bray, "Dress Pattern Designing", Blackwell Publications, USA, 2007.

REFERENCE BOOKS:

1. Peggali - I & Marshall Caverdesh, "The Complete Dress Maker", Textile North Publishers, London ,2004.
2. David .T .T yler, "Materials Management in Clothing Production", Blackwell Publications, USA, 2007.
3. Gerry Cooklin, "Garment T echnology for Fashion Designers", Blackwell Science, 1997.

IV Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT425 INDUSTRIAL ENGINEERING FOR TEXTILES & APPARELS

Course Description & Objectives:

This main objective of this course is to understand the set up of manufacturing unit and work practice to get better quality and higher production.

Course Outcomes:

At the completion of this course, the student should be able to

1. *Understand the different Concepts and meaning of industrial engineering*
2. *Understand Different techniques in designing a workstation at bulk production*
3. *Design a production system or work system by using different techniques in industrial engineering*
4. *Understand how to Perform Work study and method study*

UNIT I- Introduction

Introduction to Industrial Engineering: Nomenclature as Production & Operations Management, Need for Textile production, meaning, objectives, scope & its relevance to Textile Industry, Economical size of the firm, factors governing size, small scale industries - reasons for survival and optimum firm. Facilities planning: Product selection process and selection of a process, Project form. capacity planning-Def. measurement of capacity-process of capacity planning. Capacity Utilisation.

UNIT II - Plant Building And Location

Plant Building: Significance, considerations of building design, types of industrial building -Textile examples, Ideal building. Plant lighting: Need, types, factors governing, A brief note on Ventilation, Plant Location:Def., need, Factors governing, theories, selection of actual site, quantitative techniques, types of location like: Rural, sub-urban & Urban, merits &demerits - Examples from Textile field.

UNIT III - Plant Layout And Material Handling

Plant Layout and Material Handling: Def, need, objectives of Scientific layout, Principles of layout, Types of material flow, factors governing the layout , types of layouts, Merits and demerits, textile examples. Quantitative techniques for selection of plant layout.(brief note on QTM, Craft,Corelap) Principles of material handling – meaning &significance, types equipments for Textile production Value Engineering: Value and functions – types. Maintenance Management – Types – maintenance cost.

UNIT IV - Production System And Purchasing

Types of Production Systems: Flow line, batch and job shop – Planning and Control for mass production – characteristics – Design aspects – Problem of mass production – FMS – Batch production – EBQ. Supply Chain Management: concept & tools, make or buy & factors affecting out sourcing

Purchasing: Fundamentals, purchase procedure – types of purchases– purchase organization introduction to material management in production system; product organization role of material management, Inventory and stores management (Brief study of EOQ, ABC analysis).

UNIT V - Safety And Method Study

Organisation for Safety: Safety , significance, Accident s classified,causes of accidents costs of accidents, safe-t-score test, various approaches of accident prevention and recording. Introduction to Work study: step s in method study , tools of record, Time study-step s, elements, allowances, work measurement (Assessment of S M V for Apparel Product) Ergonomics - Noise control - Plant Humidification in Textile mills: working of humidification Units, RH% selection.

TEXT BOOKS:

1. Chunnawala and Patel, "Production and Operations Management", Himalaya Publishing House, 1997.
2. Aswathappa, "Production & Operations Management", Himalya Publishing House, New Delhi, 2006.

REFERENCE BOOKS:

1. O.P.Khanna, "Industrial Engneering & Management", Dhanpat Rai & Sons, New Delhi, 2004.
2. Samual Eilon, "Elements of Production Planning & Control", Newyork,1962.
3. Banga Sharma, "Industrial Engineering & Management", Khanna Publications, 1992.
6. Nobert Lioyd Enrick, "Industrial Engineering Manual of Textile Industry", R.E.Krieger Publication, 1978.

IV Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT427 PRACTICAL ASPECTS OF TEXTILE AND APPAREL MANUFACTURING

Course Description & Objectives:

It is very essential for any student to understand various practical aspects of the textile field. This course will be helpful to the students in terms of understanding various important techniques and calculations required.

Course Outcomes:

From this course students would be able to

1. *Understand labor requirement for different departments.*
2. *Calculations for Spin Plan & Weaveplan*
3. *Learn different practical aspects in textile industry.*

UNIT I - Fiber Preparation For Spinning

Ginning : Planning for Ginning plant, space calculations, Labor requirement, Inventory planning and Transportation planning to Spinning Mills

Blow room :Requirements for preparation of lot size of Cotton, Calculation of lot size from Bales, planning of the settings in Blow room machines, Calculation of Individual and Overall Cleaning efficiency of Blow room, Waste calculation , Assessment of Productivity , Planning of Blow room lines with respect to the lot size prepared

Carding : Calculation of Number of Cards, Setting of zones for Cotton, Blends and Synthetics, replacement analysis of spares of Card , Labor allotment , Productivity in Cards

UNIT II - Spinning Preparatory & Spinning

Drawing : Calculation of Number of Draw frame passages, Setting of zones for Cotton, Blends and Synthetics, replacement analysis of spares , Labor allotment , Productivity.

Simplex: Desired Roving Hank by Adjustment of machinery elements, arrangement of cans for feed, Productivity assessment, Labor allotment , replacement of spares.

Ring Frame: Replacement of Cots, Aprons, Travellers, Spacers, planning for allotment of Ring frames with respect to count spun, Bonda waste assessment and control, Hank meter gain, adjustment of desired twist by changing twist change pinion.

Post spinning and Modern spinning : Calculation of space and labor, planning and inventory of spares, Waste estimation and planning for transport, estimation of water, air and electrical energy for all the spinning process.

UNIT III - Weaving Preparatory

Winding : Labor and Drums allotment based on count, Machines allotment for feed stock, Productivity and Waste control , Planning of Inventory of spares

Wapring: Optimum creel utilization, Number of Warper beams estimation and labor allotment, Planning for material transport, Planning of Inventory of Beams of different widths.

Sizing: Space estimation for Creel zone, Decision on Number of Sow box and Storage Becks to be used, Consumables and inventory planning of Sizing ingredients , beam press rollers, Dry splitting rollers, chain drives etc.,

Post Sizing operations: Planning of Inventory for Heald wires, Reeds, Drop wires, Weavers beams, accessories of drawing and denting operations

UNIT IV - Weaving

Loom Shed: Space planning and looms accommodation, Labor allotment , Planning for replacement of spares and Inventory planning and ABC analysis, calculation of water for weaving process , RH calculations , Elimination of wastes in weaving

Grey ware house: Space calculation, planning of labor, planning of transportation of cloth roll beams to wet processing area, spares planning and C class items.

Wet Processing: Calculation of labor for all the operations, Planning for spares and Inventory planning, Space planning, Water requirement and planning for wet processing house, estimation of Effluent for a dye and wet pro.

UNIT V - Apparel Manufacture

Inspection : Man power allocation for Grey fabric checking- 100% checking, Random checking.

Marker making- considerations, constraints for check and stripes- marker utilization Vs human factors- estimation of time for 1.5, 3, 6 and 12 meters marker plan.

Cutting : Man power allocation for cutting table for a given order quantity- cut plan- critical issues in cutting- improvement of productivity

Sewing : Capacity planning for sewing department- skill matrix development – problems with WIP- machinery planning for given order- man power allocation for sewing line -men to machine ratio- material handling- spare parts management- work aid for critical operations- productivity enhancement- line balancing.

Finishing: Plan for finishing department- man power allocation for thread sucking- trimming- checking- ironing- folding- poly bag- cartooning- problems in trimming and ironing

TEXT BOOKS

1. Process and Quality control in Textiles – ATIRA, 1998
2. "Quality Control in Spinning" – SITRA Publication

REFERENCE BOOKS:

1. Sewn product Analysis : Ruth glock, 4 th Edition Printice Hall ,New Jersy,2004
2. V. A. Shenai, "Evaluation of Textile Chemicals", Sevak Publications, 1980.

IV Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT429 GARMENT MERCHANDISING (ELECTIVE - III)

Course Description & Objectives:

This Course Teaches The Students About Fundamental Concepts Of Garment Merchandising that includes the types of merchandings, product development, sampling procedures, procurement techniques, costing and various channels of sourcing.

Course Outcomes:

1. *Understanding the different roles and works fulfilled by merchandiser*
2. *Understanding the fashion merchandising principles*
3. *To learn different concepts in costing, sourcing, sampling.*

UNIT I - Introduction, Types Of Merchandising

Structure of Fashion Industry, Need of Merchandising, Different forms of merchandising -Export merchandising, merchandising in garment production, Marketing merchandisier, Sampling merchandiser, Product development merchandiser, planning merchandiser, Buying house merchandising, Retail Merchandising, , Visual merchandising, etc. Traits of merchandiser.

UNIT II - Product Development

Functions of Production merchandiser: Product development, Sampling, Costing, Planning (T&A Calendar) , Coordination, Sourcing.

Product development: product development stages, different types of samples, costing at sampling stage, Role of Production merchandiser in product development.

Communication: Backbone of merchandising, Modes of Communication. Brief note of virtual prototyping, EDI. Communication Tools off Fashion merchandiser: quality manual, Purchase order, Tech Pack. Color communication tools: Lab dip / yarn dip / knit down, Desk Loom, Print Strike Off, Thread Run, art work etc. techpack contents .

UNIT III - Coordination & Sampling

Coordination: internal coordination and external coordination. Internal Coordination with sampling, PPC, Sourcing, Quality, Pattern making / CAD, cutting, Production, Finishing and Packing, IE, Finance / Accounts. External coordination with sub vendors (printing / Washing / Embroidery), Third Party testing, Fabric and trim Suppliers, Freight forwarder and Buyer.

Sampling: Different types of samples. Brief note on different samples like Design development sample, proto sample, fit sample, AD or photo shoot sample, salesman sample, pre production sample, GPT sample, size set sample, TOP sample, wash sample, shipment sample. Assessment of sample.

UNIT IV - Costing

Costing: Components of cost of garment. Brief note on costing of fabric, trims, CMT, Value added services (print, embroidery, washing, appliqué), Garment testing, quality cost, transportation and logistics cost, profit fixing. Brief note on INCO terms like ex-factory, FOB, CIF and DDP.

UNIT V - Sourcing

Merchandising Sourcing : Material sourcing & buying, Different Sources, Domestic and International Sourcing :Advantages, Disadvantages, Buying Offices, Services offered by a Resident buyer, Buying Cycle, Vendor

Management: Vendor selecton & development Logistics and Transportation, Vendor, Partnership, causes and conflicts between retailer and vendor, process and factors involved in Fabric / trims sourcing. Lead time, logistics, Quality parameters,sourcing costs, MOQ. Types of Supplier: Nominated supplier, Non – Nominate dusppliers – advantages. Brief note on ordering specifications.

TEXT BOOKS:

1. Fashion Buying & Merchandising by Sydney Packard
2. Fashion Merchandising by Elain Stonepage

REFERENCE BOOKS:

1. Supply Chain Management by B.S. Sahay
2. Techniques for Merchandising Buying by M.S. Bohlinger
3. Articles by Vasant R.Kothari, NiFT in Bangladesh Textile Today.
4. Fashion Buying by Elain Stonepage

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	4	0	-	4	4

TT 431 RETAILING AND BRANDING MANAGEMENT OF APPARELS (ELECTIVE - III)

Course Description & Objectives:

This Course Teaches The Students About Fundamental Concepts of retailing systems And Brand management techniques.

Course Outcomes:

1. *Understanding the different roles and works fulfilled by Retailers.*
2. *Understanding the different types of retailing systems, stores.*
3. *To learn different concepts in Branding and retailing.*

UNIT I - Basic Concepts Of Retailing

Introduction, retailing as a concept, importance, difference between retailing and wholesaling or other channels of distribution. Functions of retailers, main features of modern retail, concept of value chain in retail, retailing services.

UNIT II - Retailing Types

Types of retailers: Store based retail formats, Multi channel retail Formats, Ownership structure in Retail, Retail Mix, Retail Formats, Current Indian scenario in retail formats.
Store Location: Introduction , importance of location in retail.

UNIT III - Brands & Branding

Merchandising Procurement and store Brands: Introduction, Types of merchandise products, Product Range, Process of merchandise procurement, merchandise assortment plan, Store Brands. Category management : Introduction, Product category, Category management.
Pricing in Retailing: Importance of retail Pricing, Factors Affecting Pricing, Approaches adopted in Pricing of Products, Few guidelines of pricing.

UNIT IV - Visual Merchandising

Store layout, design and Visual Merchandising : Introduction, Store layout and design, Visual Merchandising. Promotional mix in retailing : introduction, need, strategies, elements planning and implementation. Introduction to Inventory management in retail, Supply chain management in retail, Customer Loyalty, CRM.

UNIT V - Brand Management

Branding : Introduction, Brand elements, Brands Vs Products, Online Brands, Branding Challenges and opportunities. Strategic brand management, Brand positioning, establishing Brand awareness, Brand building, Brand Communities, Brand elements Case studies on Raymond, WALMART, NIKE, ZARA etc

TEXT BOOKS:

1. Fundamentals of Retailing By K. V. S. Madaan, Tata McGraw Hill,
2. Strategic Brand Management: Building, Measuring, and Managing Brand Equity By Kevin Lane Keller, M. G. Parameswaran, Isaac Jacob, PEARSON

REFERENCE BOOKS:

1. Brand Management By Ranjeet Verma, University Science Press, New Delhi
2. Luxury Retail Management: How the World's Top Brands Provide Quality Product & Service support By Michel Chevalier, Michel Gutsatz, Wiley Publishers
3. Retailing Management (Special Indian Edition) By LEVY, Eighth edition, Tata McGraw Hill

IV Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT433 ENERGY AND POLLUTION CONTROL IN TEXTILES (ELECTIVE - III)

Course Description & Objectives:

This objective of course is to make aware the students about the pollution created by the production process. The other objective of the course is to know about the preventive measures of the pollution created by the production process.

Course Outcomes:

1. *Understanding of energy spent in textile.*
2. *Understanding the causes of pollution in textile industry.*
3. The energy and pollution control process will be taught.

UNIT I - Introduction

The nature of textiles: Textiles as engineering materials, Energy**,** Environmental impact of fibre production. Environmental impact of yarn production – Baling Transportation Opening Carding Spinning, Noise and dust. Environmental impact of fabric production – weaving, knitting and nonwovens, Coating and laminating, Film fibrillation.

UNIT II - Environment Responsibility

Toxicology of textile dyes: Introduction and Historical aspects**.**

Environmentally responsible dye application: Introduction, The influence of environment on the dyer's task,

Supercritical fluid textile dyeing technology: Introduction, Environmental compatibility of CO_2, Physicochemical properties of CO_2, Current environmentally sound applications of CO_2

Pollution abatement and waste minimization in textile dyeing: Introduction, Best management practices. Reducing pollution in textile dyeing, Recycling and reuse of dyestuffs and chemicals. Waste minimisation in textile dyeing.

UNIT III - Effluent Treatments

Reuse of spent dye bath –Use of spent dye bath through reconstitution, Use of spent dye bath through decomposition of dyes, Spent dye bath reuse techniques, The effect of residual components.

Chemical treatment of textile dye effluent: Introduction, Measurement of colour removal, Other measures of dye molecule fate. Chemical methods for colour removal and other processes. Biotechnological treatment of textile dye effluent: Introduction, Biotechnology and dye effluent treatment, Microbial processes, Enzymic processes

UNIT IV - Sustainability In Industry

Sustainability in industry: Tools for assessment and practice in industry, International organizations, Textile and apparel organizations, Sustainability for credit rating. Environmental management systems – International management systems: ISO 14000, Textile environmental management systems (EMS).

UNIT V - Disposal Techniques

Disposal, reuse and recycling scenarios, Strategic considerations and practices, The Swiss recycling system, Case studies: recycling PET and polyamide. Protection of, or by, textiles from environmental Damage.

TEXT BOOKS:

1. R M Christie, "Environmental_aspects_of_textile_dyeing", Woodhead Publishing Limited, 2011.
2. Slater, "Environmental impact of textiles: Production, processes and protection" Woodhead Publishing Limited, 2003.

REFERENCE BOOKS:

1. Blackburn, "Biodegradable and sustainable fibres", Woodhead Publishing Limited, 2005.
2. Dale H. Besterfield, "Total Quality Management", 2nd ed., Pearson Education India, 2006.
3. Proceedings of the Seminar – Non Woven Technology, Market and Product Potential, IIT, New Delhi, December 2006.
4. Asolekar S, "Environmental problems in chemical processing of textiles"1st Ed. NCUTE, Department of Textile Technology, IIT-Delhi, 2000.

IV Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
	4	0	-	4	4

TT435 STRUCTURE AND PROPERTIES OF YARNS & FABRICS (ELECTIVE - IV)

Course Description & Objectives:

This objective of course is to learn about structure property relationship of yarns and fabrics.

Course Outcomes:

1. *Students will able to relate basic parameters with final property and also its calculation.*
2. *They will also know the structure property relationship.*

UNIT I - IDEALISED HELICAL YARN GEOMETRY AND TWIST

Basic geometry of twisted yarn – The idealised helical yarn geometry – yarn count and twist factors – Limits of twists – Real and idealised yarns– Schwarz Constant - Twist contraction: – Contraction & retraction factor.

UNIT II - PACKING OF FIBERS

Packing of fibers – yarn idealised packing – concept of open and close packing – Deviations from ideal forms of packing – specific volume of yarns – Measurement of packing facts – yarn diameter concept as suggested by pierce Hamilton, Grosberg and Dickson.

UNIT III - FIBER MIGRATION AND STRAIN MECHANICS

Fiber migration – ideal migration – Tracer fibre technique –characteristics of migration – Strain mechanics: Strain in yarns – with and without lateral change – determination of twist angles before and after straining (simple numerical problems) – energy stored in fibre – blended yarn mechanics – Hambergers analysis.

UNIT IV - FABRIC GEOMETRY-I

Elements of fabric geometry – pierce cloth geometry – Problems on Pierce geometry model – Concept of Kemp's race track model and Olefin mechanistic model – Derivation of formula of Arial density of fabrics, Problems on fabric weight, cover factor and fabric cover – Pierce & Balls weight factor – Fabric quality index.

UNIT V - FABRIC GEOMETRY-II

Tensile properties of woven fabric – Geometrical changes during extension– the load extension modulus (without considering bending energy) – Geometry of plain knitted fabrics – Empirical dimensionless relation ships, Concept of Runners ratio, Structure ratio – Problems on dimensionless constants, Analysis of fabric shear.

TEXT BOOKS:

1. Hearle, Grosberg and Backer, "Structural Mechanics of Fibers, Yarns and Fabrics", Vol – I, Wiley – Inter-Science, New York, 1987.
2. B.C.Goswami, "Textile Yarns", John Wiley & Sons, New York, 1987.

REFERENCE BOOKS:

1. Mechanics of Flexible Fiber Assemblies – J.W.S. Hearle, The Textile Institute, Manchester, 1971.
2. D.Joing, "The Mechanics of Wool Structures – Postal", New South Wales University Publication, New South Wales, Australia, 1998.

IV Year B.Tech. Textile Technology I - Semester

L	T	P	To	C
4	0	-	4	4

TT437 TEXTILE POLYMER SCIENCE (ELECTIVE - IV)

Course Description & Objectives:

This objective of course is to learn about polymerization process. The other objective of this course is to know the properties and use of different polymers.

Course Outcomes:

1. *Students will able to understand the importance of polymer.*
2. *They will able to understand different polymerization technique, process chemistry and machine related to the process.*
3. *They will know the characterization of the polymers.*
4. *They will also learn the application of polymer blend and composites.*

UNIT I - Introduction And Types Of Polymerization

Introduction to polymers, Bonding in Polymers, Functionality, Polymerization mechanism & kinetics, chain-polymerization, Free-radical, anionic & cationic Co-ordination polymerizationm, Step polymerization, Poly-condensation, Mechanism of compensation polymerization, Ziegler natta catalysts, Mechanism of Polly - addition and ring opening polymerization chemical & geometric structures in polymers, growth of polymer industry in India.

UNIT II - Characterization And Molecular Weight

Molecular weights and their determination: Number average, weight average and viscosity average molecular weight, principles and calculation of the molecular weights by end group analysis, cryoscopy, Ebulliently osmometry light / scattering methods and viscometer methods, molecular weight distribution, Gel Permeation chromatography, Polymer Morphology and crystallization, Transition in polymers, Thermodynamics of polymer solutions, solubility parameter and its determination, Flory Huggins theory.

UNIT III - Blend And Special Polymer

Polymer Blends and alloys, Definitions, Phase diagrams, Reasons for blending, Types of blends, Compatibilization, methods of blending, Technoeconomical consideration for blending, Interpenetrating networks, Polymer rheology recent application of polymers, Electro-active polymers & Biomedical applications.

UNIT IV - Polymerization Techniques

Polymerization Techniques (mechanism, merits demerits along with examples of manufacture of polymers), Bulk Polymerization - PET& PBT manufacture, solution polymerization - Poly propylene manufacture, suspension polymerization, PS & PMMA, Emulsion polymerization, SBR; Processing of polymers: Compounding, extrusion, Injection molding, rotational molding, compression molding, blow extension and extrusion blow molding.

UNIT V - Polymer Composites

Polymer composites: Introduction, applications, constituent materials, details of matrices (polymers) Polymer resins, epoxy resins, vinyl ester resins ,silicone resins, structural aspects influencing properties (Intramer, Intro molecular Inter molecular structure) – Reinforcement – glass fibres, general performance, characteristics, fibre production glass compositions, forms of commercial fibres, carbon and carbon firbes: production & properties, Aramid fibres, production & properties, manufacturing techniques of composite materials, hand layup process, bag moulding process, matoned die moulding, filament winding, pultrusion, perpregs and moulding compounds, introduction to polymer nano composites.

TEXT BOOKS:

1. P. Ghosh, "Polymer Science & Technology",Tata McGraw Hill Publishing, New Delhi (2002).
2. B.T. Astron, "Manufacturing of Polymer Composites", Chapman & Hall (1997).

REFERENCE BOOKS:

1. Harry R.allcock & Frederick W. Lampe & James E. Mark, "Contemporary Polymer Chemistry", Prentice Hall, New Jersey (2003).
2. L.A. Utraclci, "Polymer Blends & Alloys", Hanser Publishers, (1988).
3. J. R. Fried, "Polymer Science & Technology", Prentice Hall Publications (1999).
4. George Lubin, "Handbook of Fibre Glass and Advanced Plastic Components", Van Nostred Reinhold Compong (1969).

IV Year B.Tech. Textile Technology I - Semester

L	T	P	To	C
4	0	-	4	4

TT439 MAINTENANCE OF TEXTILE MACHINES (ELECTIVE - IV)

Course Description & Objectives:

This course deals with the maintenance of textile machines includes Spinning, Weaving and processing etc. are to be covered.

Course Outcomes:

1. To learn maintenance of various machines in textile industries.
2. To learn significance of machine maintenance with proper schedule.

UNIT I - Introduction to maintenance

Maintenance: Meaning, need concept, importance, objectives of maintenance, Types of Maintenance: Breakdown & planned maintenance sub classification of planned maintenance, Procedure for planning, schedules for preventive maintenance.

House Keeping: Meaning, Need, scope, Types and Equipment available today and cost of maintenance, Type of Hose keeping required from fibre processing to Garment production in Textile & Apparel Industry- Requirements of Export houses with respect to House-keeping – I S O recommendations for House-keeping -Impact on the Psychological aspects of worker and intern effect on Production, Precautions to be taken while spinning too trashy cottons, Dust prone sections in Spinning.

UNIT II - Maintenance of Spinning Preparatory Machines

Machine Schedules, staff, precautions & methods to be followed during maintenance activities, tools & gauges used for maintenance.

UNIT III - Maintenance of Ring frame & other spinning machines

Maintenance of Ring frame & Compact Spinning Mechanisms: Schedules, staff, precautions & methods to be followed, Tools & gauges used, Maintenance of Rotor Spinning Machines, Schedules, Precautions, Methods etc., Study of aprons & cots used in spinning & their maintenance.

UNIT IV - SQC & Lubrication

SQC Synchronization with Maintenance: SQC activities useful for maintenance in various departments of spinning, Basic concept of lubrication, types of lubricants used for textile machines, Lubricant storage handling, precautions, Maintenance of weaving preparatory machines, schedules, critical points of maintenance, precautions to be taken during maintenance operations.

UNIT V - Maintenance of Plain & Auto Loom and Machine audits

Maintenance of Plain & Auto Loom: Schedules, critical points, precautions, auditing of plain & auto loom.

Maintenance of Shuttle-less Weaving Machines: Approach towards maintenance of latest weaving machines, Critical maintenance points of various shuttle-less weaving machines, Recording of maintenance activities & its importance.

Machine Audit: Concept and auditing of all Textile and Apparel machines, Energy conservation Textiles & Apparels.

TEXT BOOK:

1. BTRA, "Maintenance Manuals for Various Spinning & Weaving Machines", 2nd ed., 1990.
2. Machine Maintenance manuals from LMW

REFERENCE BOOKS:

1. SITRA, "Spinning Machinery Maintenance", 2nd ed., SITRA Publications, 1996.
2. SITRA, "Maintenance Manuals of Different Machinery Manufacturers of Spinning & Weaving Machines", 2nd ed., SITRA Publications, 1996.

IV Year B.Tech. Textile Technology - I - Semester

L	T	P	To	C
-	-	3	3	2

TT 441 APPAREL PRODUCTION TECHNOLOGY LAB

Course Description & Objectives:

This Course GIVES hands on experience on the cutting & sewing machine handling and also students will get better understanding of application od different seams and stitches

Course Outcomes:

At the completion of this course, the student should be able to

1. *Understand the different parts in a sewing machine*
2. *To perform different types of seams and stitches*
3. *To perform cutting of fabric*
4. *To perform sewing of fabrics*

LIST OF EXPERIMENTS

1. To understand different parts in sewing machine.
2. Study of straight knife and round knife cutting machine.
3. Study of single needle lockstitch machine and adjustment of major parts.
4. To perform stitching in different shapes used in training of the sewing operators
5. To study different types of Seams.
6. To stitch the fabric with different types of seams.
7. Cutting the fabric with the help of patterns drafted.
8. To perform fusing operation to garment parts like collars and cuffs.
9. To prepare the different parts of the garment with sewing.
10. To assemble the different parts of the garment.
11. To analyse the garments for quality inspection.
12. To analyse the garment defects and suggest the improvements in prepared garments.

IV Year B.Tech. Textile Technology - I - Semester	L	T	P	To	C
	-	-	3	3	2

TT 443 PATTERN MAKING LAB

Course Description & Objectives:

This Course provide practical knowledge / hands on experience in preparing patterns for some of the classic garments like shirt, trouser etc.

Course Outcomes:

At the completion of this course, the student should be able to

1. *Understand the different concepts in pattern making*
2. *To perform pattern making for different types of garments.*
3. *To plan the operation bulletin and calculate the SAM*
4. *To perform cutting of fabric*
5. *To perform sewing of fabrics*

LIST OF EXPERIMENTS

1. Drafting the pattern for five piece basic set consisting of basic block, basic shirt with sleeve.
2. Calculate the marker efficiency of a shirt and minimize the fabric consumption with the help of mini marker.
3. Development of the pattern for a basic block using CAD system.
4. Development of design, pattern and marker plan for men's formal shirt using CAD system.
5. Preparation of a marker plan and calculate the marker efficiency for the men's shirt on CAD system.
6. Preparation of an operation bulletin for a garment and suggest the number of machines required, number of operators required and SAM of the garment.
7. To prepare pattern for a childrens garment
8. To prepare patterns for a mens / womens trouser
9. To prepare patterns for women's top.
10. To prepare production patterns for a mens shirt with signle pocket.

IV Year B.Tech. Textile Technology - I - Semester	**L**	**T**	**P**	**To**	**C**
	-	**-**	**3**	**3**	**2**

TT 445 INDUSTRIAL ENGINEERING LAB

Course Description & Objectives:

This Course provide practical knowledge to improve the production by only work practice with the same resources.

Course Outcomes:

1. *At the completion of this course, the student should be able to Perform work study*
2. *Able to Calculate SAM*
3. *Able to Calculate SMV*

LIST OF EXPERIMENTS

1. To study the terminology and process of work study
2. To perform method study
3. To perform RH LH chart of one sewing operation
4. To perform time study
5. To calculate SMV by Work Study
6. To analyse one operation and to give suggest new method and calculate savings in tine.
7. To study different types of charts used in method study
8. To study different types of charts used in Time Study
9. To study various types of elements and perform a small operation into elements.
10. To study concepts in calculation of SAM

IV Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT414 HIGH PERFORMANCE FIBERS (ELECTIVE - V)

Course Description & Objectives:

This objective of this course is to provide thorough knowledge about high end use fibre. The manufacturing process and properties of those fibres has also to be taught.

Course Outcomes:

Students will able to understand the importance of high performances fibre.

1. *They will able to understand importance of preparation technique, process chemistry and machine related to the process.*
2. *They will know the characterization of those fibres.*
3. *They will also learn the application of high performances fibre.*

UNIT I - Introduction

Introduction to fibres for high performance fibres; Polymerization, spinning and properties of aromatic polyamides, high molecular weight polyester, rigid rod and ladder polymers such as BBL, PBZT, PBO, PBI; Manufacturing of carbon fibres from PAN precursors, viscose and pitch fibres.

UNIT II - Glass Fibres

Glass fibres; Liquid crystal fibres; Gel spinning of polyethylene; Hollow and profile fibres, design of spinnerette for such fibres; Membrane technology; Blended and bicomponent fibres.

UNIT III - Aromatic Polyamides And Carbon Fibres

Production and properties of aromatic polyamides & polyesters, Rigid rod and ladder polymers such as Kevlar, Nomex, BBL, PBZT, PBO, PBI, Manufacturing of carbon fibres from PAN precursors, viscose and pitch fibres.

UNIT IV - Liquid Crystal Fibres

Liquid crystal fibres, High performance polyethylene fibres, Ceramic fibres, Definition of composites, Resins for composites, Fibre architecture- short and long, Interfaces, Composite theory, Fabrication of composite materials, Case studies on composites.

UNIT V - Fibre Architectures

Different fibre architectures used for composites and their characteristics and properties; Influence of fibre architectures on the properties of composites; Unidirectional, planar, 3D and net-shaped performing; Introduction to matrix types and their properties, Polymeric matrices for rigid and flexible composites;

TEXT BOOKS:

1. J. Hearle , "High-Performance Fibres, 1st Edition", Woodhead Publishing, 26 Oct (2001).
2. B.T. Astron, "Manufacturing of Polymer Composites", Chapman & Hall (1997).

REFERENCE BOOKS:

1. J. G. Morley, "High-performance fibre composites", Academic Press, (1987).
2. George Lubin, "Handbook of Fibre Glass and Advanced Plastic Components", Van Nostred Reinhold Compong (1969).
3. Mukhopadhyay S K, 'High-performance fibres', Textile Progress, 1993, 25, 1–85.

IV Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT 416 FUNCTIONAL AND MEDICAL TEXTILES (ELECTIVE - V)

Course Description & Objectives:

This objective of this course is to provide thorough knowledge about functional clothing of the functional property of the textile materials. Other objective of the course is to provide knowledge about smart and medical textiles.

Course Outcomes:

Students will able to understand the functional & protective clothing.

1. *They will able to understand the smart material and clothing .*
2. *They will know the importance of medical textile and thorough knowledge about medical textile.*
3. *They will also learn the artificial organs.*

UNIT I - Introduction

Introduction to and classification of Functional clothing envelopes: definition and terminology, Principles of Ergonomics and Human factors engineering: their application in design of functional clothing envelopes, Principles and practice of Anthropometrics, Biomechanical considerations in design of envelopes for specific applications, Comfort in 3D assemblies, testing and analysis of existing functional envelopes with a view to study specific design and manufacturing considerations.

UNIT II - Protective Clothing And Sportswear

Protective clothing: Clothing requirements for thermal protection, ballistic protection, UV-protection, protection from electro-magnetic radiation and static hazards, protection against micro-organisms, chemicals and pesticides. Design principles and evaluation of protective clothing;

Sportswear: Clothing requirements for different sports. Development of highly functional fibres, yarns and fabrics for temperature control and moisture management; Stretch, bulky and light weight fabrics.

UNIT III - Smart And Intelligent Textiles

Definition of smart and intelligent textiles; Passive and active functionality; Textile with high protection and comfort properties; Extreme winter clothing with low heat transmission, heat absorbing, heat storing systems; Phase change materials, incorporation of PCMs in fibres and fabrics; Breathable textile; Multifunctional textiles with incorporated electronics for integrated communication, music, health monitoring, defence support functions, wearable computers.

UNIT IV - Medical Textiles

Medical textiles; Healthcare and hygiene products: Surgical Gowns, masks, wipes, Antibacterial Textiles, Super absorbent polymers, Superabsorbent fibres, Safety, Legal and ethical issues involved in the medical textile materials; Plasma modification; Radiation processing; Polymers and Textile-based techniques used for medical applications.

UNIT V - Artifical Body Parts

Cell-Polymer interaction, Non-implantable materials: Wound-dressing, related hydrogel and composite products, Bandages, Gauges, Implantable biomedical devices: Vascular grafts, Sutures, Heart valves, Extra-corporeal materials: Scaffolds for Tissue engineering, Rapid prototyping, Cartilages, Liver, Blood Vessel, Kidney, Urinary bladder, Tendons, Ligaments, Cornea.

TEXT BOOKS:

1. P. Ghosh, "Polymer Science & Technology",Tata McGraw Hill Publishing, New Delhi (2002).
2. V Bartels, "Handbook of Medical Textiles" Woodhead Publishing Ltd,Cambridge, (2001).

REFERENCE BOOKS:

1. Harry R.allcock & Frederick W. Lampe & James E. Mark, "Contemporary Polymer Chemistry", Prentice Hall, New Jersey (2003).
2. Tao X (editor), "Smart fibres, fabrics and clothing", Woodhead Publishing Ltd,Cambridge, 2001.
3. Subhash C. Anand, J F Kennedy, M Miraftab, S Rajendran "Medical Textiles and Biomaterials for Healthcare" Woodhead Publishing Ltd,Cambridge, (2005).

IV Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT418 COMPUTER APPLICATIONS IN TEXTILES (ELECTIVE - V)

Course Description & Objectives:

This objective of this course is to learn various applications of computes in textile industries.

Course Outcomes:

At the completion of this course, the student should be able to

1. *Understand the different applications of computers in different process of textile and apparel manufacturing.*
2. *Able to understand the need of CAM, CAD in textile manufacturing*

UNIT I - Introduction & CAD

Introduction to Computers: Types, selection, memory devices, Computer technology, programming languages, microcomputers and programmable controllers.

Computer Aided Design: Fundamentals of CAD, Hardware in CAD, Computer Graphics, Computer Aided Process Planning

Computer Integrated Manufacture: Scope and Application to Textiles

Application of Computers in Man Made Fibre Manufacture:

Introduction to computrisation of Textile production and need – Broad applications of computers in Textile production - Selection of monomers in planning of production mix for synthetic fibre manufacture using computes – computers in Melt, Solution and Gel Spinning of man made fibres – Techno-economics of computerization – Role of IT in fibre manufacture.

UNIT II - Applications In Spinning

Application of Computers in Spinning: Selection of cotton and different fibres in yarn manufacture using LPP through computers – applications of user friendly devises in Carding, Comber, Drawframe, Simplex, Ring Frame & Rotor spinning- Modeling of yarn structure thro' computers- Spin plans for different lot size and fir different fibres (100% and Blends)- Data bases for calculation of cost /kg of yarn, raw cotton cost and clean cotton cost - Role of IT in Spinning.

UNIT III - Applications In Weaving And Testing

Application of Computers in Weaving & Testing: Use of computers in weave plan, Development of Woven fabric designs through CAD for Dobby and Jacquard designs, Development of Stripes and checks thro' colour pallet, Use of computer in understanding colour and weave effect, application of computers in understanding the historical ornamentations of India and other countries – Use of computers in Testing instruments like Computarised count, strength, etc., properties measurement – Role of IT in Weaving and Testing

UNIT IV - Applications In Chemical Processing And Garments

Application of Computers in Chemical Processing, Garmenting & Production Management: Computer aided textile printing, texture mapping and garments structure designing CAD, CAD in Garment Industry, CAD in Fashion Design, Internet and Intranet (Brief note), information technology in Hosiery Manufacture -Computer applications in textiles – Inventory control Maintenance – scheduling – production and efficiency – Management reporting power, fuel consumption analysis, Applications of computers in SQC, Financial analysis – Evaluation and monitoring the through computers.

UNIT V - ERP

Introduction of ERP: Evolution of ERP, growth of ERP, Need for system interaction and interface, early ERP packages, various models of ERP, advantages of ERP, Overview of enterprise, integrated management, business modeling ERP for small business, business process for ERP module design, opportunities and problems in ERP selection and implementation, hardware Environment.

TEXT BOOKS:

1. Computer Technology for Textiles and Apparel by J Hu, Woodhead Publishing Series in Textiles 2011
2. "All India Seminars by Institution of Engineers" (India), Coimbatore Center, December,1983.

REFERENCE BOOKS:

1. "Computers in World of Textiles", Textile Institute, Vol - 6, 2002.
2. "Computer Technology for Textiles", WRC Smith Publ. & Co.,Georgia,1969.

IV Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT420 TEXTILES IN SPORTS AND AUTOMOBILES (ELETIVE - VI)

Course Description & Objectives:

This objective of this course is to provide thorough knowledge about the manufacturing and properties of textiles used for sports and automobiles.

Course Outcomes:

- *Understanding of trends in sportswear design and material requirement.*
- *Application of coated and elastic textiles in sportswear and designing of breathable fabric.*
- *Selection and design of textiles materials for different automobiles part depending upon end use.*

UNIT I – Introduction to Key trends in Sportswear Design

Introduction, Market overview, Future market trends, the evolution of performance underwear; the rise of all-in-one suits; The evolution of layering: the reorganization of the three-layer system; the soft shell; air: a key raw material, External influences: interactions between fashion and sportswear; wearable technology, Future trends: streamlining or stealth design.

Material requirements for the design performance of sportswear

Developments in sport specific clothing from post war to the present day: the layering system; from walking to mountaineering; point of sale promotional material; synthetic fibres and fabrics.

UNIT II - Laminated And Elastic Textiles

Coated and laminated textiles in sportswear: Introduction, Sports products from coated and laminated fabrics: protective sportswear and comfort; other sports products Base fabrics and fabric preparation.

Elastic textiles: Manufacturing of Elastic textiles for sportswear, Stretch fabrics, Breathable stretch, Breathable waterproof stretch.

UNIT III - Water Resistance And Water Vapour Transfer

Introduction, Water resistance, Water vapor transfer: performance and protection under steady state conditions; performance and protection under windy conditions; performance and protection under rainy conditions; performance and protection under wind driven rainy conditions, The condensation problem in waterproof breathable fabrics for sportswear. Performance of clothing for cold protection. Textile composites in sports products.

UNIT IV - Quality Testing

Quality assurance and testing for Automotive textiles: Quality assurance, Test method details, Product engineering – interior trim, Introduction, Seats, Materials for seat making, seat comfort, Headliners, Door casings, Parcel shelves, other interior trim, complete modular interiors.

UNIT V - Various Applications

Introduction , Seat belts, Airbags, Carpets, Cabin air filters, Battery separators, Bonnet (hood) liners Wheel arch liners, Hood material for convertibles, Tyres, Hoses and belts – general considerations.**Textiles in other road vehicles:** Railway applications, Marine applications, Textiles in aircraft.

TEXT BOOKS:

1. Fung W., Collins & Aikman, "Textiles in Automotive Engineering", 2nd ed., Wood Head Publishing ltd., UK, 2000.
2. R. Shishoo, "Textiles in sport", Woodhead Publishing Ltd.

REFERENCE BOOKS:

1. R. Shishoo ,"Textile advances in the automotive Industry".
2. . Horrocks A. R., Anand S.C., "Handbook of Technical Textiles", 2nd ed., Woodhead Publishing, Cambridge, 2000.
3. S. K. Mukhopadhyay, "Automotive textiles",Textile progress Vol. 29.

IV Year B.Tech. Textile Technology II - Semester

L	T	P	To	C
4	0	-	4	4

TT 422 TEXTILES COSTING AND FINANCIAL ANALYSIS (ELECTIVE - VI)

Course Description & Objectives:

This course deals with textile costing and financial analysis i.e. planning and preparation of textile projects.

Course Outcomes:

1. *To prepare project their own if they like to be as an entrepreneur.*
2. *To know, learn how to implement a new project with financial analysis and risk analysis to overcome all and taking the project as successful.*

UNIT I - Introduction

Overview – Capital expenditure, Phase of capital budgeting, Project development cycle, Objectives of investment, decision-making, Risk & return. Definition of Economics – Nature and Scope of Economics, Market & demand analysis – Information required for market & demand analysis – demand forecasting methods – market planning.

UNIT II - Ideas & Technical analysis

Identification of investment opportunities, Generation & screening of project ideas, Project identifications for an existing company, Technical Analysis – Material inputs & utilities – Manufacturing process / technology – Plant capacity – location & site – structures & civil works – Machineries & equipments – Project charts & layouts – Work schedule –Need for tendering alternatives.

UNIT III - Financial analysis

Financial Analysis, Cost of Project, Means of finance, Estimation of Sales & Production, Cost of production, Working capital requirement & financing, Profitability projections, Break-even point, Project cost flow statements, Projected balance sheet – Multi – year projection. Time value of money, Future value of single amount, Future value of an annuity.

UNIT IV - Cost management & appraisal

Cost Management - An overview: Definition of Cost Management – Basic concepts, Traditional Cost Accounting and Cost Management. cost of Equity Capital – Weighted average cost of capital – Marginal cost of capital-Cost of capital for a new company. Appraisal criteria, Urgency, Payback period, Accounting, Debt service coverage ratio, Rate of Return, Net present value, Internal rate of return, Annual capital charge, Investment appraisal in practice.

UNIT V - Risk Analysis

Risk analysis, Types & measurement of project risk, Analytical derivation or simple estimation, Sensitivity Analysis, Selection of a project. Project implementation, forms of project organization, project planning, project control, human aspects of project management, pre-requisites for successful project implementation.

TEXT BOOKS

1. Project, Planning Analysis, Selection Implementation & Review by Prasanna Chandra, Tata McGraw Hill Publishing Co. Ltd.,
2. Industrial Organisation & Engg. Economics T.R. Banga & S.C. Sharma, Khanna Publishers, Delhi.

IV Year B.Tech. Textile Technology II - Semester	L	T	P	To	C
	4	0	-	4	4

TT424 HOME TEXTILES (ELECTIVE - VI)

Course Description & Objectives:

This course deals with textile costing and financial analysis i.e. planning and preparation of textile projects.

Course Outcomes:

1. *To learn about different products and their specifications of home textile products.*
2. *To learn how these products can be manufactured.*

UNIT I - Introduction

Textile for Seating: Upholstery fabrics for domestic applications – scope, fixed upholstery, non-stretch loose covers, stretch covers, Upholstery fabrics for contract use – general, automotive applications, Commercial applications. Window Textiles: Sun filters (Sheers and nets), Semi-sheers, Reflective textiles, curtain fabrics & drapes, Blinds.

UNIT II - Bed Textiles And Towels

Bed Textiles: Sheets & Pillow Cases, Quilted Textile, Blankets & Rugs - Jacquard blankets, Printed blankets, Fire proof blankets, Baby blankets, Bed Spreads, Mattress covers (Ticking).

Towels: Types of towels, Bath robes, Beech Towels, Kitchen Towels, Terry towels, Napkins - Construction, weave, pile height, patterning, production, dyeing, finishing, etc.

UNIT III - Textile Art And Accessories

Fabrics for Wall Covering, Textile Art: Tapestries, Wall hangings, Textiles for screens & Room Dividers. Bathroom Textiles: General shower curtains, Terry Toweling.

Accessories: Scatter Cushions, Floor Cushions, Lampshade fabrics. Table Textiles: Tablecloths – Colour – Woven & Printed type, jacquard types, embroidered types, non-woven types. Table mats – Colour -woven, Printed jacquard, embroidered.

UNIT IV - Floor Coverings

Textile Floor Coverings: Introduction, Pile Fibres, Backing fibres & fabrics, Tufted carpets, Needle felt backings, woven carpet, Woven Carpet Manufacture, Wilton weaving, shedding mechanism, Aximinster, Tufted Carpet Manufacture, Broadloom machinery, Hand tufting, Ancillary equipments Needle felt Manufacture, Needling machinery, textured & patterned needle felts, thermo-bonded products, Unconventional methods for making carpets, Bonding, knitted carpet, stitch bonding, flocking.

UNIT V - Velour

Velour: Types of velvets – Jacquard, Dobby, Plain, Printed – Manufacture & construction, Methods of velour making by cutting and shearing. Kitchen

Textiles: Aprons, Dish cloth, Teacosy, Bread bag, Mittens, Pot Holders, Table Mats, Construction & manufacturing details.

General: Hand / machine embroidered scarves, stoles, shawls, Made-ups used in hospitals, etc., Textiles care labeling & Design aids.

TEXT BOOKS:

1. Mortimer O.Shea, "Interior Furnishing", Vol.11, No.1, The Textile Institute, Publication, 1996.
2. G.H. Crawshaw, "Textile Floor Covering", Vol.9, No.2, The Textile Institute, Publication, 1994.

REFERENCE BOOKS:

1. L Cegielka MA, "Carpets : Back to Front", Vol.19, No.3, The Textile Inst. Publication, 1985.
2. G.H. Crawshaw, "Textile Floor Coverings", Vol.9, No.2, The Textile Inst. Publisher, 2000.
3. Mortimer O.Shea, "Interior Furnishings", Vol.11, No.1, The Textile Inst. Publication, 1996.

I YEAR

AGRICULTURE ENGINEERING

B.Tech.

I SEMESTER

16HS101	-	Engineeirng Mathematics - I
16HS102	-	Engineering Physics
16HS105	-	Technical English Communication
16CS101	-	Basics of Computer and Internet
16CS102	-	Computer Programming
16EE101	-	Basics of Engineering Products
16HS104	-	English Proficiency and Communication Skills
16HS110	-	Engineering Physics Laboratory

II SEMESTER

16HS108	-	Engineering Mathematics - II
16HS107	-	Engineering Chemistry
16ME101	-	Engineering Graphics
16EE102	-	Basics of Electrical and Electronics Engg.
16HS111	-	Engineering Chemistry Laboratory
16HS109	-	Environmental Science and Technology
16ME102	-	Engineering Mechanics
16ME103	-	Workshop Practice

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of Matlab related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with Matlab output*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*

UNIT - I **L- 9**

FIRST ORDER DIFFERENTIAL EQUATIONS : Variable separable, homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - II **L- 9**

SECOND ORDER DIFFERENTIAL EQUATIONS : Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form : eax, sinax, cosax and xn.

UNIT - III **L- 9**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS : Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS : Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - IV **L- 9**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES : Review of partial differentiation: Partial derivatives, Partial derivatives of higher order, Homogeneous function, Euler's theorem, Total differential coefficient. Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions

UNIT - V **L- 9**

PARTIAL DIFFERENTIAL EQUATIONS : Formation of Partial Differential Equations, Linear (Lagrange) Equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method.

Second order linear equations with constant coefficients only, classifications, rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Basic mathematical operations using Mat Lab
2. Solving simple expressions
3. Limits
4. Continuity
5. Symbolic differentiation
6. Symbolic integration
7. Plotting of curves
8. Plotting of surfaces
9. Maxima & minima of functions of one variable
10. Maxima & minima of functions of two variable
11. Solving first order O D E
12. Euler's Method and RK Method

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd revised edition, S. Chand & Co., 2014
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014
3. Rudra Pratap, "Getting started with MatLab", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015
2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill Education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	45	30	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibres, Photonics, Nano and funcational materials, make the students to enrich basic knowledge in various fields of physics and aply the same in engineering fields.

Course Outcomes:

The student will be able to :

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fibre which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

- ✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*
- ✓ *Study the wavelengths of light sources and lasers.*
- ✓ *Estimate the efficiency of a given solar cell.*
- ✓ *Learn about the type of the optical fibre and their ability to propagate light waves from its numerical aperture.*
- ✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - I **L- 9**

ULTRASONICS : Introduction – production of ultrasonic waves – piezoelectric method – Properties of ultrasonic waves – Types of ultrasonic waves – Determination of Velocity of ultrasonic waves in solids and liquids – SONAR - Medical Applications.

NDT: Introduction - Types-visual inspection-liquid penetrate testing – Ultrasonic Testing Systems – X - Ray Radiography.

UNIT - II **L- 9**

LASERS : Characteristics of Laser light – Spontaneous and Stimulated emission of radiation – He-Ne Laser – CO_2 Laser – Semiconductor laser - Applications.

HOLOGRAPHY: Holography and Applications.

FIBER OPTICS : Principle of optical fibre – Acceptance angle – Numerical Aperture – Types of fibres – Dispersion and Attenuation in optical fibres – Optical fibre communication system - Fibre Optic sensors.

UNIT - III **L- 9**

QUANTUM MECHANICS : Introduction- Matter waves - Schroedinger's time independent wave equation - Physical significance of the wave function - Particle in one dimensional potential well – Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS : Introduction – Classical free electron theory – Electrical conductivity of metal – Quantum free electron theory - Fermi - Dirac distribution function and its variation with temperature

PARTICLE ACCELERATORS: Introduction- Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - IV **L- 9**

SOLAR ENERGY: Solar radiation – Photovoltaic effect – solar cells – Efficiency of solar cell – Solar thermal energy conversion systems.

PHOTONICS: LED – LCD – Photo conducting materials – photo detectors – photonic crystals - non-linear optical behaviour of materials - applications.

UNIT - V **L- 9**

NANO MATERIALS: Introduction – Fabrication of nano materials – Ball milling - Sol-Gel – Physical and Chemical properties of nano materials – Applications.

FUNCTIONAL MATERIALS: Smart materials – shape memory alloys – chromic materials (Thermo, Photo and electro) – Metallic glasses – Advanced ceramics – composites, Fiber reinforced plastics / metals – biomaterials.

TEXT BOOKS:

1. V.Rajendran, *"Engineering Physics"*, 7th edition, TMH Publications, 2014
2. D.K. Bhattacharya and Poonam Tandon, *"Engineering Physics"*, Oxford University Press, 2015/

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand & Company Ltd, 1992.
3. Sukhatme S.P, "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Finding height of a room using laser.*
- *Identifying the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials .*
- *Measuring temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The teaching efforts in this course will be directed towards making students develop their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to :

- acquire an understanding of the rules of grammar
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom
- have a command of basic vocabulary related to different subject areas
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts
- attain language proficiency to participate in the classroom discussions

SKILLS:

- ✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text*
- ✓ *Apply different sub skills like top down, bottoms up approachs to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses*
- ✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly*
- ✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*
- ✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - I **L-9**

- Text : **Environmental Consciousness**
  (Climate Change – Green Cover – Pollution - Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles – Prepositions – Sentence Types and Construction
- Vocabulary : Root – Prefixes - Suffixes
- Composition : Paragraph Writing (Descriptive and Narrative)
- Laboratory Practice : Introduction to Phonetics
  (Organs of Speech; Consonants, Vowels & Diphthongs; Syllable, Stress and Intonation)

UNIT - II **L-9**

- Text : **Emerging Technologies**
  (Solar Power – Cloud Computing – Nanotechnology- Wind energy (to be covered from Energy unit))
- Grammar : Time and Tense (Present-Past-Future; Helping Verbs; Modals)
- Vocabulary : Synonyms – Antonyms
- Composition : Letter Writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - III **L-9**

- Text : **Travel and Tourism**
  (Advantages and Disadvantages of Travel-Tourism – Atithi Devo bhava – Tourism in India)
- Grammar : Subject-Verb Agreement - Sentence Construction
- Vocabulary : Idioms & Phrases
- Composition : Letter Writing (Formal)
- Laboratory Practice : Situational Conversations – Role-Plays
  (Introducing; Greeting; Enquiring; Informing; Requesting; Inviting)

UNIT - IV **L-9**

- Text : **Engineering Ethics**
  (Challenger Disaster – Biotechnology – Genetic Engineering – Protection from Natural Calamities- How pertinent is the nuclear option? An Environment of Energy (from Energy unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence Transformation (Degrees, Voice, Speech & Synthesis)
- Vocabulary : Phrasal Verbs

  Composition : Note-making – Text - Nandan Nilekani's In search of our energy solutions (from Energy Unit)
  Summarizing, Text on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational Conversations – Role-Plays (Emotions; Directions; Descriptions; Agreements; Refusals; Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD & CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion..*

UNIT - V **L-9**

- Text : **Media Matters**
  (History of Media – Language and Media – Milestones in Media – Manipulation by Media – Thousands march against nuclear power in Tokyo (from Energy Unit) - Entertainment Media – Interviews)
- Grammar : Common Errors
- Vocabulary : One-word Substitutes
- Composition : E-mail – Short Message Service (SMS) - Writing Advertisements, Reporting, Social Media: Blogging, Facebook, Twitter (acceptable & non acceptable content)
- Laboratory Practice : Group Discussions – (Topics from Energy unit) – Dumping of nuclear wastes, Exploration of eco-friendly energy options- lifting of subsidies on Petrol, Diesel, LPG etc)

TEXT BOOK:

1 *“Mindscapes - English for Technologists and Engineers”*, Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy*, “Strengthen Your Writing”,* 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry*, “The Most Common Mistakes in English Usage”,* 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, *A Textbook of English Phonetics for Indian Students*, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. *Spoken English: A Self-Learning Guide to Conversation Practice,* 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine your English”, 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, “Effective Technical Communication”, Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTER AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to :

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software

SKILLS:

- ✓ *Assemble and disassemble the personal computer system*
- ✓ *Install different desktop operating systems*
- ✓ *Use the basic text processing, simple data analysis and data presentation tools*
- ✓ *Configure network parameters*
- ✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - I **L- 10**

COMPUTING SYSTEMS : Introduction to computer, computers for individuals, importance of computers, parts of computer system, memory devices, input and out devices, types of monitors, types of printers, number systems, bits and bytes, text codes and types of processors.

UNIT - II **L- 10**

OPERATING SYSTEMS : Types of operating systems, user interfaces, PC operating systems, network operating systems, types of software, programming languages, compiler and interpreter, program control flow and algorithm.

UNIT - III **L- 08**

NETWORKS & DATABASES : Networking basics, uses of network, types of networks, network hardware, introduction to data bases and database management systems.

UNIT - IV **L- 8**

INTERNET AND WWW : Internet's services, world wide web, browser setups, using search engine, email and other internet applications.

UNIT - V **L- 9**

CYBER SECURITY : The need of computer security, basic security concepts, threats of users, online spying tools, threats to data, cybercrime, protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours: 30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, *"Introduction to Computers"*, 7th edition, Tata-McGrawHill, 2010

REFERENCE BOOKS:

1. ITL Education Solution Limited, *"Introduction to Computer Science"*, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, "*Fundamentals of Network Security"*, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - I **L- 10**

INTRODUCTION TO C PROGRAMMING : structure of C program: comments, processor statement, function header statement, variable declaration statement and executable statement; C character set: constants, identifiers, operators, punctuations, keywords, modifiers, identifiers, variables, c scopes, basic data types, type qualifiers, storage classes, reading and writing characters, formatted I/O.

UNIT - II **L- 10**

OPERATORS AND CONTROL STATEMENTS : Operators: assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, size of, dot, arrow, and parentheses operators; expressions precedence of operators, associative rules; control statements: category of statements, selection, iteration, jump, label, expression and block.

UNIT - III **L- 10**

FUNCTIONS AND ARRAYS : Function: declaration, prototype, definition, calling by value and call by address, standard library functions and recursive functions; Array: declaration, initialization, reading, writing, accessing and passing as a parameter to functions, 2D-arrays, multidimensional arrays.

UNIT - IV **L- 9**

STRINGS AND POINTERS : Strings: declaration, string library functions, array of strings, command line arguments; pointers: declaration, initializing pointers, multiple indirection, relationship between arrays and pointers; scaling up: array of arrays, array of pointers, pointer to a pointer, pointer to an array; pointer to functions, dynamic memory allocation functions.

UNIT - V **L- 9**

STRUCTURES AND FILES : Structures: Declaration, initialization and accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, types and enumerations; Files: I/O and processing operations on text and binary files; pre-processor directives.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- choose programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS

Total hours: 30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.
7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.

11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

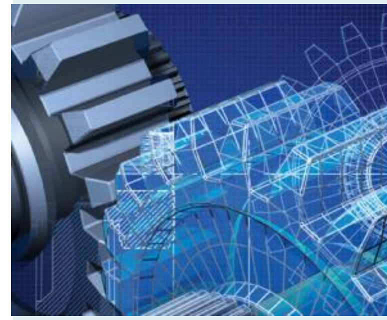
TEXT BOOK:

1. Ajay Mittal, *"Programming in C - A practical Approach"*, Pearson Education, India, 2015

REFERENCE BOOKS:

1. Reema Thareja, *"Introduction to C Programming"*, 2nd edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, *"The Complete Reference"*, 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, *"Programming in ANSI C"*, 4th edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy
- gain awareness on choosing appropriate construction materials

SKILLS:

- ✓ *Identify UPS requirements for a given load*
- ✓ *Provide a Lighting scheme for specific working environment.*
- ✓ *Design a composition of Heating element for a particular application.*
- ✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*
- ✓ *Provide an earthing for Domestic Outlet*
- ✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembling and Assembling of Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Providing Earthing for Domestic Outlet*
- *Designing Electric Wiring system for a prototype house*
- *Designing UPS for a defined load*
- *Practice assembly of a FM radio*
- *Configure a Wifi Router for required number of users*

UNIT - I **L- 9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air-conditioner and Refrigerator- components, assembly and disassembly, Working principle of Centrifugal and Reciprocating pumps: Types, parts and applications, working principle of Screw jack and its components. Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - II **L- 10**

BRICKS : General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks.

Timber: Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS : Types and composition of Cement, Setting of cement, Tests for physical properties of cement, Different grades of cement.

AGGREGATES : Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates

STEEL: Types of steel, Physical properties and Mechanical properties of steel.

Simple layout design, paints, tiles,fittings, ventilation, furniture and green house aspects.

UNIT - III **L- 08**

ELECTRIC ENERGY SYSTEMS : Overview of Power System Structure – Conventional and Non Conventional Generations - Types of Turbines, Generators, Substations, Towers – Earthing procedure – Protection schemes – Single Phase and Three Phase Systems

Methods of Electrical Wiring Systems - Wiring procedure and calculations – Wiring methods.

Un-Interruptible Power Supply (UPS) – Components in UPS – its functionality – Calculation of ratings for UPS components to a specific load.

UNIT - IV **L-10**

LIGHT : Light Energy – Evolution of Light sources – Working of Incandescent, Fluorescent, MV, SV and LED Lamps – Comparison and Applications.

HEAT : Heat Energy – Modes of Heat Transfer – Resistance and Induction Heating – Comparison and Applications.

MOTOR : Electric Motors – Classification – Construction and Working principles of motors used in Domestic Applications - Mixer Grinder, Ceiling and Exhaust Fan, Hair Dryer, Washing Machine, Water Pump, Air Coolers, Vacum Cleaner, Computer Cooling Motor, Electric Bike.

UNIT - V **L- 8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of Television, Radio, Remote Control, Telephone, Microwave Oven, Cell phone, PA system, Induction Stove, WiFi Router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 stroke and 4 stroke engines
3. Reciprocating pumps
4. Power screw jack
5. Size and Water absorption capacity of Bricks.
6. Initial and final setting time of cement.
7. Toughness value of coarse aggregates.
8. Bulking of sand.
9. Fan and Immersion heater
10. Solar panel connections to different loads with Battery and without battery
11. Television
12. Radio
13. Remote Control
14. Telephone
15. Fax Machine
16. Mobile phone
17. PA system

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st ed., S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition., Charotar Publishing House, Anad, 2009.
3. Govindasamy, A Ramesh et al, "Electrical engineering - Electrical machines and Appliances Theory, 1st edition, Tamilnadu text book corporation, 2010
4. Janakaraj, A Sumathi et al, "Electrical engineering - Electrical machines and Appliances Theory", 1st edition, Tamilnadu text book corporation, 2011
5. Marshall Brain, "How Stuff Works", 1st edition, John Wiley&Sons, 2001

5\. Pravin Kumar, "Basic Mechanical Engineering", 1st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. Students will strengthen their comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to :

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

- ✓ *ability to use appropriate words in right order for effective sentence formation, and writing short texts*
- ✓ *ability to read and extract information from different texts & draw inferences by understanding elements like tone and transitional words*
- ✓ *ability to understand short and long spoken discourses through analysis of elements like stress and intonation*
- ✓ *ability to articulate clearly thoughts and ideas on simple every day topics*

UNIT - I **L- 10**

Functions : Introducing Self/others; Expressing needs/feelings/opinions (SWOT Analysis)

Skill Focus:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, intonation and accent

Speaking – Articulating syllables clearly, speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, use of nouns, adjectives, verbs, prepositions in the sentence structure

Practice: Objective PET Units 1 - 6

UNIT - II **L- 10**

Functions : Defining; Describing People, Places, Things, Process.

Skill Focus:

Reading – Inferences from sentences and short messages – True or False

Writing – Rewording – Sentence transformation - Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, short conversations

Vocabulary / Grammar – Use of adjectives/adverbs, Comparatives and Superlatives

Practice : Objective PET Units 7 – 12

UNIT - III **L- 12**

Functions : Describing Spatial and Temporal Relations; Giving Directions/Instructions

Skill Focus:

Reading – Reading between the lines – Inferences – True/False

Writing – Developing hints - Writing short messages/paragraphs

Listening – Searching for factual information - Gap filling

Speaking – Snap talks, JAM, Elocution

Vocabulary / Grammar – Prepositions; Phrasal Verbs; PET word list

Practice: Objective PET Units 13 - 18

UNIT - IV **L- 9**

Functions : Narrating; Predicting; Negotiating; Planning

Skill Focus:

Reading – Reading for evaluation and appreciation - Comprehension

Writing – Letters – e-mails – 7 C's

Listening – Following long conversations / interviews

Speaking – Discussions – Debate - Descriptions

Vocabulary / Grammar – Modals – Conditionals - verb forms (Time and Tense)

Practice: Objective PET Units 19 – 24

ACTIVITIES:

- *SWOT Analysis*
- *Snap talks*
- *Spell Bee*
- *Short conversations*
- *Role play*
- *Quiz*
- *Elocution*
- *JAM*
- *Group Discussion Debate*
- *Team presentations*

UNIT - V **L- 9**

Functions: Requesting; Denying; Suggesting; persuading

Skill Focus:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements - Presentations

Vocabulary / Grammar – Punctuation – Cloze tests

Practice: Objective PET Units 25 – 30

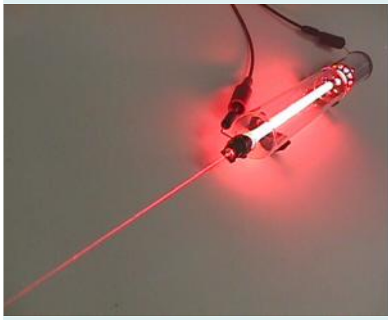
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, *"Objective PET"*, Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8
2. Annette Capel and Rosemary Nixon, *"Introduction to PET"*, Oxford University Press,

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Outcomes:

Upon successful completion of this course, the student will be able to:

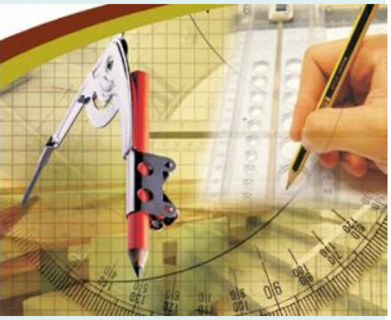
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory, thermal conductivity by conducting experiments of field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser
4. Determination of Planck's constant
5. Determination of Frequency of Alternating current
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor
8. Hall coefficient
9. Thermal conductivity of bad conductor - Lee's method
10. Optical Fibre – Determination of numerical aperture
11. Solar Cell – efficiency
12. Study of V – I characteristics of LED.
13. Seebeck effect

REFERENCE BOOKS :

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to computer Eigen values and Eigen vectors, to verify C.H.T. and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration, to make the student to use different mathematical tools of Mat lab related to above concepts.

Course Outcomes:

The student will be able to :

- carry out the basic operations of matrix algebra
- use row operations to reduce a matrix to echelon form, normal form
- determine consistency of a system linear equations
- compute eigen values and eigen vectors
- evaluate double integrals and triple integrals
- evaluate double integrals in polar coordinates
- utilize Cartesian and polar coordinates to find area
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - I **L-9**

Rank Of Matrix and Linear Equations: Rank of a matrix, Normal form, Triangular form, Echelon from; Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - II **L- 9**

Eigen Values and Eigen Vectors: Eigen values, Eigen vectors, properties (without proofs), Cayley-Hamilton theorem (without proof), power of a matrix, diagonalisation of a matrix.

UNIT - III **L- 9**

Multiple Integrals: Double integrals, Evaluation, Evaluation in Polar coordinates, Change of order of integration, Change of variables, Applications to Area in Cartesian coordinates and polar coordinates; Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - IV **L- 9**

Vector Differentiation: Vector Function, Differentiation, Scalar and Vector point function, Gradient, Normal, Divergence, Directional Derivate, Curl, Vector identities.

UNIT - V **L- 9**

Vector Integration: Line Integral, Surface Integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Matrix Algebra
2. Rank of a matrix
3. System of equations (Direct method)
4. System of equations (Cramer's Rule)
5. System of equations (matrix inversion method)
6. Eigen values and Eigen vectors of a matrix
7. Powers of matrix & Cayley-Hamilton Theorem
8. Vector algebra
9. Gradient
10. Divergence
11. Curl
12. Multiple Integrals (Area etc.)
13. Interpolation

TEXT BOOKS :

1. H. K. Dass and Er. Rajanish Verma, *"Higher Engineering Mathematics"*, 3rd edition, S. Chand & Co., 2014
2. B. S. Grewal, *"Higher Engineering Mathematics"*, Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, *"Getting started with Matlab"*, Oxford University Press, 2009

REFERENCE BOOKS :

1. Srimanta Pal and Subodh C. Bhunia, *"Engineering Mathematics"*, Oxford Publications, 2015
2. B. V. Ramana, *"Advanced Engineering Mathematics"*, 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, *"Advanced Engineering Mathematics"*, 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, *"Advanced Engineering Mathematics"*, 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with Matlab output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with Matlab output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with Matlab output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to :

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

- ✓ *Analyse the total hardness of water sample*
- ✓ *Understand the basic principles involved in various batteries.*
- ✓ *Understand the mechanisms of corrosion and various controlling methods.*
- ✓ *Synthesize various polymers.*
- ✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - I **L- 9**

WATER TECHNOLOGY : Introduction, WHO, BIS standards of water, Hardness of water - Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water-Scales and Sludges - Caustic embrittlement - Boiler Corrosion - Priming and Foaming; Softening Methods - Zeolite process, Ion Exchange process; Desalination of Brackish water-Reverse Osmosis, Electrodialysis.

UNIT - II **L- 9**

ELECTRO CHEMISTRY: Electrode Potential, Electrochemical Series, Nernst Equation, Reference Electrodes - Calomel and Standard Hydrogen Electrode, Ion Selective Electrode, Glass Electrode; Determination of pH by pH meter, Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cell - Hydrogen Oxygen, Methanol Oxygen.

UNIT - III **L- 9**

SCIENCE OF CORROSION : Introduction, Dry corrosion, Wet corrosion - Mechanisms of wet corrosion; Bimetallic corrosion - Concentration cell corrosion; Factors influencing the rate of corrosion, Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - IV **L- 9**

POLYMERS: Introduction, Types of Polymerization - Preparation, Properties and applications of Polyethylene, PVC, Teflon, Bakelite, Urea Formaldehyde, Silicones, Rubber – Vulcanization; Synthetic Rubbers - Buna-S, Buna-N, Neoprene; Introduction to Conducting polymers - Poly thiophene.

UNIT - V **L- 9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV - Visible Spectroscopy-Beer - Lambert's law - Qualitative and Quantitative Analysis; Block diagram of UV- Visible Spectrophotometer ; IR Spectroscopy - Types of Vibrations - Block diagram of IR Spectrophotometer.

TEXT BOOKS :

1. P.C Jain and Monica Jain, *"Engineering Chemistry"*, 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "*A Text book of Engineering Chemistry Engineering Materials and Applications"*, 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, *"Engineering Chemistry"*, 1st edition, Pearson publication, 2015
2. M.R. Senapati, *"Advanced Engineering Chemistry"* 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, *"Instrumental methods of Analysis"*, 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, *"Instrumental Methods of Analysis"*, 5th edition, Himalaya Publications, 2007.
5. J.D. Bares, M.Thomas, B. Siva Sankar,J.Mendham, R.C Denney, *"Vogel's Text book of qualitative Chemical Analysis"*, 6th edition, Pearson Publications, 2009
6. Dr.Sunita Rattan, *"Experiments in Applied Chemistry"* by S.K. Kataria & Sons publications, 2008.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
15		45	6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an "International language of Engineers". It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to :

- sketch engineering objects in the freehand mode
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

- ✓ *draw free hand sketches, layouts, circuit diagrams, plan and elevations*
- ✓ *draw geometrical objects like polygons, solids of different types*
- ✓ *visualize the objects in real time situations*
- ✓ *develop 3D views (isometric views)*

UNIT – I **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Introduction to Engineering Drawing: Types of lines, lettering, dimensioning Construction of polygon and Conics. (Ellipse, Parabola and Hyperbola by general method), ellipse by oblong method.

UNIT-II **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection-Planes of projections; Projections of points; Projection of straight lines; Inclined to one plane and both the planes; Projections of planes; Simple planes, Planes inclined to one reference planes.

UNIT – III **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, pyramids, cylinders, cones, solid axis inclined to one plane.

UNIT – IV **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: - Isometric drawing of simple objects- isometric view of prisms; pyramids; cone and cylinder – simple orthographic views into isometric views through AutoCAD.

UNIT – V **L-3, P-9**

ORTHOGRAPHIC VIEWS: - Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS :

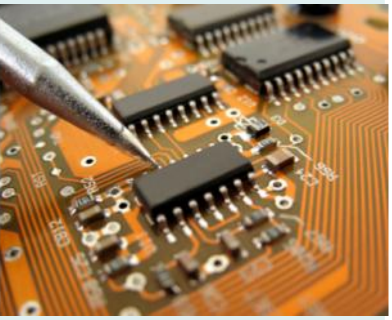
1. N.D.Bhatt, “Engineering Drawing”, 53rd edition., Charotar Publication, 2014.
2. Basant Agrawal , C.M.Agrawal “Engineering Drawing” , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS :

1. J. hole, *“Engineering Drawing”*, 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, *“Engineering drawing”*, 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits
- analyze AC (single and three phase) and DC. AC circuits using different methods and laws
- operate various electrical machines.
- understand the concepts of Semiconductor devices and their operation

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT – I **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law; Kirchhoff's Laws: application to simple series, parallel circuits, mesh and nodal analysis of simple resistive circuits.(Simple numerical problems).

UNIT – II **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - frequency, average value, R.M.S. value, form factor, peak factor for sinusoidal only; phasor representation of alternating quantities; Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – III **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, reluctance, flux and flux density, concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, constructional features, EMF equation (simple numerical problems).

UNIT – IV **L-9**

DC MACHINES: Constructional details of a D.C. Machine; D.C. Generator; Principle of operation; EMF equation; types of D.C. generators (simple numerical problems).

D.C. Motor: Principle of operation, Torque equation, types of D.C. motors (simple numerical problems)

A.C MACHINES: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – V **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory; Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- Apply the ohm's law, KVL and KCL laws to different circuits.
- Calculate the power and energy in electric circuits.
- Operate and find the transformation ratio of transformer at different loads.
- Study and verify the characteristics of semiconductor devices.
- Calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, “Basic Electrical and Electronics Engineering”, 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, “Electrical Technology”, Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, “Basic Electrical Engineering”, 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http://nptel.ac.in/courses/108108076/
2. https://books.google.co.in/books/about
Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to :

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water
2. Estimation of Total hardness of water
3. Find the percentage of available chlorine in Bleaching powder
4. Estimation of Fe (II) by Dichrometry method
5. Preparation of Phenol - Formaldehyde Resin
6. Synthesis of Urea- Formaldehyde Resin
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS :

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas & B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I 2009
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
30	-	-	10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to :

- observe and integrate the diverse information from sources outside the classroom
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness
- adapt eco-friendly technologies in order to maintain hygienic conditions
- understand the human activities that are detrimental to environment
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem*

UNIT- I **L-6**

NATURAL RESOURCES

Environmental Studies: Definition Scope and its importance, Need for Public Awareness, Natural Resources, Forest Resources - deforestation ; Water resources - Properties and conflicts, Mineral resources - extraction and impacts, Food resources - Modern agriculture methods, fertilizer-pesticide problems, water logging, salinity, Energy resources - renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources - land degradation, soil erosion; Role of an individual in conservation of natural resources.

UNIT- II **L-6**

ECOSYSTEMS AND BIODIVERSITY

Ecosystem : Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems.

Biodiversity : Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT- III **L -6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY

Solid waste Management: Causes, effects and control measures of Municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and Noise Pollutions; Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, applications of the remote sensing, Innovative practices-objectives, innovative practices in agriculture and forestry-community, Bio-villages.

Green technology for Sustainable development, Life cycle assessment and its Concept.

UNIT- IV **L -6**

SOCIAL ISSUES AND EIA

Sustainable development, Water conservation, Cloud Seeding, Rainwater Harvesting Methods Watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental Legislation: Wildlife Protection Act - Water Act - Forest Conservation Act - Air Act. – Environmental Protection Act. Environmental Impact Assssment (EIA) - Introduction, definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed Projects / Industry / Developmental activity.

UNIT- V **L-6**

ENVIRONMENTAL SANITATION

Food sanitation **-** food and drugs Act, Food preservations, Milk sanitation, tests for milk, pasteurization of the milk; Water , Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions, Role of youth in the development, Promoting activities -Youth as initiators and activities.

Field work/Environmental Visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment - common plants, insects, birds; Study of simple ecosystems - pond, river, hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik- CP Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016
2. Benny Joseph, “Environmental studies”, 2nd edition, Mc Graw Hill Education, 2015.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.CHAND & Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004
7. Kurian Joseph and R.Nagendram, “Essentials of environmental studies”, Pearson Education Pt Ltd, Delhi, 2007.

16ME102 ENGINEERING MECHANICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	-	5	-	5

Course Description and Objectives:

Engineering Mechanics is the application of mechanics to solve problems involving common engineering elements. The goal of this course is to expose students to problems in mechanics as applied to plausibly real-world scenarios.

Problems of particular types are explored in detail in the hopes that students will gain an inductive understanding of the underlying principles at work, students should then be able to recognize problems of this sort in the real-world situations and respond accordingly. The course uses the Laws of Mechanics to predict forces in and motions of machines and structures. The course is the key prerequisite course to sequences of courses dealing with mechanics of machines, stress analysis and design of mechanical systems.

Course Outcomes:

Upon completion of this course, the student will be able to:

- use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- apply basic knowledge of mathematics and physics to solve real-world problems.

SKILLS:

- ✓ knowledge on classical mechanics, scalar, vector quantity, force, system of force, resultant force, moment of a force, force-couple
- ✓ comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline
- ✓ knowledge on equilibrium condition
- ✓ in-depth understanding of specialist bodies of knowledge within the engineering discipline.
- ✓ application of established engineering methods to complex engineering problem solving.
- ✓ application of systematic engineering synthesis and design processes.
- ✓ idea about the centre of gravity and moment of inertia of a body.

UNIT-1 **L-10; T-3**

GENERAL PRINCIPLES: Introduction to engineering mechanics; idealization in mechanic's basic concepts; vectors and scalar quantity; laws of mechanics.

Force system and resultant: Concept of force; representation of force; system of forces; resolution of forces using rectangular components.

Moments and couples: Introduction; moment of force; varignon's theorem; resultant of parallel forces; couple and moment of couple; characteristic of couple.

UNIT -2 **L-8; T-3**

EQUILIBRIUM OF BODIES: Conditions of equilibrium for a coplanar force system and coplanar non parallel non concurrent force system; principle of equilibrium (two ; three ; force principle) ; Lami's theorem

Truss: Introduction; classification of truss; fundamental of truss; analysis of truss (method of joints and method of section)

UNIT-3 **L-10; T-3**

FRICTION: Introduction ; classification of friction ; coefficient of friction ; laws of friction ; angle of friction ; angle of repose ; cone of friction ; ladder friction ; wedge friction

UNIT-4 **L-10; T-3**

CENTROID: Introduction; centroid of lines; centroid of surfaces; determine of centroid of simple figures; centroid of composite figures; centroid of a parabolic spandrel

Center of Gravity: Introduction; center of gravity; location of center of gravity - right circular cone and solid hemisphere; center of mass; theorem of Pappus.

UNIT-5 **L-10; T-3**

MOMENT OF INERTIA: Moment of inertia of plane areas ; polar moment of an area ; radius of gyration of area; parallel axis theorem ;perpendicular axis theorem; moment of inertia of composite areas. Mass moment of inertia; introduction; radius of gyration of mass; mass moment of inertia of rod; rectangular plate ; right circular cylinder ; circular ring ; circular plate.

TEXTBOOKS:

1. A K Dhiman, P Dhiman. And D. C Kulshreshtha, "Engineering Mechanics: Statics and Dynamics", Mc Graw Hill ,2015
2. Basudeb Bhattacharyya, "Engineering Mechanics", 2nd Edition, Oxford University Press 2014.

REFERENCE BOOKS:

1. N H Dubey" Engineering Mechanics : statics and dynamics",1st Edition, Mc Graw Hill,2015.
2. S SBhavikatti, "Engineering Mechanics", 1st edition, New age International, reprint 2015.
3. J. L. Meriam, L. G. Kraige, "Engineering Mechanics: Statics", 8th Edition d., John Wiley and sons, 2015.

URL:

1. https://www.youtube.com/user/mySeriesEM
2. https://www.youtube.com/channel/UCSeYfmhG5Z25uvm9C7gdrWw
3. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-engineering-mechanics-i-fall-2007/index.htm

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	20	-	-

Course Description and Objectives

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes

The student will be able to :

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

- ✓ *Prepare wooden and metal furniture*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs etc*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*
- ✓ *CNC machines and various machining operations and processes*

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry
2. Fitting
3. Tin Smithy and Black smithy
4. House wiring
5. Foundry and Welding (Demonstration)
6. Machine shop and CNC (Demonstration)

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS :

1. S.K. Hazra Choudhury, “Elements of workshop Technology”, 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., “A first course on workshop practice: Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S., “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai, 1999.

II

YEAR

AGRICULTURE ENGINEERING

B.Tech.

I SEMESTER

16AG201	Engineering Properties of Biological Materials & food Quality
16AG202	Farm Power and Renewable EnergySources
HS16202	Probability & Statistics
16CE202	Fluid Mechanics
16AG203	Principles of Thermodynamics
16AG204	Soil Mechanics
16EL102	Soft Skills Lab

II SEMESTER

16AG205	Crop Production Technology
16AG206	Strength of Materials
16AG207	Surveying & Levelling
16AG208	Theory of Machines
16AG425	Principles of Heat and Mass Transfer
16HS203	Professional Communication Lab

COURSE CONTENTS

I SEM & II SEM

16AG201 ENGINEERING PROPERTIES OF BIOLOGICAL MATERIALS AND FOOD QUALITY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	4	4	5	-

Course Description and Objectives:

This course describes the properties of different food materials and quality standards. The objective of the course is to familiarize the students about the basic properties of food materials for better preservation and use.

Course Outcomes:

After completion of this course students will be able to:

- learn the basic properties of food materials
- apply the properties on industrial scale
- have basic knowledge about food laws
- use the food laws in different food industries.

SKILLS:

✓ *Measure engineering properties of food for the application of various designs in food industry.*

✓ *Analyze the food product available in the market based upon its quality standards.*

ACTIVITIES:

- o *Hazard analysis of pilot scale food manufacturing.*
- o *Quality assessment of various food products by considering existing laws and quality parameter analysis.*
- o *Estimation of engineering properties of different regional crops.*

UNIT - 1 **L-09**

PHYSICAL AND THERMAL PROPERTIES: Importance of engineering properties of biological materials, Study of different physical and thermal characteristics of important biological materials like shape, size, volume, density, roundness, sphericity, surface area, specific heat, thermal conductivity, thermal diffusivity, etc.

UNIT - 2 **L-09**

RHEOLOGICAL AND AERODYNAMIC PROPERTIES: Measurement of colour, flavour, consistency, viscosity, texture and their relationship with food quality and composition. Rheological characteristics like stress, strain time effects, rheological models and their equations. Aerodynamic characteristics and frictional properties.

UNIT - 3 **L-09**

APPLICATIONS OF ENGINEERING PROPERTIES: Application of engineering properties in handling processing machines and storage structures. Concept, objectives and need of quality, quality control, methods of quality control, sampling.

UNIT - 4 **L-09**

QUALITY CONTROL AND ASSURANCE: Purpose, sampling techniques, requirements and sampling procedures for liquid, powdered and granular materials, sensory quality control, panel selection methods. Interpretation of sensory results in statistical quality control, TQM and TQC, Consumer preferences and acceptance.

UNIT - 5 **L-09**

FOOD LAWS: Food Laws and Regulations in India. Food grades and standards like BIS, AGMARK, PFA, FPO, CAC (Codex Alimantarious Commission), Sanitation in food industry, GMP, HACCP (Hazard analysis and critical control point) and ISO 9000 Series.

TEXT BOOKS:

1. G. G. Birch and K. J. Paiker, “Control of food quality and food analysis”. Elsevier applied science, 1990.
2. M.A. Rao and S.S.H Rizvi, “Engineering Properties of Foods”. CRC Press, 2014.

REFERENCE BOOKS:

1. O.P. Singhal and D.V.K. Samuel, “Engineering Properties of Biological Materials”. Saroj Prakashan, Allahabad, 2003.
2. S.N. Herschdoerfer, “Quality Control in Food Industry”. Academic Press Inc., 1980.
3. N. N. Mohsenin, “Electrical and Electro magnetic radiation properties of food and Agricultural materials”. Gordon and Breach publishers Inc. U. K. 1996.

WEB LINK:

1. http://ecourses.iasri.res.in/email_authentication.aspx?Degree_Id=04

16AG202 FARM POWER AND RENEWABLE ENERGY SOURCES

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	-

Course Description and Objectives:

This course deals with the different sources of power to perform field operations in agriculture. The objective of the course is to empower the student to think of different sources of energy for farming requirements according to the area of farming.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

- learn the fundamentals of I.C. engine.
- acquire basic information about use of renewable energy in agriculture field.

SKILLS:

✓ *Use of briquetting machine for small scale farmers.*

✓ *Identification of the required specifications of engines used for field operations.*

✓ *Design of solar operated cooker, water heater and lamp.*

ACTIVITIES:

- *Preparation of biomass briquettes.*
- *Development of solar energy operated sprayer, cooker and lamps.*
- *Development of mini wind turbine.*
- *Design of small scale rice husk gasifier.*

UNIT - 1 **L-06**

I.C ENGINES: Sources of farm power conventional and non conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. Study of engine components their construction, operating principles and functions.

UNIT - 2 **L-06**

SYSTEMS OF I.C ENGINE: Engine systems- valves and valve mechanism, Fuel and air supply, Cooling, Lubricating, Ignition, Starting and Electrical systems. Study of constructional details, Adjustments & operating principles of these systems.

UNIT - 3 **L-06**

FUEL AND FUEL TEST: IC engine fuels -their properties and combustion of fuels, gasoline tests and their significance, diesel fuel tests and their significance, detonation and knocking in IC engines. Study of properties of coolants, anti freeze and anti corrosion materials. Lubricant types and study of their properties. Engine governing systems.

UNIT - 4 **L-06**

BIOMASS AND WIND ENERGY: Energy sources - Introduction, Classification, Energy from Biomass. Types of biogas plants, Constructional details, Principles of combustion, Pyrolysis and gasification, Types of gasifiers, Briquetting, Types of Briquetting machines, Wind energy, Types of wind mills, Constructional details and application of wind mills, Modern applications and future potential of renewable energy sources.

UNIT - 5 **L-06**

SOLAR ENERGY: Solar energy, Solar flat plate and focusing plate collectors, Solar air heaters, Solar space heating and cooling, Solar energy applications / Solar energy gadgets, Solar cookers, Solar water heating systems, Solar grain dryers, Solar Refrigeration system, Solar ponds, Solar photo voltaic systems, Solar lantern, Solar street lights, Solar fencing, Solar pumping systems.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Introduction to different systems of an CI engine; Engine parts and functions, working principles etc.
2. Valve system and Injection.
3. Air cleaning system and Fuel supply system of SI engine.
4. Cooling system and fan performance, thermostat and radiator performance evaluation.
5. Part load efficiencies & governing.
6. Lubricating system & adjustments.
7. Starting and electrical system and Ignition system.
8. Preparation of biomass sample and determination of calorific value.
9. Estimation of ash content, fixed carbon, volatile matter and moisture content of biomass.
10. Demonstration of down draft throat less and with throat rice husk gasifier.
11. Working of a fixed dome type and floating drum type biogas plants.
12. Biodiesel preparation.
13. Measurement of basic solar parameters and demonstration of solar water heater;

14. Demonstration of solar cooker

TEXT BOOK:

1. J. B. Liljedahl, W. M. Carleton, P. K. Turnquist, D. W. Smith and Makoto Hoki. “Tractors and Their Power Units”, AVI publishing Company Incorporated, Westport, Connecticut, 1996.

REFERENCE BOOKS :

1. S. C. Jain and C. R. Roy, “Farm Tractor Maintenance and Repair”, Tata McGraw-Hill Publishing Co. Ltd., New Delhi. 2012.
2. G. D. Rai, “Non- Conventional Energy Sources”, Khanna Publishers, New Delhi, 2014.
3. Jagdishwar Sahay, “Elements of Agricultural Engineering”, Agro Book Agency, Patna, 2009.

WEB LINK:

1. http://ecoursesonline.iasri.res.in/course/view.php?id=539

16HS202 PROBABILITY AND STATISTICS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

CS	WA/RA	SSH	SA	S	BS
-	10	45	-	-	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation and regression and their applications, probability, theoritical distributions and testing of hypothesis.

The objective of this course is to enable the student to understand and apply statitical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L- 12**

DESCRIPTIVE STATISTICS : Basic Definitions, Frequencies, Graphical Representation, Histogram, Ogive curves, Measures of Central tendency, Arithmetic mean, Median, Mode, mean deviation, standard deviation, Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT - 2 **L- 12**

CURVE FITTING, CORRELATION AND REGRESSION : Least squares method, curve fitting (straight line and parabola only).Covariance, Correlation, Types, Pearson's Coefficient of correlation, Rank correlation, Spearman's rank correlation.Regression, Regression lines.

UNIT - 3 **L- 12**

PROBABILITY : Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L- 12**

DISTRIBUTIONS : Random variables, Discrete and Continuous variables, Introduction to Distributions *Binomial distribution :* Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

Poisson Distribution *:* Definition, Mean and Standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

Normal Distribution : Definition, Normal curve, Mean and Standard deviation, Median, Mode, Normal Distribution applications,

UNIT - 5 **L- 12**

TESTING OF HYPOTHESIS : Population and Sampling, Parameters and Statistics, Types of sampling~~.~~Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion~~,~~ t-distribution for small sample, difference between means of small sample, Chi square test for goodness of fit, Chi-square test for test of independence.

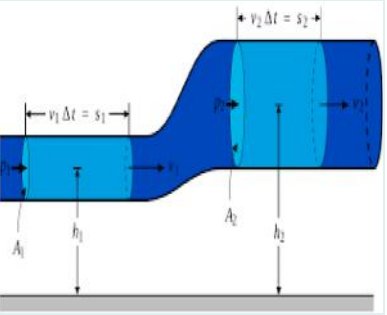
TEXT BOOKS:

1. Miller and Freund, "Probability and Statistics for engineers", 8th edition, Pearson publishers, 2013.

2. H. K. Dass and Rajanish Verma, "Higher Engineering Mathematics", 3rd Revised edition, S. Chand & Co.,2014.

REFERENCE BOOK:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Co., New Delhi, 2005.



16CE202 FLUID MECHANICS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	5

Course Description and objectives:

This course deals with the basic concepts of fluid flow, basic equations of continuity, energy and momentum. In addition, the course offers knowledge on various flow measuring devices. The objective of this course is to provide knowledge on basic properties of fluid in static and kinematic state and study of laminar and turbulent flow through pipes.

Course Outcomes:

Students will be able to:

- gain insights into properties of fluids like viscosity, density, specific weight etc,
- understand basic definitions related to fluids and fluid mechanics.
- measure pressure in fluid-flowing pipes and vessels.
- handle different kinds of pressure measuring instruments.
- apply continuity equation and energy equations in flow measurements.

SKILLS:

- ✓ *Differetiate between Newtonian and Non Newtonian fluids.*
- ✓ *Determine fluid pressure using different types of gauges.*
- ✓ *Determine hydrostatic forces on a body immersed in a fluid.*
- ✓ *Use flow measuring devices like pitot tube.*

UNIT - 1 **L-09**

FLUIDS: Definition, Ideal fluids, real fluids, Newtonian and non-Newtonian fluids.

PROPERTIES OF FLUIDS: Units of measurement, Mass density, Specific weight, Specific volume, Specific gravity, Viscosity, Surface tension and Capillarity, Compressibility and Elasticity.

MEASUREMENT OF PRESSURE: Pressure at a point in a static fluid; pressure variation in an incompressible static fluid; atmospheric pressure, Gauge pressure, vacuum pressure, absolute pressure, Manometers, Bourdon pressure gauge.

UNIT - 2 **L-09**

HYDROSTATIC FORCES: Forces acting on immersed plane surfaces, Center of pressure, forces on curved surfaces.

BUOYANCY: Conditions of equilibrium for floating bodies, meta-center and meta-centric height, experimental and analytical determination of meta-centric height.

UNIT - 3 **L-09**

FLUID KINEMATICS: Types of Flows, steady and unsteady flows, uniform and non-uniform flows, stream lines, path lines, stream tubes, Principles of conservation of mass, equation of continuity, acceleration of fluid particles: local and convective, rotational and irrotational motions, free and forced vortex, velocity potential and stream function, flow net.

FLUID DYNAMICS: Euler's equations of motion and integration of Euler's equations, Bernoulli's equation for incompressible fluids.

UNIT - 4 **L-09**

FLOW MEASURING DEVICES: Pitot tube, Venturimeter, Orifice meter, orifices and mouth pieces, time of emptying of tanks by orifices, sharp edged rectangular, triangular and trapezoidal notches, Francis formula, Velocity of approach, End contractions; Cippoletti Weir.

MOMENTUM EQUATION AND ITS APPLICATION: Development of momentum equation by control volume concept, Momentum correction factor, applications, forces on pipe bend.

UNIT - 5 **L-09**

ANALYSIS OF PIPE FLOW: Darcy's equation, Minor losses, pipes in series, pipes in parallel, total energy line and hydraulic gradient line, Hydraulic power transmission through a pipe, Siphon, Water hammer.

LAMINAR FLOW: Reynolds experiment, Characteristics of laminar flow, Steady laminar flow through a circular pipe (Hazen poiseuilles equation).

TURBULENT FLOW IN PIPES: Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, Friction factor for pipe flow, Variation of friction factor with Reynolds number, Moody's chart.

LABORATORY EXPERIMENTS

LIST OF EXPERMENTS Total hours: 30

1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Friction factor for a given pipe line.
4. Head loss due to sudden contraction in a pipeline

ACTIVITIES:

- *Measure weight and volume to calculate specific weight, mass density and specific gravity of various fluids like water, petrol, oil etc.*
- *Measure pressure at different points of a tank containing two or three immiscible liquids using a simple manometer.*
- *Prepare a model of hydraulic lift to demonsrate the concept of Pascal's law.*
- *Measure the depth of immersion of a floating object using the buoyancy principle.*

5. Verification of Bernoulli's equation
6. Coefficient of discharge of Mouthpiece
7. Coefficient of discharge of Orifice
8. Discharge by V-Notch
9. Discharge by Rectangular – Notch

TEXT BOOKS:

1. P. N. Modi and S. N. Seth, "Hydraulics and Fluid Mechanics", 20th edition, Standard book house, New Delhi,2013.
2. R. K. Bansal, "Fluid Mechanics and Hydraulic Machines", 9th edition., Laxmi Publications, New Delhi, 2005.

REFERENCE BOOKS:

1. V.L. Streeter and E.B.Wyile, "Fluid Mechanics", 9th edition., McGraw-hill Publications, 2011.
2. S.K. Som and G. Biswas, "Fluid Mechanics", 2nd edition., Tata Mc Graw Hill, 2008.
3. John F. Douglas, Janusz M. Gasiorek, John A. Swaffield, "Fluid Mechanics", 5th edition, Pearson Education Publishers.2005

16AG203 PRINCIPLES OF THERMODYNAMICS

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
30	-	30	2	40	2	8	2	2

Course Description and Objectives :

This course describes the theory and applications of classical thermodynamics, thermodynamic properties, equations of state and methods used to describe and predict phase equilibria. The objective of the course is to analyze and evaluate various thermodynamic cycles used for energy production - work and heat, within the natural limits of conversion.

Course Outcomes:

After completion of this course students will be able to:

- apply fundamental concepts of thermodynamics to engineering applications.
- define heat, work and thermal efficiency.
- differentiate between various forms of energy.
- estimate thermodynamic properties of substances in gas and liquid states.
- determine thermodynamic efficiency of various energy related processes.

SKILLS:

✓ *Comprehend different systems and basic laws of thermodynamics which are useful for engineering applications.*

✓ *Use entropy in different process and use of Carnot cycle/ theorem.*

✓ *Recognize different types of boilers and its use for different system according to working principle.*

✓ *Appreciate the effect of different parameters on steam generation.*

✓ *Use otto cycle and diesel cycle in steam engines.*

ACTIVITIES:

- *Development of layout of heat engine and heat pump by application of basic laws in live engineering models.*
- *Development of PVT profile for same engineering models (IC engine, Air condition system etc.)*
- *Modelling of energy requirement for different boilers with same capacity.*
- *Simulation of refrigeration system/ air conditioning*

UNIT - 1 **L-06**

INTRODUCTION AND BASIC LAWS : Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady. Flow processes. Kelvin-Planck and Claussius statements.

UNIT - 2 **L-06**

ENTROPY AND PROCESSES Reversible processes, Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamics processes. Difference between gas and vapor, change of phase during constant pressure process.

UNIT - 3 **L-06**

STEAM GENERATION : Generation of steam, triple point and critical point. Internal energy and entropy of steam. Use of steam tables and Mollier chart, heating and expansion of vapor in non-flow processes, measurement of dryness fraction.

UNIT - 4 **L-06**

BOILER : Classification of steam boilers, Cochran, Lancashire, locomotive and Babcock-Wilcox boilers. Boiler mountings and accessories. Desirable properties of working fluid used for power plants. Rankine cycle. Expansive and non-expansive working. Saturation curve and missing quantity, governing. Calculations of cylinder dimensions

UNIT - 5 **L-06**

STEAM ENGINES : Introduction to compound steam engines. Air Standard efficiency, other engine efficiencies and terms.Otto, diesel and dual cycles. Calculation of efficiency, mean effective pressure and their comparison. Measurement of IP, BP and .heat balance calculations (not involving combustion).Engine efficiencies and performance.

LABORATORY EXPERIMENT

LIST OF EXPERIMENTS **Time: 30hours**

1. Study of boilers.
2. Various mountings and accessories of boilers.
3. Study of steam engine.
4. To measure dryness fraction of steam.
5. Performance test of steam engine.
6. Study of I.C. engines.
7. Valve-timing diagram of 2-stroke engines.
8. Valve timing diagram of 4stroke engines.
9. Performance test on 2- cylinder diesel engines.
10. Performance test and heat balance test on a four cylinder horizontal diesel engine.
11. Comparison of different temperature measuring methods.

TEXT BOOKS:

1. Y. A. Cengel and M. A. Boles, “Thermodynamics, an Engineering Approach”, 7th edition, Tata McGraw-Hill Publishing Co. Ltd, 2012.
2. P.K. Nag, “Engineering Thermodynamics”, 5th edition, Tata McGraw-Hill Publishing Co. Ltd, 2013.

REFERENCE BOOKS:

1. J.P. Holman, “Thermodynamics”, 10th edition, Tata McGraw-Hill Publishing Co. Ltd, 2011.
2. E. H. Lewitt, “Thermodynamics applied to Heat Engines”, 5th Edition, Sir Isaac Pitman and Sons Limited, London, 1957.

WEB LINK:

1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=126017

16AG204 SOIL MECHANICS

Hours Per Week :

L	T	P	C
2	1	2	4

Total Hours :

L	T	P
30	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	-

Course Description and Objectives:

This course deals with the relationships between physical characteristics and mechanical properties of soils. The objective of this course is to expose the students to the fundamental knowledge on soil physical parameters, permeability compaction, consolidation, earth pressure and stability of slopes.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

- develop an understanding of the relationships between physical characteristics and mechanical properties of soils.
- understand and experience experimental measurement of the physical and mechanical soil properties commonly used in engineering practice.
- understand and experience shear test of soil.
- apply engineering science principles, using shear strength and compressibility parameters, to analyze the response of soil under external loading.

SKILLS:

✓ *Determine soil moisture content, bulk density, soil texture value, and classify soil .*

✓ *Test soil compaction, consolidation and strength for different places.*

✓ *Perform Sieve analysis test.*

✓ *Find the response of soil under external loading principles, using shear strength and compressibility parameters.*

✓ *Prepare and present soil characteristics curve for different locations.*

ACTIVITIES:

- *Perform different soil parameters laboratory test, taking soil sample, handling balancer, drier, chemical experiment, analysis of charts, tables, graphs.*
- *Preparation of soil sample and perform compaction test consolidation and strength test and results analysis for different types of soil.*
- *Classify soil based on analysis of different soil properties.*
- *Differentiate soil characteristics based on analysis of soil test results.*

UNIT- 1 **L-06,T-03**

INTRODUCTION OF SOIL MECHANICS : Intruction of soil mechanics, field of soil mechanics, phase diagram, physical and index properties of soil, Classification of soils, general classification based on particles size, textural classification and I.S. soil classification system. Stress condition in soils, effective and neutral stress, elementary concept of Bousinesque and Wester guards analysis, new mark influence chart.

UNIT- 2 **L-06,T-03**

SHEAR STRENGTH : Mohr stress circle, theoretical relationship between principle stress circles, theoretical relationship between principal stress Mohr-coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear to be circle, theoretical test. Numerical exercise based on various types of tests.

UNIT- 3 **L-06,T-03**

COMPACTION AND CONSOLIDATION : Compaction, composition of soils standard and modified Proctor test, Abbot compaction and Jodhpur mini compaction text field compaction method and control. Consolidation of soil: one dimensional consolidation spring analogy, Terzaghi's theory, Laboratory consolidation test, calculation of void ratio and coefficient of volume change, Taylor's and Casagrande method, determination of coefficient of consolidation.

UNIT- 4 **L-06,T-03**

EARTH PRESSURE : Plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure, active and passive earth pressure for cohesive soils, simple numerical exercise.

UNIT- 5 **L-06,T-03**

STABILITY OF SLOPES : Introduction to stability analysis of infinite and finite slopes, friction circles method, Taylor's stability number.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **Total hours: 30**

1. Determination of water content of soil.
2. Determination of specific gravity of soil.
3. Field density of soil: core cutter method.
4. Field density: sand replacement method.
5. Grain size analysis: sieving (Dry sieve analysis).
6. Grain size analysis: hydrometer method.
7. Liquid limit: Casagrande's method.
8. Liquid limit: cone penetrometer and plastic limit.
9. Shrinkage limit.
10. Permeability: constant head method.
11. Permeability: variable head method.
12. Compaction properties: standard proctor test.
13. Shear parameters: direct shear test.
14. Unconfined compressive strength of soil.

15. Shear parameters :Tri-axial test.

16. Consolidation properties of soils.

TEXT BOOKS:

1. B. C. Punmia and A. K. Jain, "Soil Mechanics and Foundations", Laxmi Publishing Private Limited, New Delhi, 2005.

2. V. N. S. Murthy, "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2007.

REFERENCE BOOKS:

1. N. C. Brady, "The Nature and Properties of Soil",10th Edition, Macmillan Publishing Company, New York, 2008.

2. B. M. Das and G. V. Ramana, "Principles of Soil Dynamics", Cengage Learning, 2010.

3. B. Singh and S. Prakash, "A Text Book of Soil Mechanics", New Chand and Bros., Roorkee, 2010.

WEB LINKS:

1. http://nptel.ac.in/courses/105103097/

2. http://ecoursesonline.iasri.res.in/course/view.php?id=8

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, Preparing Resume, Group Discussion, and Interview Skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs equip with requisite professional and inter-personal skills.
- they will possess the ability to think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- through identification and introspection on individual strengths and weaknesses.
- students will emerge with improved levels of self-awareness and self-worth, for greater efficacy at workplace.

SKILLS:

✓ *Able to Communicate and understand the difference between soft skills an hard skills.*

✓ *Able to learn professionalism and Employability skills.*

✓ *Able to plan Career by drawing their SWOT, Setting the Goal, learn the importance of Time and Stress Management.*

✓ *Able to learn Vocabulary, Situational English, Group Discussion, Reading Comprehension and Listening Comprehension which are essential for all competitive examinations.*

✓ *Able to prepare Resume and learn how to face interview.*

✓ *Able to learn Gender sensitive language, Good manners, emotional intelligence and essential skills.*

UNIT - 1 **P-08**

A) COMMUNICATION: Need for effective communication - the process of communication, levels of communication, flow of communication, choice of diction and style with reference to setting (formal, semi-formal or informal); communication networks, barriers to communication, miscommunication, noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, need for soft skills, professionalism, employability skills

C) CAREER PLANNING:

Job vs. career, Goal setting, SWOT analysis, planning and prioritization, four quadrant time management system, self-management, stress-management.

ACTIVITY: Johari Window for SWOT analysis; Setting a SMART goal using the provided grid; Writing a Statement of Purpose (SOP).

UNIT - 2 **P-08**

A) VOCABULARY BUILDING: Word etymology, roots, prefixes & suffixes, synonyms & antonyms, collocations, one-word substitutes, analogies, idioms and phrases, contextual guessing of unfamiliar words, task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student) – vocabulary exercises with hand-outs – Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day)

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student)

C) GROUP DISCUSSION: Articulation and flow of oral presentation, dynamics of group discussion, intervention, summarizing and conclusion, voice modulation, content generation, Key Word Approach (KWA), Social, Political, Economic, Legal and Technical Approach (SPELT), View Point of Affected Part (VAP), language relevance, fluency and coherence.

ACTIVITY: Viewing a recorded video of GD & Mock sessions on different types of GD topics- controversial, knowledge, case study (including topics on current affairs)

UNIT - 3 **P-04**

A) RESUME-WRITING: Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, preparing the resume, writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, understanding employer expectations, pre-interview planning, opening strategies, impressive self-introduction, answering strategies, other critical aspects such as body language, grooming, other types of interviews such as stress-based interviews, tele-interviews, video interviews, frequently asked questions (FAQs) including Behavioural and HR questions and the aspect looked at by corporate during interviews

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-04**

A) READING COMPREHENSION: Reading as a skill, techniques for speed reading, understanding the tone, skimming and scanning, appreciating stylistics, impediments for speed reading, eye fixation,

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

sub-vocalization, critical reading, reading based on purpose, reading for information, reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas. (Hand-outs). Newspaper activity with students divided into 4 groups. Each group looks at critical component of communication such as Listening, Speaking, Reading and Writing enabling them to be better communicators as well as be more aware about the current affairs, which help in Group Discussion.

B) LISTENING COMPREHENSION: Listening as a skill, different types of listening, active and passive listening, top-down approach, bottom-up approach, understanding the non verbal cues of communication; intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - V 5 **P-06**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, cultural sensitivity, social awareness, emotional intelligence, good manners, self-grooming, positive body language, accepting and handling responsibility, assertiveness, problem solving, negotiating skills, networking and creating a good first impression.

Seven essential skills for a team player; attentive listening, intelligent questioning, gently persuading, respecting other's views, assisting others, sharing, participating actively.

ACTIVITY: Johari Window, Games and Case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation" 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan & NP Singh, "Speaking English Effectively" 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011
8. Rajiv K. Mishra, "Personality Development", Rupa & Co. 2004.

16AG205 CROP PRODUCTION TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	5	6	-

Course Description and Objectives:

This course describes the various types of soil and its properties for better production of crops and horticulture of crops. The objective of this course is to understand different types of soils and its properties with production of different agriculture as well as horticultural plants.

Course Outcomes:

After completion of this course students will be able to:

- about drying and storage of farm crops.
- of use of different production techniques for different crops.

SKILLS:

✓ *Understand the basic classification of crops and their tillage characteristics.*

✓ *Understand Criteria for site selection, layout and planting methods, nursery raising, macro and micro propagation methods.*

✓ *Knowledge to handle Garden tools, management of orchard.*

✓ *Information regarding extraction and storage of vegetables seeds.*

ACTIVITIES:

- o *Identification of rocks and minerals.*
- o *Determination of bulk density, particle density and porosity of soil.*
- o *Determination of organic carbon of soil.*
- o *Identification of crops and their varieties seeds and weeds.*
- o *Nutrient requirement and fertilizer requirement recommendation for different crops.*

UNIT - 1 **L-06**

SOIL PHYSICS: Soils: Nature and origin of soil; soil forming rocks and minerals, their classification and composition, soil forming processes. Classification of soils, soil taxonomy orders; important soil physical properties, soil particle distribution.

UNIT - 2 **L-06**

SOIL CHEMISTRY: Soil inorganic colloids - their composition, properties and origin of charge; ion exchange in soil and nutrient availability; soil organic matter - its composition and decomposition, effect on soil fertility; soil reaction - acid, saline and sodic soils; quality or irrigation water; essential plants nutrients - their functions and deficiency symptoms in plants; important inorganic fertilizers and their reactions in soils.

UNIT - 3 **L-06**

AGRONOMY: Definition and scope of agronomy. Classification of crops, Effect of different weather parameters on crop growth and development. Principles of tillage, tilth and its characteristics. Soil water plant relationship and water requirement of crops, weeds and their control, crop rotation, cropping systems, Relay cropping and mixed cropping.

UNIT - 4 **L-06**

HORTICULTURE-1: Scope of horticultural and vegetable crops. Soil and climatic requirements for fruits, vegetables and floriculture crops, improved varieties, Criteria for site selection, layout and planting methods, nursery raising, macro and micro propagation methods, plant growing structures.

UNIT - 5 **L-06**

HORTICULTURE-2: Pruning and training, Fertilizer application, fertigation, Irrigation methods, Harvesting, Grading and packaging, Post harvest practices, Garden tools, Management of orchard, Extraction and storage of vegetables seeds.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **Total hours: 30**

1. Identification of rocks and minerals.
2. Examination of soil profile in the field.
3. Determination of bulk density, particle density and porosity of soil.
4. Determination of organic carbon of soil.
5. Identification of crops and their varieties seeds and weeds.
6. Fertilizer application methods.
7. Different weed control methods.
8. Judging maturity time for harvesting of crop.
9. Study of seed viability and germination test.
10. Identification and description of important fruit, flowers and vegetables crops.
11. Study of different garden tools.
12. Preparation of nursery bed.
13. Practices of pruning and training in some important fruit crops.

TEXT BOOKS:

1. ICAR, “Hand Book of Agriculture”. ICAR Publication, New Delhi, 2011.
2. J. M. Martin and W. H. Leonard, “Principles of Field crop production”. Macmillon Publishing Co. Inc. New York, 1976.

REFERENCE BOOKS:

1. Chhidda Singh, “Modem Techniques of raising field crops”. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2001.
2. N. C. Brady, “The Nature and Properties of Soils”. Tenth Ed. Prentice-Hall of India Pvt. Ltd., 10th edition, New Delhi, 1999.
3. M.M. Rai, “Principles of Soil Science”. Macmillon India Ltd., New Delhi, 1998.

16AG206 STRENGTH OF MATERIALS

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	-

Course Description and Objectives:

This course describes concepts of mechanics of deformable solids including static equilibrium, geometry of deformation and material constitutive behaviour. Objective of the course is to provide students with exposure to the systematic methods for solving engineering problems in solid mechanics. It also discuss the basic mechanical principles underlying modern approaches for design of various types of structural members subjected to axial load, torsion, bending, transverse shear, and combined loading.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

- understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
- establish relation between shear load and shear force and draw shear force and bending moment diagram.
- derive flexural formula for simple bending and able to calculate variation shear stress-shear stress distribution for various cross sections.
- calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.
- determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.

SKILLS:

✓ *Measure tensile and compressive strength of materials using UTM.*

✓ *Measure shear strength of materials.*

✓ *Determine deflections produced by axial, torsional and flexural loads.*

ACTIVITIES:

- *Measurement of tensile, compressive and shear strength of materials.*
- *Design of cantilever beam.*
- *Design of simply supported and overhanging beams.*

UNIT - 1 **L-05**

SIMPLE TRESSES AND STRAINS : Types of Stresses and Strains-Hooke's law-Stress strain diagram for ductile and Brittle materials, salient points. Elastic Constants – relations strain energy, Simple and compound bars. Thermal Stresses-Stress on an inclined plane, principle stresses – Mohr circle. Strain Energy-Resilience-Gradual, Sudden, Impact and Shock loadings.

UNIT - 2 **L-06**

SHEAR FORCE AND BENDING MOMENT : Types of loads and beams-Relation between shear load, shear force and bending moment-Shear force and bending moment diagrams – Cantilevers – Simply supported beams and over-hanging beams subjected to point loads, UDL and Uniformly varying loads-Point of contra flexure.

Deflection of Beams:Introduction-deflection equation for elastic curve of a beam– deflection, slope for cantilever beam and simply supported beams – point loads, UDL and uniformly varying loads. Double integration method - Macaulay's method – Area moment methods.

UNIT - 3 **L-06**

FLEXURE AND SHEAR STRESSE : Theory of simple bending – Assumptions – Flexural formula – Bending stresses in beams for various cross sections. Shear stresses in beams – Assumptions – Derivation for variation of shear stress – shear stress distribution for various cross-sections.

UNIT - 4 **L-06**

TORSION : Introduction – Torsion equation – shear stress distribution for circular solid and hollow shafts – Stepped shafts –Shafts fixed at both the ends.

UNIT - 5 **L-07**

THIN CYLINDRICAL SHELLS : Introduction – hoop and longitudinal stresses – strains – thin spherical shell - stresses. Columns and Struts: Introduction, Euler's Formula for critical load of columns for different end conditions, Limitations of Euler's theory, Rankine's formula, Simple Numerical.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS. **Total hours: 30**

1. Direct tension test
2. Bending test on

   a) Simply supported beam b) Cantilever beam
3. Torsion test
4. Hardness test

   a) Brinell hardness test b) Rockwell hardness test
5. Test on springs.
6. Compression test on cube.
7. Impact test.

TEXT BOOKS:

1. L. N. Srinath, "Advanced Mechanics of Solids", 3rd edition, Tata McGraw-Hill Publishing Co. Ltd, 2010.
2. S. Singh, "Strength of Materials", Khanna Publications, 2009.

REFERENCE BOOKS:

1. Bhavikatti, "Strength of Materials", 3rd edition, New Age International Publishers, 1998.
2. S. Timoshenko, "Strength of Materials", 3rd edition, D. Van Nostrand Company, 1983.
3. P. P. Egor, "Engineering Mechanics of Solids", Prentice Hall of India, 1998.

WEB LINK:

1. http://ecoursesonline.iasri.res.in/course/view.php?id=9

16AG207 SURVEYING AND LEVELLING

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	-

Course Description and Objectives:

This course deals with the various methods employed for the measurement of distances, areas and volumes and also deals with the marking positions of the proposed structures on the ground by using various surveying techniques. The objective of this course is to learn the basic levelling principles, theory and applications and make students to be able to book and reduce levelling data.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

- understand the basic principles of surveying and levelling.
- apply the basic principles of surveying and levelling on agriculture structures.
- measure all the land measurements including horizontal distances, angles, elevations,and areas with chain, compass, and levelling instruments.
- measure the horizontal and vertical angles to simplify the calculations involving in height and distance measurements of inaccessible points.
- construct closed and open traverses for the finding out the land areas in large scales using Theodolites.

SKILLS:

- ✓ *Finding the length between two stations and areas an iruugular field.*
- ✓ *Performing chaining and ranging where different types of obstructions are present.*
- ✓ *Take offsets (Perpendicular and Oblique) in different filed conditions.*
- ✓ *Finding latitude and longitude of area using GPS system.*
- ✓ *Determining bearings of different survey lines by using Prismatic Compass.*
- ✓ *Setting plane table by different orientation methods on given survey station.*

ACTIVITIES:

- *Handling different types of survey chains, ranging rods, metallic tape, prismatic compass, and cross staff.*
- *Determining included angles from measured bearings.*
- *Finding location of an area using precised GPS system.*
- *Performing contour survey of an area and preparation of contour map.*
- *Projecting Plane Table Survey: Prepare map of open vacant land using any plane table method.*

UNIT - 1 **L- 03**

INTRODUCTION : Definitions of surveying and levelling, Branches and classification of surveying, Principles of surveying, Accuracy and precision.

LINEAR MEASUREMENTS : Instruments, Methods of measurements; on level ground, on slope and across obstacles, setting out parallels and perpendiculars, Errors, mistakes and corrections in linear measurements.

CHAIN SURVEYING : Introduction, Principle and purpose of chain surveying, Field work and plotting work procedures, Accuracy in chain surveying.

UNIT - 2 **L- 03**

LEVELLING : Definition of levelling, Principles of ordinary levelling and terms used in levelling, Equipment used in levelling and Types of levels, Temporary and Permanent adjustments, Series/ Reciprocal levelling, Methods of booking levels, Use of levelling, Errors in levelling.

COMPASS SURVEYING : Systems of designating bearings, Compass and its parts, Open and closed traverses, Compass traverse: field work and office work procedures, Accuracy of compass traversing.

UNIT - 3 **L- 03**

THEODOLITE TRAVERSING : Introduction to Theodolite, Classification of Theodolites, Parts of the Theodolite and temporary adjustments, Permanent adjustments of Theodolite, Measurements of horizontal and vertical angles, Methods of Traversing, Traverse computations, Errors in Traversing and Precautions.

CONTOURING : Characteristics of contours, Use of contour maps, Methods of contouring.

UNIT - 4 **L- 03**

PLANE TABLE SURVEYING : Plane table and accessories, Methods of plane table surveying, Contouring with Indian clinometers, Uses of Plane table surveying, Advantages & disadvantages of plane table surveying, Errors in plane table surveying.

AREAS AND VOLUMES : Computation of areas from plotted plan, Computation of areas from field notes, Volumes of a prismoid by Trapezoidal and Simpson's rule.

UNIT - 5 **L- 03**

GLOBAL POSITIONING SYSTEMS (GPS) : Introduction to GPS, Maps and types of digital map, Fundamentals of GPS, Uses of GPS, GPS Receivers (Hand held GPS receivers), Field procedures of GPS.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **Total hours: 45**

1. Chain surveying.
2. Cross staff survey.
3. Compass traversing.
4. Differential levelling.

5. Reciprocal levelling method.
6. Profile levelling.
7. Plane table traversing.
8. Plane table intersection.
9. Theodolite surveying.
10. Global Positioning System (GPS).

TEXT BOOKS:

1. B. C. Punmia, “Surveying: Volume I and II”, Laxmi Publishers, 15th Edition, 2005.
2. T. P. Kanetkar and S. V. Kulkarni, “Surveying and levelling Vol-I”, Puna Vidyarthi Griha Prakashan Publication, 1986.

REFERENCE BOOKS :

1. K. R. Arora, “Surveying Vol. I”, 10th Edition, Standard Book House, 2008.

16AG208 THEORY OF MACHINES

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
30	-	30	5	40	5	8	5	-

Course Description and Objectives:

The course describes the anatomy of mechanisms, machine elements and their response to static and dynamic forces. The objectives of the course are to Introduce the approaches and mathematical models used in kinematic and dynamic analysis of machinery, and to give basic knowledge on kinematic and dynamic design of machinery. It also impart the basic knowledge on mechanical vibrations.

Course Outcomes:

Upon successful completion of this course, the students should be able to:

- identify common mechanisms used in machines and everyday life.
- calculate mobility (number of degrees-of-freedom).
- conduct a complete (translational and rotational) velocity, acceleration analysis of the mechanism.
- understand gear mechanism, classification and to become familiar with gear standardization and specification in design.
- do static and dynamic force analysis and balancing of masses.
- understand the types of vibrations developed during functioning of any mechanical system.

SKILLS:

✓ *Identify common mechanisms used in machines.*

✓ *Simulate different mechanisms using software.*

✓ *Measure vibrations in different mechanisms.*

✓ *Determine degree of freedom for mechanisms.*

UNIT - 1 **L- 05**

INTRODUCTION TO MECHNISMS : Links, classifications of links, kinematic pairs - lower pairs , higher pairs, kinematic chain-inversion-four bar chain and slider crank mechanisms, Determination of Degree of freedom of simple mechanisms. Straight line motion mechanisms: Classification of straight line motion mechanisms-Peaucellier's, Tchebicheff's and pantograph mechanisms.

UNIT - 2 **L-07**

VELOCITY AND ACCELERATION IN MECHNISMS : Motion of a link in machine, velocity of a point on a link – Instantaneous center – types of instantaneous centers – Kennedy's theorem – velocity measurement by instantaneous center method, relative velocity method. Acceleration of a point on a link - acceleration in slider crank mechanism, Coriolis component of acceleration.

UNIT - 3 **L-06**

GEARS AND GEAR TRAINS : Introduction, friction wheels toothed gearing-types of gears-law of gearing-condition for constant velocity ratio for transmission-form of teeth, cycloidal and involute profiles-phenomena of interferences-condition for minimum number of teeth to avoid interference-expression for arc of contact and path of contact. Introduction to gear train-train value-simple, compound, reverted and -epicyclic gear train - method to find gear train value.

UNIT - 4 **L-06**

BALANCING : Balancing of rotating masses-primary, secondary balancing ,balancing of reciprocating masses, analytical and graphical methods - unbalanced forces and couples - hammer blow, swaying couple, variation of tractive effort.

UNIT - 5 **L-06**

MECHANICAL VIBRATION : Basic Concepts – types of vibrations - determination of natural frequency of simple systems - vibrations of beams due to point loads- Dunkerley's method-Rayleigh's method - Forced and damped vibrations - vibration isolation and transmissibility. Whirling of shafts, critical speeds - torsional vibrations of two and three rotor systems.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Characteristics of four bar mechanism.
2. Variation in velocity and acceleration of the slider crank mechanism.
3. Dynamic balancing of the rotating mass system.
4. Study of the free vibration and determination of natural frequency of vibration of Two- Rotor system.
5. Longitudinal and torsional vibration and determination of natural frequency vibration of single rotor system.
6. Study of damped torsional vibration and determination of damping coefficient.
7. Verification of the relation T = 2p "l/g for a simple pendulum.
8. Determination of whirling speed of shafts.

TEXT BOOKS:

1. Thomas Bevan. "Theory of Machines", 3rd edition, CBS publishers, 2004.
2. S. S. Rattan. "Theory of Machines", Tata McGraw Hill Publishing Co. Ltd., New Delhi. 2014.

REFERENCE BOOKS:

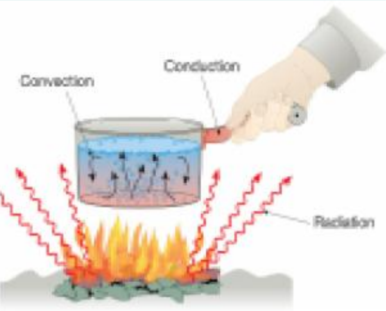
1. R.L. Norton. 'Kinematics and Dynamics of Machinery', 1st edition, Tata McGraw-Hill Publishing Co. Ltd., 2009.
2. J.S. Rao and R.V. Dukkipati. "Mechanism and Machine Theory", 2nd edition, New Age Publications, 2007.
3. J.E. Shigley, "Theory of Machines", 3rd edition, Oxford Publishers, 2009.

WEB LINKS:

1. http://nptel.ac.in/courses/112104121/
2. http://nptel.ac.in/courses/112101096/
3. http://ecoursesonline.iasri.res.in/course/view.php?id=37

ACTIVITIES:

- *Prototypes of different straight line motion mechanisms.*
- *Simulation of different mechanisms*
- *Design of quick return motion mechanism for given inputs.*
- *Measurement and analysis of vibration in different systems.*



16AG425 PRINCIPLES OF HEAT AND MASS TRANSFER

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
2	40	4	8	2	-

Course Description and Objectives:

This course elaborates the basics of heat and mass transfer properties of material and applications of different heat transfer processes in different food engineering aspects.This course is designed to analyze heat as well as mass transfer phenomenon takes place during food processing.

Course Outcomes:

After completion of this course, the student would be able to:

- apply principles of heat and mass transfer to basic engineering systems.
- analyze heat transfer by conduction, convection and radiation.
- analyze and design heat exchangers.
- analyze diffusional processes and calculate the flux in a diffusion process during mass transfer.
- analyze heat as well mass transfer taking place during different unit operations like drying, evaporation, distillation.

SKILLS:

- ✓ Understand different thermal properties like thermal conductivity, specific heat, thermal diffusivity for different food material.
- ✓ Understand measurement of different thermal properties.
- ✓ Understand basic principles of conduction, convection and radiation.
- ✓ Recognize different types of fins and identify its application in food industry.
- ✓ Understand critical thickness of insulation and identify its use in cold storage design.
- ✓ Understand different types of heat exchanger and design it according to its effectiveness.
- ✓ Understand diffusion of mass during different unit operations like drying, evaporation, distillation.

UNIT - 1 **L-10,T-04**

BASICS AND CONDUCTION HEAT TRANSFER: Introductory concepts, modes of heat transfer, thermal conductivity of materials, measurement. General differential equation of conduction.One dimensional steady state conduction through plane and composite walls, tubes and spheres with and without heat generation.Electrical analogy.

UNIT - 2 **L-10,T-03**

INSULATION AND CONVECTION HEAT TRANSFER: Insulation materials, critical thickness of insulation. Fins, Free and forced convection. Newton's law of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection.Useful non dimensional numbers and empirical relationships for free and forced convection.Equation of laminar boundary layer on flat plate and in a tube. Laminar forced convection on a flat plate and in a tube. Combined free and forced convection.

UNIT - 3 **L-10,T-03**

RADIATION HEAT TRANSFER: Absorptivity, reflectivity and transmissivity of radiation. Black body and monochromatic radiation, Planck' s law, Stefan-Boltzman law, Kirchoff' s law, grey bodies and emissive power, solid angle, intensity of radiation. Radiation exchange between black surfaces, geometric configuration factor.

UNIT - 4 **L-08,T-03**

HEAT EXCHANGERS: Types of heat exchangers, fouling factor, log mean temperature difference, heat exchanger performance, transfer units. Heat exchanger analysis restricted to parallel and counter flow heat exchangers

UNIT - 5 **L-07,T-02**

MASS TRANSFER: Steady state molecular diffusion in fluids at rest and in laminar flow, Flick's law, mass transfer coefficients. Reynold's analogy.

TEXT BOOKS:

1. C.J. Geankoplis, "Transport Processes and Unit Operations", 4th edition,Prentice Hall of India, New Delhi, 2003.
2. R. C.Sachdeva, "Fundamentals of Engineering Heat and Mass Transfer", 7th edition,New Age International, 2012.

REFERENCE BOOKS:

1. S. C. Arora and S.Domkundwar, "A Course in Heat & Mass Transfer", 8th edition, Dhanpat Rai and Sons, Delhi, 2010
2. F. P. Incropera and D. P. DeWitt, "Fundamentals of Heat and Mass Transfer", 6th edition, John Wiley and Sons, 2006.
3. J. P. Holman, "Heat Transfer",10th edition, Tata McGraw Hill, 2011.
4. P.K. Nag, "Heat and Mass Transfer",3rd edition, Tata McGraw Hill, 2011.

WEB LINKS:

1. http://nptel.ac.in/courses/112108149/
2. http://ecoursesonline.iasri.res.in/course/view.php?id=61

ACTIVITIES:

- *Development of apparatus for measurement of thermal conductivity of different food material.*
- *Development of apparatus for measurement of specific heat/ heat capacity of different food material.*
- *Simulationof conduction, convection, radiation at basic level.*
- *Design of effective heat exchanger for maximum economic u se.*
- *Calculation of refrigeration load on cold storage with and without insulation.*
- *Calculation of thickness of insulation for different rural level cold storages with different capacity for different food products.*
- *Modelling of mass transfer during tray drying of different food material.*

16HS203 PROFESSIONAL COMMUNICATION

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	42	6	12	3	2

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

Students will be able to:

- having gone through the course, students would be equipped to clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- this will equip them to stand out both in the professional setting as well as for further pursuits in the academic world.
- Since this certification looks at LSRW (Listening, Speaking, Reading and Writing) components in great detail, we hope to equip students to confidently and successfully attempt all the 4 critical components.

SKILLS:

- ✓ *Able to understand and use grammar rules in writing; sentences, paragraphs, paraphrasing,*
- ✓ *Able to write business emails, memos, letters, reports and proposals*
- ✓ *Able to comprehend business articles, and documents*
- ✓ *Able to use expressions in Professional context, and acquire presentation skills like one minute talk and pair discussion in professional context*
- ✓ *Able to familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT – 1 **P-06**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage) **Elements of Technical Writing**: Sentence structure, reducing verbosity, arranging ideas logically, building coherence, paragraph level and document level, topic sentence, cohesive devices, transitional words, paraphrasing and précis-writing. **Mechanics of Writing:** Stylistic elements, the rapporteur, the purpose, the reader's viewpoint (audience), elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, weak links in business correspondence, ethical concerns in business writing, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication

UNIT – II **P-06**

BUSINESS CORRESPONDENCE: E-mail: nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and minutes of the meeting, notice, circular and memo

Letter-Writing: Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiring, claim letter – letter of apology etc], introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts ofa report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusion and recommendations, citations, references and appendices)

UNIT-III **P-06**

SPEAKING: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), features of a good power point presentation (making the PPT), delivering the presentation effectively, telephone etiquettes, delivering seminar/proposal/ report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations

UNIT-IV **P-06**

READING: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT-V **P-06**

LISTENING: Specific information in business context, listening to telephonic conversations/messages and understanding the correct intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion, enable active listening

TEXT BOOKS: BEC

1. Guy Brook Hart (2014): Cambridge English Business Bench Mark: Upper Intermediate, Second Edition: CUP.
2. CUP (2002) Cambridge: BEC VANTAGE: Practice Tests, CUP

ONLINE REFERENCES:

1. http://www.cambridgeenglish.org/exams/business-certificates/business vantage/ preparation/
2. https://www.youtube.com/watch?v=qxFtn9pGaTI

ACTIVITIES:

- *Basic grammar practice, Framing paragraphs on topics allocated,*
- *Paraphrasing an article or a video in your own words Finding topic sentences in newspaper articles*
- *Finding out new words from a professional viewpoint Understanding the meaning and its usage*
- *Perusing samples of well prepared proposals and reports*
- *Draft different proposals/reports on topics assigned.*
- *Watching videos/ listening to audios of business presentations*
- *Classroom activities of team and individual presentations*
- *Using PPTs, mock exercises for BEC speaking.*
- *Presenting (speaking) the written components completed in Unit 1*
- *Hand-outs; matching the statements with texts.*
- *Finding missing appropriate sentence in the text from multiple choice, multiple choices*
- *Using right vocabulary as per the given context and editing a paragraph.*

VFSTR UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

III Year I Semester

L	T	P	To	C
3	1	-	4	4

AG301 Machine Design

Course Description & Objectives:

To familiarize students with various steps involved in the design process and to make them understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.

Course Outcomes:

By completing this course, the students will have the ability to:

1. *design the components against static loading.*
2. *design the components against cyclic loading.*
3. *design the fasteners like rivets, bolts and cotter joints.*
4. *design power transmission shafts and couplings*
5. *calculate stress and load along with deformations of various types of springs*

Unit I: Steady Stresses and Variable Stresses in Machine Members:

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties – Direct, Bending and Torsional stress equations.

Unit II: Design of Shafts and Couplings and Design of Fastners and Welded Joints:

Design of solid and hollow shafts based on strength, rigidity and critical speed, Design of keys and key ways - Design of rigid and flexible couplings design of knuckle joints.

Threaded fasteners, Design of bolted joints including eccentric loading, Design of welded joints for pressure vessels and structures, theory of bonded joints.

Unit III: Design of Springs and Bearings:

Design of helical, leaf, disc and torsional springs under constant loads. Design of bearings, sliding contact and rolling contact types, Cubic mean load, Design of journal bearings, Lubrication in journal bearings, Calculation of bearing dimensions.

Unit IV: Thin Cylinders & Thick Cylinders, Clutches & Brakes:

Design principles, Stresses due to internal and external pressures, Design methodology for enhanced pressure. Design of Clutches: Single plate, multi plate and cone clutches. Design of Brakes: Block and Band brakes: Self locking of brakes.

Unit V: Spur & Helical Gears:

Spur Gears: Definitions, stresses in gear tooth, Lewis equation and form factor, Design for strength. Helical Gears: Definitions, formative number of teeth, Design based on strength.

TEXT BOOKS:

1. Joseph E. Shigley and Charles R. Mischke, “Mechanical Engineering Design”, 6th ed., McGraw Hill International edition, 2003,
2. V.B. Bhandari, “Design of Machine Elements”, 2nd ed., Tata McGraw Hill Publishing Company Ltd., New Delhi, 2007.

REFERENCES:

1 Robert L. Norton, “Machine Design”, Pearson Education Asia, 2001.
2. Hall, Holowenko, Laughlin, “Machine Design”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2008.

III Year I Semester

L	T	P	To	C
3	1	-	4	4

AG303 Farm Machinery and Equipment

Course Description & Objectives:

To study the different machinery used for various agricultural operations and to understand the basics of designing and maintaining the same.

Course Outcomes:

The students will have emphasis on:

1. *Necessities of farm mechanization.*
2. *Usage of tillage, plant protection, harvesting machines.*
3. *Testing procedures and ergonomics of machines.*
4. *Uses of different machines for different purposes in the farm.*

Unit I: Farm Mechanization:

Objectives of farm mechanization. Classification of farm machines. Materials of construction & heat treatment. Principles of operation and selection of machines used for production of crops. Field capacities & economics.

Unit II: Tillage and Equipments:

Tillage; primary and secondary tillage equipment. Forces acting on tillage tools. Field operation patterns. Draft measurement of tillage equipment: Earth moving equipment their construction & working principles viz Bulldozer, Trencher, Excavators etc.; sowing, planting & transplanting equipment their calibration and adjustments.

Unit III: Plant protection Equipments:

Fertilizer application equipment. Weed control and Plant protection equipment sprayers and dusters, their calibration, selection, constructional features of different components and adjustments. Work physiology of men and women.

Unit IV: Harvesters:

Principles & types of cutting mechanisms. Construction & adjustments of shear &impact type cutting mechanisms. Crop harvesting machinery: mowers, windrowers, reapers, reaper binders and forage harvesters. Forage chopping & handling equipment. Threshing mechanics & various types of threshers. Threshers, straw combines & grain combines, maize harvesting & shelling equipment, Root crop harvesting equipment potato, groundnut etc., Cotton picking & Sugarcane harvesting equipment.

Unit V: Testing & Selection of machines:

Principles of plantation crops and fruit harvesting tools and machines. Horticultural tools and gadgets. Testing of farm machine. Test codes & procedure. Interpretation of test results. Selection and management of farm machines for optimum performance. Workplace layout for men and women.

TEXT BOOKS:

1. Donnel Hunt.(1995).*Farm Machinery and management.* Iowa State University Press, Ames, USA.
2. Srivastava, A.C. (1990). *Elements of Farm Machinery.* Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.

REFERENCES:

1. Kepner, R.A., Bainer Roy, and Barges, E.C. (1978). *Principals of Farm Machinery, .* CBS Publishers and Distributors, Delhi 17.
2. Kurtz,G.L., Thompson and Claer, P. (1984). *Design of Agricultural Machinery.* John Wiley & Sons, New York.
3. Michael, A. M. and Ojha, T.P. (1985). *Principles of Agricultural*

Engineering.(Vol. II). Jain brothers, New Delhi.

4. Smith Harris Pearson, H.E., and Lambent Herry Wilkes, M.S. (1977). *Farm Machinery and Equipment.* Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
5. Kanafoshi, C.Z. and Karwawshi, T. (1976). *Agricultural Machines, Theory and Construction* (Vol. 1 and 2). USDA, Poland.
6. Ghosh, P.K, and Swain, S. (1993). *Practical Agricultural Engineering.* Naya Prokash, Calcutta.
7. Kelnin, N.I.,Popov, I.F., and Sakun, V.A. (1985). *Agricultural Machines.* Amerind Publishers, New Delhi. Bosoi, E.S. (1990). *Theory, Construction and Calculation of Agricultural Machines* (Vol. 1 and 2). Oxonion Press Pvt. Ltd., New Delhi.
8. http:agritech.tnau.ac.inagricultural_engineeringagriengg_fmp_tillagee.html
9. http://ecourses.iasri.res.ineLeaarningdownload3_new.aspx?Degree_Id=04

III Year I Semester	**L**	**T**	**P**	**To**	**C**
	3	1	-	4	4

AG305 Ground Water, Wells and Pumps

Course Description & Objectives:

To study the mechanics of water storage and to understand the design and maintenance of pumps.

Course Outcomes:

At the end of course students will have:

1. *basic knowledge on different types of wells and pumps.*
2. *knowledge to acquire modelling and uses of different methods used for estimation of ground water potential.*

Unit I: Groundwater and Wells:

Occurrence and movement of ground water, aquifer and its types, classification of wells, steady and transient flow into partially, fully and non penetrating tube wells and open wells, familiarization of various types of bore wells common in the State

Unit II: Design of Wells:

Design of open well, groundwater exploration techniques, methods of drilling of wells, percussion, rotary, reverse rotary, design of assembly and gravel pack, installation of well screen, completion and development of well, groundwater hydraulics determination of aquifer parameters by different method such as Theis, Jacob and Chow' s etc. Their recovery method, well interference, multiple well systems.

Unit III: Groundwater modelling:

Surface and subsurface exploitation and estimation of ground water potential, quality of ground water, artificial groundwater recharge planning, modeling, ground water project formulation.

Unit IV: Pumps and Classification:

Pumping Systems: Water lifting devices; different types of pumping machinery, classification of pumps, component parts of centrifugal pumps; pump selection, installation and troubleshooting

Unit V: Working of Pumps:

Design of centrifugal pumps, performance curves, effect of speed on head capacity, power capacity and efficiency curves, effect of change of impeller dimensions on performance characteristics; hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; priming, self priming devices, rotodynamic pumps for special purposes such as deep well turbine pump and submersible pump.

TEXT BOOKS:

1. Michael, A. M. (1992). *Water Well and Pump Engineering.* Tata Mc Graw Hill Pub. Co. Ltd., New Delhi.

REFERENCES:

1. Modi, P.M. and Seth, S.M. (1991). *Hydraulics and Fluid Mechanics.* Standard Book House, New Delhi .
2. Sivanappan, R.K. (1987). *Sprinkler irrigation.* Oxford & IBH Publishing Company, New Delhi.
3. Subramanhya. (1994). *Engineering Hydrology.* Tata Mc Graw Hill. New York.
4. Todd, D.K. (2004). *Ground Water Hydrology.* John Wiley & Sons, New York.
5. Chow, V.T. (1964). *Hand Book of Applied Hydrology.* Mc Graw Hill, NewYork.
6. Jack, K. and Rend, B. (1991). *Sprinkler and Trickle Irrigation.* Van NostraReinhold, New York.
7. James, L.G. (1988). *Principles of Farm Irrigation system Design.* John Wiley & Sons, New York.
8. http://nptel.ac.in/courses/105103026/
9. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

III Year I Semester

L	T	P	To	C
3	1	-	4	4

AG307 Watershed Hydrology

Course Description & Objectives:

Study of hydrological cycles, precipitation, stream flow, hydrograph and modelling of watersheds, flood routing etc.

Course Outcomes:

The students will be able to:

1. *concentrate on hydrologic cycle, hydrograph and precipitation and its parameters.*
2. *apply empirical formulae and different methods for estimating the runoff and stream flow.*

Unit I: Hydrological Cycle:

Introduction; Hydrologic cycle; Precipitation forms, Weather systems for precipitation, Characteristics of precipitation in India; Rainfall measurement, rain gauge network, optimum number; Representation of rainfall data Mass curve, hyetograph, Moving average curve etc; Mean precipitation over an area Different methods.

Unit II: Precipitation:

Frequency analysis of point rainfall, Calculation of rainfall return period and probability, plotting position; Estimation of missing data, test for consistency of rainfall records; Double mass curve technique; Abstractions from precipitation interception; Depression storage; infiltration; evaporation; evapo transpiration estimation and measurement; Reservoir evaporation methods of reduction, Infiltration indices.

Unit III: Runoff:

Geomorphology of watersheds stream number, stream length, stream area, stream slope and Horton's laws; Runoff factors affecting, measurement; Runoff characteristics of streams, estimation of peak runoff rate and volume; Rational method, Cook' s method, SCS Curve number method.

Unit IV: Hydrograph:

Stream flow measurement of stage and velocity, rating curve, extension of rating curve; Hydrograph; components, Factors affecting the shape of hydrograph, base flow separation, unit hydrograph theory – Assumptions, applications, derivation of unit hydrographs, unit hydrograph of different durations, dimensionless unit hydrograph, distribution hydrograph, synthetic unit hydrograph, uses and limitations of unit hydrograph.

Unit V: Flood and Drought:

Floods Terms and definitions, Head water flood control methods, retards and their location; flood routing – graphical methods of reservoir flood routing; Channel routing Muskinghum method; Hydrology of dry land areas drought and its classification; introduction to watershed management and planning.

TEXT BOOKS:

1. Subrahmanya, K. (1987). *Engineering Hydrology.* TataMcGrawHillPub.Co. New Delhi.
2. Singh, V. P. (1992). *Elementary Hydrology.* Prentice Hall India.

REFERENCES:

1. Chow, V.T. (1964). *Hand Book of Applied Hydrology.* Mc Graw Hill, NewYork.
2. Linsley, R.K., Kohler, M.A., and Paulhus, J.L.H. (1984). *Hydrology for Engineers.* Mc Graw Hill Pub.Co. Japan.
3. McCuen, R. H. (1989). *Hydrologic Analysis and Design.* Printice Hall.
4. Mutreja, K.N. (1990). *Applied Hydrology.* Tata Mc Graw Hill Pub. Co., NewYork.
5. Raghunath, H.M. (2006). *Hydrology Principles, Analysis and design.* New age International (P) Ltd.
6. http://nptel.ac.in/courses/105101002/
7. http://nptel.ac.in/courses/105107129/

III Year I Semester

L	T	P	To	C
0	0	3	3	2

AG315 Machine Drawing

Course Description & Objectives:

Students will learn to apply principles of technical drawing and acquire skills in the use of appropriate computer aids for effective preparation of 3D models in Machine Drawing.

Course Outcomes:

Students will have fundamental knowledge of drawing of different machine parts such as sectional views, bolts, nuts and lock nuts.

Total 12 sheets to be drawn, minimum being 10

Sheet 1 : conversion of isometric views to orthometric views

Sheet 2 : conversion of optometric views to isometric views

Sheet 3	:	conventions of different materials and standard components
Sheet 4	:	sectional views
Sheet 5	:	fasteners, bolts and nuts, locknuts
Sheet 6	:	keys, couplings

Assembly drawing

Sheet 7	: stuffing box
Sheet 8	: eccentric
Sheet 9	: screw jack
Sheet 10	: connecting rod
Sheet 11	: swivel bearing
Sheet 12	: piston assembly

TEXT BOOKS:

1. K.L. Narayana, “Machine Drawing”, 3rd ed., New Age International, 2007.

REFERENCES:

1. N.D. Bhatt, “Machine Drawing”, Charotar Publishing House, 2008.
2. R.K. Dhawan, “Machine Drawing”, 2nd ed., S.Chand & Company Ltd., 1998.

III Year I Semester	L	T	P	To	C
	0	0	3	3	2

AG319 Farm Machinery and Equipment Lab

Course Description & Objectives:

To study design features of various farm machinery and understanding them for effective use in different farming applications.

Course Outcomes:

Students will have knowledge of farm mechanization and use different machineries for agricultural operations.

List of Experiments:

1. Introduction to various farm machines
2. Field capacity and field efficiency measurement for at least two machines/ implements

3. Draft& fuel consumption measurement for different implements under different soil conditions
4. Construction details, adjustments and working of M.B. plow, disc plow and disc harrow and secondary tillage tools
5. Construction and working of rotavators and other rotary tillers, measurement of speed & working width
6. Working of seed cum fertilizer drills, planters and their calibration in field
7. Construction and Working of rice and crop transplanters for potato, sugarcane, cotton etc., and their field operation patterns
8. Weeding equipment and their use
9. Study of sprayers and dusters, measurement of nozzle discharge, field capacity etc.
10. Familiarization with various Farm machines related to harvesting, threshing, root harvesting, combine etc
11. Study of various types of mowers, constructional details, materials and working
12. Study of various types of reaper, constructional details, materials and working & performance
13. Study of various types of reaper binder, constructional details, materials and working
14. Study of various types of potato harvesters, constructional details, materials and working
15. Study of various types of groundnut harvesters, constructional details, materials and working & performance
16. Study of various types of forage harvester, constructional details, materials and working
17. Study of various types of sugarcane harvester, constructional details, materials and working

III Year I Semester

L	T	P	To	C
0	0	3	3	2

AG317 Database Management and Internet Lab

Course Description & Objectives:

Study the basics of internet usage and database management for proper collection, compilation and analysis of data in various applications.

Course Outcomes:

After completion of this lab students will have fundamental information of database management.

List of Experiments:

1. Creating a table, data base, inserting, manipulation
2. Programming using select statement
3. Programming using in and between operators
4. Programming using like operators
5. Programming using sub queries
6. Group by clause
7. Programming using aggregate function sum, min, max
8. Order by clause
9. Set operators
10. Internet applications
11. Tools required tags, attributes
12. Formatting text, heading, paragraph
13. Designing a web page background color, marquee, adding, images, and sound.

III Year II Semester

L	T	P	To	C
3	1	-	4	4

AG302 Irrigation Engineering

Course Description & Objectives:

To study the techniques of irrigation methods and understand the various technologies of irrigation.

Course Outcomes:

By completing this course, the student will be able to:

1. *acquire knowledge of irrigation water*
2. *use of irrigation water in farm lands*
3. *understand different irrigation methods*
4. *understand effective usage of water resources.*

Unit I: Introduction to Irrigation:

Irrigation Engineering: Irrigation, impact of irrigation on Human Environment, some major and medium irrigation schemes of India, purpose of irrigation, sources of irrigation water, present status of development and utilization of different water resources of the country.

Unit II: Measurement Techniques:

Measurement of irrigation water, weir, notches, flumes and orifices and other methods; waterconveyance, design of irrigation field channels, underground pipe conveyance system, irrigation structures, channel lining; land grading, different design methods and estimation ofearth work and cost;

Unit III: Soil, water and plant relationship:

Soil water plant relationship, soil water movement, infiltration, evapotranspiration, soil moisture constants, depth of irrigation, frequency of irrigation, irrigation efficiencies;

Unit IV: Irrigation Techniques:

Surface irrigation methods of water application, border, check basin, furrow and contour irrigation; sprinkler and drip irrigation method, merits, demerits, selection and design; Participatory irrigation management.

Unit V: Design of irrigation methods:

Economics of water resources utilization. Command area concepts and components, irrigation terminologies relevant to command area, on farm development works, farmer participation in water distribution, water delivery methods, design of unlined alluvial channels silt theories, design of lined channels, materials for lining.

TEXT BOOKS:

1. Michael, A.M. (1986). *Irrigation Theory and Practice.* Vikas Publishing House, New Delhi.
2. Israelson and Hassan. (1981). *Irrigation Principles and Practices.* John Wiley and sons, New York.

REFERENCES:

1. Garg,S. K. (1987). *Irrigation Engineering and Hydraulic Structures*. Khanna Publishers, New Delhi.
2. Majumdar, D. K. (2000). *Irrigation Water Management Principles and Practice.* Prentice Hall of India, New Delhi.
3. Modi, P. (1987). *Irrigation Water Resources and Water Power Engineering.* Standard Book House, New Delhi.
4. Murthy, V.V.N. (1998). *Land and Water Management.* Kalyani Publishing, New Delhi.
5. Murthy, C. S. (1997). Water Resources Engineering Principles and Practice. New Age International (P) Ltd. New Delhi.
6. James, J.G. (1988). *Principles of Farm Irrigation system Design.* John Wiley & Sons, New York.
7 Lal, R. (1983). *Irrigation Hydraulics.* Saroj Prakashan Publishers, Allahabad.

III Year II Semester	**L**	**T**	**P**	**To**	**C**
	3	1	-	4	4

AG304 Tractor Systems and Controls

Course Description & Objectives:

To study the basic prime mover of farming activities, its types, functions and capabilities in connecting various implements. Students would be exposed to different range of prime movers in this course.

Course Outcomes:

Students will have information about:

1. *tractor system and mechanism of different parts in the tractor.*
2. *types of brake, steering and hydraulic systems of tractor*
3. *tapping the power through different modes*
4. *application of ergonomics for better comfort and safety in tractor operation balancing techniques for tractor*

Unit I: Transmission System:

Study of transmission systems, clutches: functioning, parts and design problem on clutch system, Gear box: different types of gear box, calculation of speed ratios, design problems on gear box, Study on differential and final drive and planetary gears, Differential and final drive mechanism.

Unit II: Brakes, steering system and hydraulic system:

Familiarization of brake mechanism, Design problems. Steering geometry and adjustments Ackerman and hydraulic steering and hydraulic systems.

Unit III: Power Outlets

Tractor power outlets: P.T.O., belt pulley, drawbar, etc. Tractor chassis mechanics and design for tractor stability. Methods of finding CG of the tractor, Methods for finding moment of inertia of the tractor.

Unit IV: Ergonomics:

Ergonomic considerations and operational safety. Importance of anthropometric requirements in design. Power Tiller: Construction and working, Power transmission system

Unit V: Balancing:

Balancing of front and rear attached machinery. Importance of balancing, Techniques in balancing

TEXT BOOKS:

1. Barger, E.L., Liledahl, J.B., Carleton, W.M. and Mckibben, E.G. (1978). *Tractor and their power units.* Wiley Eastern pvt. Ltd, New York.
2. Radhey Lal and Datta, A.C. (1978). *Problems in Agricultural Engineering.* Sathya Prakashan, Allahabad.

REFERENCES:

1. Mehta, M.L., Verma, S.R., Misra, S.K., and Sharma, V.K. (1995). *Testing and Evaluation of Agricultural Machinery.* National Agricultural Technology Information Centre, Ludhiana.
2. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

III Year II Semester

L	T	P	To	C
3	1	-	4	4

AG306 Dairy and Food Engineering

Course Descrption & Objectives:

Understanding the basics of dairy activities, process flow in milk and related production, packaging and distribution processes involved in dairy engineering is the basic objective of this course.

Course Outcomes:

At the end of this course the student would develop the following capabilities:

1. *abroad and coherent body of knowledge of milk source and composition*
2. *an in-depth understanding of thermal treatments during dairy products manufacture and the significance of healthy and functional foods*

Unit I: Milk and Milk Processing:

Dairy development in India. Engineering, thermal and chemical properties of milk and milk products, unit operations of various dairy and food processing systems

Unit II: Thermal Treatments:

Process flow charts for product manufacture, working principles of equipment for receiving, pasteurization, sterilization, homogenization, filling & packaging, butter manufacture

Unit III: Food Preservation:

Dairy plant design and layout, composition and proximate analysis of food products. Deterioration in products and their controls. Physical, chemical and biological methods of food preservation

Unit IV: Food Processing:

Changes undergone by the food components during processing, evaporation, drying, freezing and chilling

Unit V: Processing Techniques:

Behaviour of food products in extraction, leaching, crystallization, filtration, membrane separation, thermal processing. Plant utilities requirement.

TEXT BOOKS:

1. Ahamed Tuffail. (1997). *Dairy Plant Engineering & Management.* Kitab Mahal Publishers, Allahabad.
2. Farrall, A.W. (1980). *Engineering for Dairy & Food Products.* John Wiley and Sons Inc., New York.

REFERENCES:

1. Lalat Chander. (2005). *Text Book of dairy plant layout and Design.* ICAR, New Delhi.
2. Mc cabe W.L. and Smith J.C. (1990). *Unit Operations of Chemical Engg.* McGraw Hill, Tokyo. Japan.
3. Paul Sing. (2004). *Food Engineering.* Marcel Dekker Pub.
4. Sanga, K.P.S. (2001) *Dairy Processing Technology.* Saroj Prakashan, Allahabad.
5. Sukumar De. (1997). *Outlines of Dairy Technology.* Oxford University press, Delhi.
6. Charm, S.E . (1971). *The Fundamentals of Food Engg.* AVI Pub.Co. Inc.
7. Handerson, S.M. et al. (1990). *Principles of Process Engg.* ASAE, USA.
8. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

III Year II Semester	L	T	P	To	C
	3	1	-	4	4

AG308 Drainage Engineering

Course Description & Objectives:

To study the importance of drainage structures and the design of different drainage mechanisms

Course Outcomes:

Students will have basic fundamentals about

1. *drainage in agricultural lands*
2. *information on different drainage systems and structures.*
3. *calculation of subsurface flow by using different equations.*

Unit I: Introduction to Drainage:

Drainage definition; Need for land drainage; History of land drainage; Design considerations for land drainage; Definitions of parameters in drainage equations: hydraulic conductivity, tansmissivity, drainable porosity, drainage coefficient.

Unit II: Subsurface Flow:

Subsurface flow to drains Steady state equations; The Hooghoudt's equation derivation, importance of equivalent depth; The Ernst equation derivation, horizontal, vertical and radial flow; Unsteady state equations The Glover Dumm equation; Comparison between Steady State and Unsteady State;

Unit III: Surface Drainage System:

Surface drainage systems Bedding, Field drains, Field laterals; Layout of field drains and laterals; Diversion or interceptor drains; Subsurface drainage systems drain materials, envelopes, filters and surrounds; Functions of envelope, envelope materials, envelope requirements in relation to soil characteristics, gravel envelopes, organic envelopes, synthetic envelopes; Layout, construction and installation of drains

Unit IV: Drainage Structures:

Drainage structures; Tubewell drainage introduction, physical and economic feasibility; Mole drainage; Hydraulics of Drainage pipes Manning's equation for pipe flow hydraulic gradient and slope; Investigations of drain design parameters through drain testing hydraulic conductivity, transmissivity, drainable porosity

Unit V: Drainage Design:

Observation wells and their installation; Recording water table data and drain discharges; Flow equations used in drainage testing steady state and non steady state conditions; Drainage design criteria and system economics.

TEXT BOOKS:

1. Dieleman P. J., Trafford B. D. (1976). Drainage Testing, Irrigation and Drainage Paper No 28. FAO.
2. Luthin, J. (1984). Drainage Engineering. John Wiley & Sons, New York.

REFERENCES:

1. Michael, A. M. and Ojha, T.P. (1985). Principles of Agricultural Engineering (Vol. II). Jain brothers, New Delhi.
2. Murthy, V. (1998). Land and Water Management. Kalyani Publishing, New Delhi.
3. Ritzema H. P. (1994). Drainage Principles and Applications (2 ed.). ILRI Publication.
4. Mathew, E.K., Nair, M.S., Raju, T.D and Jayakumaran, U. (2004). Drainage Digest. Kerala Agrl. University, Thrissur.
5. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

III Year II Semester

L	T	P	To	C
0	0	3	3	2

AG316 Irrigation and Drainage Engineering Lab

Course Description & Objectives:

The practical in relation to course like irrigation engineering and drainage engineering would be performed by the student in this laboratory.

Course Outcomes:

Students will have practical knowledge about irrigation techniques and their designs. They will have the knowledge of drainage techniques and their field uses.

List of Experiments:

1. Measurement of soil moisture by different soil moisture measuring instruments
2. Determination of soil moisture constants by pressure plate and pressure membrane apparatus
3. Measurement of irrigation water and infiltration rate
4. Computation of evapotranspiration
5. Determination of crop water requirement
6. Irrigation scheduling
7. Land grading exercises
8. Design of underground pipe line system
9. Design of drip and sprinkler irrigation
10. Measurement of uniformity coefficient of sprinkler irrigation method
11. Measurement of uniformity coefficient of drip irrigation method
12. Field problems and remedial measures for sprinkler and drip irrigation method
13. *In situ* measurement of hydraulic conductivity Auger hole method
14. Determination of drainage coefficients
15. Preparation of water contour maps
16. Measurement of hydraulic conductivity through drain testing
17. Measurement of drainable porosity through drain testing
18. Design of surface drainage systems
19. Design of subsurface drainage systems
20. Installation techniques of sub surface drainage system
21. Cost analysis of surface and sub surface drainage system

III Year II Semester

L	T	P	To	C
0	0	3	3	2

AG318 Field Operation and Maintenance of Tractors and Farm Lab

Course Description & objectives:

The methods of operation of various farming implements with tractor would be undertaken by the students in real time field o have the basic idea of mechanized farming.

Course Outcomes:

Students will have real field experience to broaden their idea about farm machinery and use of tractor for different farming operation.

List of Experiments:

1. Introduction to various systems of a tractor viz. fuel, lubrication, cooling, electrical, transmission, hydraulic and final drive system
2. Familiarization with tractor controls and learning procedure of tractor starting and stopping
3. Hitching, adjustments, settings and field operation of farm machinery
4. Familiarization with different makes and models of 4 wheeled tractors
5. Starting and stopping practice of the tractor and familiarization with instrumentation panel and controls
6. Road signs, traffic rules, road safety, driving & parking of tractor
7. Tractor driving forward & reverse driving practice
8. Tractor driving practice with two wheeled tractor trailer forward & reverse
9. Study and practicing the hitching and de hitching of implements
10. Study operation and field adjustments of M.B. plough & disk plough
11. Field operation of trailing & mounted disk harrow
12. Field operation and adjustments of seed drill/planter/sprayer
13. Familiarization with tools and equipment used for maintaining and servicing of tractors and farm machines
14. Maintenance after 10, 50, 100, 250, 500 and 1000 hours of operation, adjustment of tractor track
15. Dismantling and assembling of major engine parts

16. Visit to tractor/ engine repair workshop, injection pump injector repair shop
17. Doing minor repair of electric, mechanical and hydraulic system
18. Adjustment and maintenance of seeding and planting and transplanting machines
19. Adjustment and maintenance of reapers and threshers
20. Adjustment and maintenance of combine harvesters, straw combines, balers etc
21. Visit to small scale farm machinery manufacturers and their repair shops, seasonal repair of farm machinery

III Year II Semester	**L**	**T**	**P**	**To**	**C**
	0	0	3	3	2

AG320 Mini Project

Course Description & Objectives:

Objective of the mini project is to enable student analytical and practical exposure by giving hands on experience with learned knowledge through different courses. It prepares the student to efficiently handle the main project for better output.

Course Outcomes:

By undergoing this course, the student will try to integrate and apply the knowledge gained through different courses into practical problems and to analyse the system for its productivity and feasibility.

VFSTR UNIVERSITY

IV Year - B.Tech

SYLLABUS

I SEM & II SEM

IV Year	I - Semester	L	T	P	To	C
		3	1	-	4	4

AG401 Soil and Water Conservation and Structures

Course Description & Objectives:

To study the concepts of conservation techniques of soil and water, to design the structures required for the same under varying conditions.

Course Outcomes:

Students will have fundamental knowledge:

1. *on soil erosion with its control as well as sedimentation.*
2. *on soil and water conservation structures and their management.*
3. *on designing of suitable structures for effective erosion control*

Unit I: Soil Erosion:

Soil erosion causes, types and agents of soil erosion; water erosion forms of water erosion, mechanics of erosion; Effect of slope, slope length, soil, vegetation, topographical features and rainfall on erosion, gullies and their classification, stages of gully development; soil loss estimation universal soil loss equation and modified soil loss equation, determination of their various parameters.

Unit II: Erosion Control Measures:

Erosion control measures agronomic measures contour cropping, strip cropping, mulching; mechanical measures terraces – level and graded broad base terraces and their design, bench terraces and their design, layout procedure, terrace planning, bunds contour bunds, graded bunds and their design; gully and ravine reclamation principles of gully control vegetative and temporary structures; control measures for stream bank and coastal erosion.

Unit III: Sedimentation and Wind Erosion:

Landslides factors causing it, land slips, Measures for control; Sedimentation sedimentation in reservoirs and streams; Estimation and measurement, sediment delivery ratio, trap efficiency; Land use capability classification; Grassed waterways and their design; Introduction to water harvesting techniques; introduction to stream water quality and pollution. Wind erosion factors affecting wind erosion, mechanics of wind erosion, soil loss estimation, wind erosion control measures vegetative, mechanical measures, wind breaks and shelterbelts, sand dunes stabilization.

Unit IV: Conservation Structures:

Classification of conservation structures, functional requirements of soil erosion control structures; flow in open channels types of flow, state of flow, regimes of flow, energy and momentum principles, specific energy and specific force, flow transitions due to hump and width variations; hydraulic jump and its application, type of hydraulic jump, energy dissipation due to jump, jump efficiency, relative loss of energy; straight drop spillway general description, functional use, advantages and disadvantages, structural parts and functions; components of spillway, hydrologic and hydraulic design, free board and wave free board, aeration of weirs, concept of free and submerged flow.

Unit V: Structure Design:

Structural design of a drop spillway loads on headwall, variables affecting equivalent fluid pressure, determination of saturation line for different flow conditions, seepage under the structure, equivalent fluid pressure, triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension; chute spillway general description and its components, hydraulic design, energy dissipaters, design criteria of a SAF stilling basin and its limitations, drop inlet spillway general description, functional use, design criteria; design of diversions; small earth embankments their types and design principles, farm ponds, percolation ponds, check dams and reservoirs. Environmental impact assessment.

TEXT BOOKS:

1. Murthy, V.V.N. (1998). Land and Water Management. Kalyani Publishing, New Delhi.
2. Suresh, R. (1997). Soil and water Conservation Engineering. Standard Publishers and Distributors.

REFERENCES:

1. Schwab, G.O, Frevert, R.K.,Edminister T.W., and Barnes,K.K. (1993). Soil and water conservation engineering. John Wiley and sons.
2. Singh,G. (1985). Manual of Soil and water conservation Practice in India.. Central Soil and water conservation Research and training institute, Dehradun.
3. USBR. (1978). Design of Small Canal Structures. U S Bureau of Reclamation.
4. USBR. (1987). Design of Small Dams. US Bureau of Reclamation.
5. Chow, V. T. (1957). Open Channel Hydraulics. McGraw Hill.

6. Dhruvanarayana, V. V. (1993). Soil and Water Conservation Research in India. ICAR, New Delhi.
7. Goldman, S. J, Jackson K. and Bursztynsky, T. A. (1986). Erosion and Sediment Control H andbook. McGraw Hill Book Company.
8. Michael, A. M. and Ojha, T.P. (1985). Principles of Agricultural Engineering. (Vol. II). Jain brothers, New Delhi.
9. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

IV Year I - Semester

L	T	P	To	C
3	1	-	4	4

AG403 Electrical Machines and Power Utilization

Course Description & Objectives:

To study different electrical power machines and their use in various applications in agricultural operations.

Course Outcomes:

Students will be able to acquire knowledge about:

1. *Different types of circuits and their applications.*
2. *Principles and operation of transformers, DC machines and motors.*
3. *Various methods of power measurement*

Unit I: Introduction

Electro motive force, reluctance, laws of magnetic circuits, determination of ampere turns for series and parallel magnetic circuits, hysteresis and eddy current losses,

Unit II: Transformer

Transformer: principle of working, construction of single phase transformer, EMF equation, phasor diagram on load, leakage reactance, transformer on load, equivalent circuit, voltage regulation, power and energy efficiency, open circuit and short circuit tests,

Unit III: DC Machine

Principles, operation and performance of DC machine (generator and motor), EMF and torque equations, armature reaction, commutation, excitation of DC generator and their characteristics, DC motor characteristics

Unit IV: Motors

Starting of shunt and series motor, starters, speed control methods field and armature control, polyphase induction motor: construction, operation, equivalent circuit, phasor diagram, effect of rotor resistance, torque equation, starting and speed control methods,

Unit V: Single Phase Induction Motor

Single phase induction motor: double field revolving theory, equivalent circuit, characteristics, phase split, shaded pole motors, disadvantage of low power factor and power factor improvement, various methods of single and three phase power measurement.

TEXT BOOKS:

1. Bimbhra, P.S.(1991). *Electrical Machinery.* Khanna Publishers., New Delhi.
2. Cotton, H. (1999). *Advanced Electrical Technology* (7 ed.). Wheeler Publishing.

REFERENCES:

1. Nagrath, Kothari. (2006) *Electric Machines.* Tata Mc GrawHill publishing company., New Delhi.
2. Theraja, A.K and Theraja, B.L (2002) *.A Textbook of Electrical Technology* Vol.1). S.Chand
3. http://nptel.ac.in/courses/108105017/
4. http://nptel.ac.in/courses/108106071/

IV Year I - Semester	L	T	P	To	C
	3	1	-	4	4

ME425 Refrigeration and Air Conditioning

Course Description & Objectives:

To introduce history, importance and components of mechanical engineering, concepts of unit operations and unit processes, and current scenario of refrigerants & industrial applications.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. *understand the difference between refrigeration and air conditioning*
2. *describe the two methods of lowering the temperature of material*
3. *identify and describe the three methods of heat transfer*
4. *understand the kinds of refrigeration systems available*
5. *understand kinds of air refrigeration systems available*
6. *understand types of vapor refrigeration systems available*
7. *understand reasons of phase change of matter*

Unit I : Introduction to Air Refrigeration and Refrigerants

Refrigeration - Unit of refrigeration, Reversed Carnot Cycle, Bell-Coleman refrigeration system. Actual air refrigeration system - Refrigeration needs of Aircrafts - Adoption of Air refrigeration, Justification. Types of air refrigeration systems - Problems. Desirable and undesirable properties - Common refrigerants used – Nomenclature, Environmental effects of refrigerants.

Unit II: Vapour Compression Refrigeration System

Compression System. Wet Compression, Dry Compression, Superheated Compression Representation of cycle on T-S, P-H and H-S charts – effect of sub cooling and super heating - cycle analysis - Actual Cycle, Influence of various parameters on system performance - use of P-H charts – Problems. Compressors - General classification – comparison. Condensers - Classification - Working. Evaporators - Classification - Working. Expansion Devices - Types -Working.

Unit III: Vapour Absorption Refrigeration System

Basic vapour absorption system. Ammonia absorptionsystem,Li - Br system, Electrolux refrigeration system, Calculation of COP. Miscellaneous refrigeration systems: Steam Jet Refrigeration System, Thermoelectric Generator and Vortex tube or Hilsch tube – working principles

Unit IV: Psychometric

Psychrometric Properties and Processes, Need for Ventilation, Infiltration, Concepts of RSHF, GSHF, ESHF and ADP. Concept of human comfort and effective temperature, Comfort Air-conditioning – Applications – Summer, Winter & Year round Air Conditioning Systems &Load Calculations, Industrial Air conditioning and Requirements.

Unit V: Equipment of Air-Conditioning Systems

Air cleaning and filters, Humidifiers and dehumidifiers, Fans and Blowers, Grills and Registers. Heat pumps - different circuits.

TEXT BOOKS:

1. S.C. Arora & Domkundwar, “A Course in Refrigeration and Air Conditioning”, 2nd ed.,Dhanpatrai& Sons, 2009.
2. Dossat, “Principles of Refrigerations”, 2nd ed., Wiley Eastern, 2006.

REFERENCES:

1. Manohar Prasad, “Refrigeration and Air Conditioning”, 2nd ed., New Age, 2002.
2. C.P. Arora, “Refrigeration and Air Conditioning”, 3rd ed., Tata McGraw Hill 2009.
3. http://nptel.ac.in/courses/112105129/
4. http://nptel.ac.in/courses/112105128/

IV Year I - Semester	**L**	**T**	**P**	**To**	**C**
	4	0	-	4	4

MS 310 Managerial Economics

Course Description & Objectives:

The course aims to develop student’s capacity to analyze the economic environment in which business entities operate and understand how managerial decisions can vary under different constraints that each economic environment places on a manager’s pursuit of it’s goals, focusing on analyzing the functioning of markets and the economic behavior of firms and other economic agents.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. *Understand nature and scope of managerial economics and its application in managerial decision making*
2. *Demand determinants, elasticity of demand and demand forecasting methods for marketing planning.*
3. *Theory of production, law of variable proportions and returns to scale*
4. *Cost analysis and cost output relationship*
5. *Types of markets and price determination*

UNIT I: Nature & Scope of Managerial Economics:

Basic tools and techniques of Business Economics, Macro Economic Environment and Managerial decisions.

UNIT – II: Demand Analysis:

Types of Demand, Demand determination Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT – III: Theory of Production:

Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors,Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT – IV: Cost Analysis:

Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis.

UNIT-V: Markets and price determination:

Features and types of different competitive situations – Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

TEXT BOOKS:

1. Gupta: Managerial Economics, 1/e TMH, 2005
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010

REFERENCES:

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004

IV Year I - Semester

L	T	P	To	C
0	0	3	3	2

AG421 Soil and Water Conservation and Structures Lab

Course Description & Objectives:

To study the various conservation structures to be employed in adverse conditions for management of soil and water.

Course Outcomes:

Students will have practical knowledge of soil and water conservation structures with their design considerations.

List of Experiments:

1. Study of soil loss measurement techniques
2. Study of details of Coshocton wheel
3. Study of details of multi slot runoff samplers
4. Study of rainfall simulators and runoff plots
5. Determination of sediment concentration by oven drying method
6. Preparation of contour map of an area and its analysis
7. Design of vegetated waterways and contour bunding system
8. Design of graded bunding system
9. Design of various types of bench terracing systems
10. Determination of rate of sedimentation and storage loss in reservoir
11. Design of Shelter belts and wind breaks.
12. Construction of specific energy and specific force diagram
13. Design of H flume and Parshall flume
14. Measurement of hydraulic jump parameters and amount of energy dissipation
15. Hydraulic design of a straight drop spillway
16. Determination of uplift force and construction of uplift pressure diagram
17. Determination of loads on headwall and construction of triangular load diagram
18. Hydraulic design of a chute spillway
19. Design of a SAF energy dissipater
20. Design of small earth embankments
21. Design of water harvesting structures
22. EIA analysis and cost estimation of structures.

IV Year I - Semester

L	T	P	To	C
0	0	3	3	2

AG419 Refrigeration and Air Conditioning

Course Description & Objectives:

This subject explores the basics of psychrometry and various types of refrigeration and air-conditions system which will be applicable for both domestic and industry.

Course Outcomes:

Students will have practical knowledge of refrigeration system to broaden its industrial applications and uses.

List of Experiments:

1. Study of vapour compression and vapour absorption systems
2. Study of eletrolux refrigerator
3. Solving problems on refrigeration on vapour absorption system
4. Experiments with the refrigeration tutor to study various components of refrigeration
5. Determination of the coefficient of performance of the refrigeration tutor
6. Experiment on humidifier for the determination of humidifying efficiency
7. Experiment on dehumidifier for the determination of dehumidifying efficiency
8. Experiment on the cooling efficiency of a domestic refrigerator
9. Experiments on working details of a cold storage plant and air conditioning unit
10. Experiments with air conditioning tutor to study various components
11. Determination of the coefficient of performance of air condititiong tutor
12. Estimation of refrigeration load; Estimation of cooling load for air conditioner
13. Estimation of humidification and dehumidification load
14. Design of complete cold storage system.

IV Year I - Semester

L	T	P	To	C
0	0	3	3	2

AG423 Dairy and Food Engineering Lab

Course Description & Objectives:

The practical in relation dairy and food engineering would be performed by the student in this laboratory.

Course Outcomes:

Students will get information about different processing machineries and their uses on industrial scale.

List of Experiments:

1. Study of a composite pilot milk processing plant & equipments
2. Study of pasteurizers
3. Study of sterilizers
4. Study of homogenizers
5. Study of separators
6. Study of butter churners
7. Study of evaporators
8. Study of milk dryers
9. Study of freezers
10. Design of food processing plants & preparation of layout
11. Visit to multiproduct dairy plant
12. Determination of physical properties of food products
13. Estimation of steam requirements
14. Estimation of refrigeration requirements in dairy & food plant
15. Visit to Food industry

VFSTR UNIVERSITY

Department Electives

Syllabus

I SEM & II SEM

ELECTIVES

III Year I - Semester

L	T	P	To	C
4	0	-	4	4

AG309 Food Packaging Technology

Course Description & Objectives:

To acquaint and equip the students with packaging methods, packaging materials, packaging machineries, modern packaging techniques etc.

Course Outcomes:

Students will have the information of:

1. importance of storage of food materials.
2. methods of packaging of perishable products.
3. types of packaging and their effect of quality maintenance.
4. economics of packaging of food materials

Unit 1: Introduction of Storage:

Factors affecting shelf life of food material during storage; spoilage mechanism during storage; definition, requirement, importance and scope of packaging of foods.

Unit II: Introduction of Packaging:

Types and classification of packaging system; advantage of modern packaging system. Different types of packaging materials used.

Unit III: Types of Package:

Different forms of packaging, metal container, glass container, plastic container, flexible films, shrink packaging, vacuum & gas packaging

Unit IV: **Selection of Packaging Material:**

Packaging requirement & their selection for the raw & processed foods. Advantages & disadvantages of these packaging materials; effect of these materials on packed commodities, Package testing, Printing, labelling and lamination.

Unit V: Economics of Packaging:

Economics of packaging; performance evaluation of different methods of packaging food products; their merits and demerits; scope for improvements; disposal and recycle of packaging waste.

TEXT BOOKS:

1. Gordon and Roberston. (2000). Food Packaging. AVI Pub.Co.

REFERENCES:

1. Mathlonthi, M. (1997). Food Packaging and Preservation Theory and Practice. Elsevier Applied Science.
2. Paine. (1998). Food Packaging. AVI Publishing Co.
3. Saccron & Graffin. (1998). Food Packaging. AVI Pub.Co.
4. Crosby. (2000). Food Packaging Material. Applied Science Publishers.
5. Gopakumar, K. (1998). Fish Packaging Technology materials and Methods. Concept Pub.C, New Delhi.
6. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

III Year I I - Semester	**L**	**T**	**P**	**To**	**C**
	4	**0**	**-**	**4**	**4**

AG310 Development of Processed Products and Equipments

Course Description & Objectives:

To acquaint and equip the students with the processed products and their equipments. This provides the knowledge to the student about different process involved during processing of agriculture products lice rice, oil seeds etc.

Course Outcomes:

After completion of the course, students will have:

1. *the understanding of the processed products and equipments,*
2. *knowledge on techniques used during processing.*
3. *knowhow of product development technology*
4. *ability to decide the various handling and process equipment*
5. *basic knowledge for various food industry jobs.*

Unit 1: Introduction of Food Processing:

Applications of unit operations to the food industry, analytical processing concepts with regards to mass and energy balances, equipment involved in the commercially important food processing methods and unit operations; value addition to cereals like rice, wheat etc.

Unit 1: Introduction of Food Processing:

Applications of unit operations to the food industry, analytical processing concepts with regards to mass and energy balances, equipment involved in the commercially important food processing methods and unit operations; value addition to cereals like rice, wheat etc.

Unit II : Processing of Food Products:

Parboiling of rice, quality of processed products of rice & wheat. Processing of pulses, extruded food product, fermented food product, frozen and dried product, technology of meat, fish and poultry products, technology of milk and milk products.

Unit III: Product Development Technology:

Technology of oilseeds and fat products, snack foods, Fruits and vegetable products: candy, nutraceuticals, food product development trends, food additives and labeling.

Unit IV: **Processing Equipment:**

Process equipment for thermal processing evaporation, dehydration, drying, blanching, pasteurization, distillation; mechanical separation filtration, sieving, centrifugation, sedimentation;

Unit V: Handling and Primary Process Equipment:

Mechanical handling conveying and elevation; size reduction and classification mixing; kneading, blending and emulsification.

TEXT BOOKS:

1. Girdhari Lal, G.S. Siddappa & G.L. Tandon. (1998). *Preservation of Fruits and Vegetables.* ICAR, New Delhi.
2. Romeo,T, Toledo. (1996). *Fundamentals of Food Process Engineering.* CBS Pub. & Distributors, New Delhi

REFERENCES:

1. Kessle, H.G.(1981). *Food Engineering and Dairy Technology.* U.A. KesslerFreising, Germany.
2. Matz,S.A. (1970). *Cereal Technology.* AVI Publishers.
3. Sukumar De. (1997). *Outlines of Dairy Technology.* Oxford University press, Delhi.
4. Carl.W. Hall. (1988). *Processing Equipments for Agrl.Products.* McGraw Hill Pub.Co.
5. Gould, G. (1989). *Mechanism of action of Food Preservation Procedures.*Elsivier applied Science.

4. Carl.W. Hall. (1988). *Processing Equipments for Agrl.Products.* McGraw Hill Pub.Co.
5. Gould, G. (1989). *Mechanism of action of Food Preservation Procedures.* Elsivier applied Science.
6. Kent, N.L. (1975). *Technology of Cereals.* Oxford Pergamom.
7. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

IV Year I - Semester

L	T	P	To	C
3	1	-	4	4

AG405 Food Processing Plant Design and Layout

Course Description & Objectives:

To expose the students with the design features of different food processing equipments being used in the industries and with the layout, planning of different food and processing plants.

Course Outcomes:

The students will gain knowledge about:

1. *types of plan design and their constraints.*
2. *precautions and design criteria for processing plants of cereals, pulses*
3. *precautions and design criteria for processing plants of horticultural and vegetable crops*
4. *design requirements for processing plants pf milk and meat products*
5. *installation requirements of processing plants.*

Unit 1: Introduction to Plan Design:

Meaning and definition of plant layout. Objectives and principles of layout. Types of layouts.

Unit II: Salient features of processing plants:

Salient features of processing plants for cereals, pulses, oilseeds, horticultural and vegetable crops, poultry, fish and meat products, milk and milk products.

Unit III: Plant Layout:

Location selection criteria, selection of processes, plan capacity, project design, flow diagrams, selection of equipment, process and controls, handling equipment.

Unit IV: Plant Layout: Secondary Consideration:

Plant layout, plant elevation, requirement of plant building and its components, labour requirement.

Unit V: Plant Installation:

Plant installation, power and power transmission, sanitation, cost analysis, preparation of feasibility report.

TEXT BOOKS:

1. Apple, J M. (2000). Plant Layout and Material Handling, Wiley Eastern Pub.
2. Lalat Chander. (2005). Text Book of Dairy Plant layout and Design. ICAR, New Delhi.

REFERENCES:

1. Norman, G.M. (2003). Principles of food sanitations. Chapman & Hall Pub., New York.
2. Slade, S. (1990). Food Processing Plant (Vol. 1). Leonard Hill Books.
3. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

IV Year I - Semester

	L	T	P	To	C
	4	0	-	4	4

AG411 Agricultural Structures and Environment Control

Course Descripition & Objectives:

To expose the students with design of agriculture structures with standard according BIS.

Course Outcomes:

The student will gain the knowledge of:

1. *design of agriculture structures*
2. *the techniques to control temperature, humidity and other composition of air to create favorable environment in the agricultural structures.*

Unit I: **Introduction to agricultural structure and environmental Control:**

Planning and layout of farmstead. Physiological reactions of livestock to solar radiation and other environmental factors, livestock production facilities,

Unit II: Introduction to BIS standard for farm structure:

BIS. Standards for dairy, piggery, poultry and other farm structures. Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc.

Unit III: Rural development:

Engineering for rural living and development, rural roads, farm fencing, their construction cost and repair and maintenance

Unit IV: **Introduction to solid waste management:**

Design of septic tank for small family. Solid waste management system

Unit V: BOD and COD:

BOD and COD of food plant waste, primary and secondary treatment of food plant waste.

TEXT BOOKS:

1. Goel, J. K. (2002). *Energy and Environment of Buildings & Farms.* Saroj Prakashan, Alahabad.
2. Jagadish Prasad. (1996). *Principles and Practices of Dairy Farm Management.* Kalyani Publishers, New Delhi.

REFERENCES:

1. Maton, A et al. (1986). *Housing of Animals Developments in Agrl.Engg.* Elsevier Science Publishing Co. Inc.
2. Michael and Ohja (2002). *Principles of Agricultural Engineering* (Vol.1). Jain Brothers, New Delhi.
3. Albright, L. D.(1996). *Environmental control for Animals and Plants.* ASAE, Michigan, USA.
4. Clark,J.A. (1980). Environmental Aspects of Housing for Animal Production.Butter worths, London.
5. http://ecourses.iasri.res.in/e-Leaamingdownload3_new.aspx?Degree_Id=04

IV Year I I - Semester

	L	T	P	To	C
	3	*1*	*-*	*4*	*4*

AG406 Design and Maintenance of Greenhouse

Course Description & Objectives:

To expose the student to the fundamental knowledge of greenhouse and their design and maintenance.

Course Outcomes:

The student will gain the knowledge of:

1. *importance of greenhouse with respect to different climate and crop.*
2. *design of greenhouse according the climate and requirements of the crop.*
3. *climate control inside greenhouse.*
4. *economics of greenhouse and selection criteria for efficient management*

Unit 1: Introduction to Greenhouse :

History and types of greenhouses; importance, function and features of green house; scope and development of green house technology.

Unit II: Design of Greenhouse:

Location, Planning and v arious component of greenhouse; design criteria and calculation; constructional material and methods of construction; covering materials and its characteristics,

Unit III: Heating and Cooling System of Greenhouse:

Solar heat transfer, solar fraction for green house, steady state analysis of green house, Greenhouse heating, cooling, shedding and ventilation systems;

Unit IV: Environment inside Greenhouse:

Carbon Dioxide generation and monitoring and lighting systems, instrumentation & computerized environmental Control Systems. Watering, fertilization, root substrata and its pasteurization, containers and benches, plant nutrition.

Unit V: Economy and application of Greenhouse:

Alternative cropping systems; plant tissue culture, chemical growth regulation; disease control; integrated pest management;
Postproduction quality and handling Cost analysis of greenhouse production; Applications of green house & its repair & maintenance.

TEXT BOOKS:

1. Manohar, K.R. and Iga Thinathane. C.(2007). *Green House Technology and Management.* B.S.Publications, Hyderabad.

REFERENCES:

1. http://ecourses.iasri.res.in/e- Leaarningdownload3_new.aspx?Degree_Id=04

IV Year I - Semester

L	T	P	To	C
3	1	-	4	4

AG415 Micro Irrigation System Design

Course Description & Objectives:

To expose the student to the fundamental knowledge in micro irrigation systems used in irrigation of crops with the design concepts of micro-irrigation systems likes drip irrigation, Sprinkler irrigation with fertilization application.

Course Outcomes:

On completion of course the student will:

1. *get the knowledge on micro irrigation concepts.*
2. *be able to understand the design concepts related to sprinkler irrigation and drip irrigation.*
3. *be able to suitably select and adopt different irrigation systems according to water requirement.*

Unit 1: Introduction to Micro Irrigation:

Past, present and future need of micro irrigation systems, Role of Govt. for the promotion of micro irrigation in India, Merits and demerits of micro irrigation system,

Unit II: Types and Design of Micro Irrigation:

Types and components of micro irrigation system, Micro irrigation system design, installation, and maintenance. Sprinkler irrigation types, planning factors, uniformity and efficiency, laying pipeline, hydraulic lateral, sub mains and main line design, pump and power unit selection.

Unit III: Drip Irrigation:

Drip irrigation – potential, automation, crops suitability. Fertigation – Fertilizer application criteria, suitability of fertilizer compounds, fertilizer mixing, injection duration, rate and frequency, capacity of fertilizer tank.

Unit IV: Micro Irrigation and Poly House:

Quality control in micro irrigation components, design and maintenance of polyhouse, importance and application of polyhouse

Unit V: Development of Waste Land:

Prospects of waste land development –hills, semi arid, coastal areas, water scarce areas, Benefit and Cost analysis.

TEXT BOOKS:

1. Israelson and Hassan. (1981). *Irrigation Principles and Practices.* John Wiley and sons, New York.
2. Lal, R. (1983). *Irrigation Hydraulics.* Saroj Prakashan Publishers, Allahabad.

REFERENCES:

1. Larry, G.J. (1982). *Principles of Farm Irrigation System Design.* John Wiley Sons,New York.
2. Michael, A.M. (1986). *Irrigation Theory and Practice.* Vikas Publishing House, New Delhi.
3. Sivanappan, R.K. (1987). *Sprinkler irrigation.* Oxford & IBH Publishing Company, New Delhi.
4. Jack, K. and Rend, B. (2007).*Sprinkler and Trickle Irrigation.* Van Nostra Reinhold, New York.
5. Cuenca, H.R. (1989). *Irrigation System Design An Engineering Approach.* Prentice Hall, Engle wood, Cliffs, New Jersey.

IIIYear I I - Semester

	L	T	P	To	C
	3	1	-	4	4

AG314 Watershed Planning and Management

Course Description & Objectives:

To acquaint and equip the students with the watershed planning and management knowledge related soil and water resources within the watersheds. The expose the student with the different techniques of analysis of different watersheds characteristics and hydrological data

Course Outcomes:

At the completion of the course the student should be able to:

1. *apply appropriate management techniques for watershed planning*
2. *know operating and maintaining techniques of the different components of integrated soil and water resources in the watershed.*
3. *know watershed modeling procedures.*

Unit 1: Introduction to Watershed Management:

Watershed management problems and prospects; Principles, Objectives, benefits and components of watershed management, Identification of watershed problems

Unit II: Watershed Planning:

watershed based land use planning, watershed characteristics – physical and geomorphologic, factors affecting watershed management, hydrologic data for watershed planning, watershed delineation, delineation of priority watershed

Unit III: Watershed Structure and Water yield Measurement:

Water yield assessment and measurement from a watershed; hydrologic and hydraulic design of earthen embankments and diversion structures; sediment yield estimation and measurement from a watershed, sediment yield models; rainwater conservation technologies in situ and storage

Unit IV: Design and Use of Watershed:

Design of water harvesting tanks and ponds; water budgeting in a watershed; effect of cropping system, land management and cultural practices on watershed hydrology

Unit V: Watershed modelling and Preparation of Project Proposal:

Evaluation and monitoring of watershed programmes; people's participation in watershed management programmes; planning and formulation of project proposal; cost benefits analysis of watershed programmes; watershed modeling optimal land use models; case studies.

TEXT BOOKS:

1. Dhruva Narayana,V,V.,Sastri,G. and Patnaik,U.S. (1990). *Watershed Management.* ICAR.,New Delhi.

REFERENCES:

1. Suresh, R. (1997). *Soil and water Conservation Engineering.* Standard Publishers and Distributors.
2. Wasi Ulla, Gupta, S.K., Dalal, S.S. (1972). *Hydrological measurements for watershed research.* Jugal Kishore & Co,Dehradun.
3. ICAR.(2008). *Soil and Water Conservation Research in India.*
4. Singh, G.,Venkataraman,C.,Sastri,C.,Joshi,B.P. (1985). *Manual of Soil Water conservation practices.* Oxford IBM Publishing Co Pvt.Ltd. New Delhi.
5. Singh, R.V. (2000). *Watershed Planning and Management.* Yash Publishing House, Bikaner.
6. http://nptel.ac.in/courses/105101010/

IV Year II - Semester

L	T	P	To	C
3	1	-	4	4

AG409 Minor Irrigation and Command area Development

Course Description & Objectives:

To expose the student with the fundamental knowledge of minor irrigation, its types operation, maintenance and people participation. It will also expose the student about the command area development, on farm structures, policy operation and maintenance

Course Outcomes:

At the completion of the course the student will:

1. *have the knowledge and skills on Planning, design, operation and management of reservoir system.*
2. *gain knowledge on different methods of irrigation including canal irrigation.*
3. *be exposed to techniques of remote sensing*
4. *be able to make participation of farmers in command area development activities.*

Unit 1 Introduction to Irrigation Projects:

Major, medium and minor irrigation projects – their comparative performance; development and utilization of water resources through different minor irrigation schemes.

Unit II: Introduction to Command area:

Basic concepts of command area – definition, need, scope, and development approaches: historical perspective, command area development authorities;

Unit III Farm Development Activities:

Interaction/collaboration of irrigation water use efficiency and agricultural production. Planning and execution of on farm development activities within the scope of command area development;

Unit IV Remote Sensing Techniques:

Use of remote sensing techniques for command area development; case studies of some selected commands

Unit V Farmer's Participation:

Farmer's participation in command area development. Case studies in related areas.

TEXT BOOKS:

1. Michael, A. M. (1990). *Irrigation Theory and Practice*. Vani Educational Books
2. Modi, P. N. (1995). *Irrigation Water Resources and Water Power Engineering.* Std Book House, New Delhi.

REFERENCES:

1. Murthy, C.S. (1990). *Design of Minor irrigation and canal structures.* Wileyeastern Limited, New Delhi.
2. Murthy, V.V.N. (1998). *Land and Water Management.* Kalyani Publishing, New Delhi.
3. Proc. of seminar on water Management. (1992). *Vol 1 & II.* Water Management Forum, Gandhinagar.
4. Punmia, B.C and Pande, B.B. (1999). *Irrigation and Water Power Engg.* Standard Publishers and Distributors, New Delhi.
5. Hoffman, G.J., Howell, T.A and Soloman, K.N. (1990). *Management of Farm Irrigation System.* ASAE.
6. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04

IV Year II - Semester

L	T	P	To	C
3	1	-	4	4

AG410 Gully and Ravine Control Structures

Course Description & Objectives:

To expose the student with the fundamental knowledge of flood and their impact on the natural resources. To provide the basic knowledge to analyse the flood data with different hydrological and meteorology data.

Course Outcomes:

At the completion of the course the student will:

1. *have knowledge of flood and flood related problem specially soil erosion and damage of crop*
2. *have the techniques in estimating the flood during peak seasons.*
3. *know how to perform the flood routing.*
4. *have the knowledge in proper design of flood storage structure to prevented soil erosion.*
5. *know planning for flood control methods and their economics.*

Unit 1: Introduction to Flood:

Introduction; floods - causes of occurrence, flood classification - probable maximum flood, standard project flood.

Unit II: Flood Estimation Methods:

Design flood, flood estimation - methods of estimation; estimation of flood peak - Rational method, empirical methods, Unit hydrograph method;

Unit III: Statistics in Hydrology:

Statistics in hydrology, flood frequency methods - Log normal, Gumbel's extreme value, Log-Pearson type-III distribution; depth-area-duration analysis;

Unit IV: Flood Routing Methods:

flood forecasting, flood routing – channel routing, Muskingum method, reservoir routing, modified Pul' s method; flood control - history of flood control, structural and non-structural methods of flood control measures,

Unit V Flood Management:

storage and detention reservoirs, levees, channel improvement; Gulley erosion and its control; soil erosion and sediment control measures; river training works, planning of flood control projects and their economics.

TEXT BOOKS:

1. Dhruvanarayana, V. V. (1993). Soil and Water Conservation Research in India. ICAR, New Delhi.

2. Goldman, S. J, Jackson K. and Bursztynsky, T. A. (1986). Erosion and Sediment Control Handbook. McGraw Hill Book Company.

REFERENCES:

1. Suresh, R. (1997). *Soil and water Conservation Engineering.* Standard Publishers and Distributors.
2. USBR. (1978). *Design of Small Canal Structures.* U S Bureau of Reclamation.
3. USBR. (1987). *Design of Small Dams.* US Bureau of Reclamation.
4. Murthy, V.V.N. (1998). *Land and Water Management.* Kalyani Publishing, New Delhi.

III Year I - Semester	L	T		T	C
	3	1	-	4	4

AG313 Remote Sensing & GIS Applications

Course Description & Objectives:

To introduce the students with principles and basic concepts of Remote Sensing and GIS and its applications in data analysis and planning.

Course Outcomes:

At the end of the course, the students will understand:

1. *the remote sensing principles, satellite data processing and available data products.*
2. *the spatial data models, analysis and presentation techniques*
3. *application of Remote Sensing and GIS techniques in various fields of agriculture, soil, land and forest resources*
4. *decision making process and utilization of advanced techniques in addressing the real world problems.*

Unit 1: Introduction Remote Sensing:

Introduction, History of remote sensing, Physics of Radiant Energy – Electromagnetic spectrum and its nature, Interactions of electromagnetic radiation with different media, Atmospheric effects in remote sensing, Spectral Reflectance curves of vegetation, soil and water, Ideal and real remote sensing. Atmospheric windows, Active and Passive remote sensing;

Remote Sensing Platforms and Sensors: Introduction, Earth Resources Satellites – IRS series, Landsat Series and SPOT, Meteorological and Other satellites, Sensor Parameters and Sensor Systems used in Imaging; Resolution: Spatial, Spectral, Radiometric and Temporal.

Unit II: Image Analysis:

Aerial Remote Sensing: Introduction to Photogrammetry, Geometry of vertical photograph, Stereo viewing, Stereoscopic depth perception, Use of stereoscopes, Mosaicing; Microwave Remote Sensing: Introduction, radar principle, radar image properties, distortions, applications. Radar Polarimetry. SAR Images. Radiometry for crop monitoring and hydrologic forecasting; Data Products, Visual and Digital Image Processing; Image analysis: Visual interpretation, digital processing, pre-processing, enhancement, transformation, classification, Integration; Image interpretation: Basic principles, factors governing quality of an image, factors governing interpretability, visibility of objects, techniques of interpretation, digital image processing;

Unit III: Application of Remote Sensing and Introduction to GIS:

Satellite data Products, their different types, Visual Image Interpretation and its key elements, Introduction and Basic character of digital image, Image Pre-processing and Image registration; Applications of RS: RS in Agricultural Engineering, agriculture, hydrology, land cover, mapping etc; Image interpretation for water resources development and soil conservation survey. Fundamentals of GIS, Introduction to GIS, Roots of GIS, Overview of Information System, GIS definitions and terminology,

Unit IV: Introduction to GIS Tools:

GIS architecture, Framework of GIS, Spatial data modelling, Vector GIS models and Raster GIS models, GIS data management. Database management system: Data file management, database models, storage of GIS data, object based data models, Topology, DBMS in GIS. Data input and editing: data stream, data input methods, GPS for data capture, data editing. Data quality issues: Introduction, accuracy, precision and resolution, consistency, completeness, sources of error in GIS, modeling errors, error evaluation by GIS.

Unit V: RS and GIS Application:

Data analysis and modeling: Introduction, format conversion, data medium conversion, spatial measurement methods, reclassification, buffering techniques, overlay analysis, modeling surfaces: DTM, TIN, slope model, GIS outputs. Integration of RS and GIS: RS and GIS synergy need for integration, facilities for integration, RS & GIS applications in Agrl. Engineering.

Entering data in computer, digitizer – scanner data compression.

TEXT BOOKS:

1. Lilles and and Keifer. (1994). *Remote sensing and image interpretation*. John Wiley.
2. Jensen, J. R. (2000). *Remote Sensing of the Environment.* Pearson Education

REFERENCES:

1. Sabins, F. (1978). *Remote sensing principles and interpretation*.
2. Burroughs, P. A. (1986). *Principles of Geographic Information Systems for land Resources Assessment.* Clarendon Press, Oxford.
3. Chang, K. T. (2006). *Inroduction to GIS.* Tata McGraw Hill.
4. Jensen, J R. (1996). *Introductory Digital Image Processing.* Prentice Hall .
5. Philip H.S et al . (1978). *Remote sensing the quantitative approach.* McGraw Hill.
6. Agarwal, C. S. & Garg, P. K. (2000). *Remote Sensing.* Wheeler publishing.
7. Langley P, McGuire D, Goodchild M F and Rhind, D. (2001). *GIS Principles and Applications.* Longman.
8. Scanda, E. (1976). *Remote sensing for environmental sciences*. Springer.
9. Anji Reddy M. (2006). *Remote sensing & GIS.* BS Publications.
10. Crocknell, A.P. (1981). *Remote sensing in meteorology Oceonography and hydrology*.
11. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04
12. http://elearning.iirs.gov.in/

IV Year I - Semester

L	T	P	To	C
3	1	-	4	4

AG417 Systems Engineering

Course Description & Objectives:

The student will expose different techniques of systems engineering of mathematic which are used in water resources engineering, food engineering and farm machinery.

Course Outcomes:

The course will enable the students to:

1. *focus on defining customer needs and required functionality early in the development cycle*
2. *proceed with design synthesis and system validation while considering the complete problem including operations, performance, test, manufacturing, cost, and schedule.*
3. *link systems enginee*ring to fundamentals of decision theory, statistics, and optimization.
4. introduce the most current, commercially successful techniques for systems engineering

Unit 1: System concepts:

System concepts. Requirements for a Linear programming problems. Mathematical Formulation of Linear Programming problems and its Graphical solution.

Unit II: Response of Systems:

Response of Systems. Computer as a tool in system analysis. Simplex method. Degeneracy and Duality in Linear programming. Artificial variable techniques, Big M method and two phase methods.

Unit III: Mathematical models:

Mathematical models of physical systems. Modelling of Agricultural Systems and operations. Cost analysis.

Unit IV: Methodologies of management:

Transportation problems. Assignment problems. Waiting line problems;

Unit V: Project Management:

Project management by PERT/CPM. Resource scheduling.

TEXT BOOKS:

1. Dharani. S and Venkata Krishnan. (1990). *Operations Research Principles & Problems.* Keerthi Publishing homes Pvt. Ltd.
2. Gupta, P.K. and Man Mohan. (1994). *Problems in Operations Research.* Sultan chand & sons, New Delhi.

REFERENCES:

1. Kapoor, V.K. (1994). *Operations Research.* Sultan chand & sons, New Delhi.
2. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04
3. https://www.coursera.org/course/introse

IV Year II - Semester	L	T	P	To	C
	3	1	-	4	4

AG414 Reservoir and Farm Pond Design

Course Description & Objectives:

To introduce the students with reservoir and farm pond design systems for agriculture watershed.

Course Outcomes:

At the completion of the course the student will:

1. *have knowledge and skills on planning, design, operation and management of reservoir system*
2. *have knowledge on planning, and management of and farm pond systems.*
3. *be exposed to different techniques to analysis different hydrological and metrology data*
4. *understand requirements of seepage line, drainage filters and pipings.*
5. *have knowledge on failure of earthern embankments and its prevention.*

Unit 1: Introduction to Earthen Embankments:

Earthen embankments functions, advantages and disadvantages, classification – hydraulic fill and rolled fill dams homogeneous, zoned and diaphragm type;

Unit II: Seepage Estimation:

Foundation requirements, grouting, seepage through dams estimation of seepage discharge, location of seepage/phreatic line by graphical and analytical methods, flow net and its properties

Unit III: Seepage Characteristics:

Seepage pressure, seepage line in composite earth embankments, drainage filters, piping and its causes

Unit IV: Design and Construction of Earthen Embankments:

Design and construction of earthen dam, stability of earthen embankments against failure by tension, overturning, sliding etc; stability of slopes analysis of failure by slice method

Unit V: Reservoirs and Farm Ponds:

Types of reservoirs and farm ponds, design and estimation of earth work; cost analysis.

TEXT BOOKS:

1. Suresh, R. (1997). *Soil and water Conservation Engineering.* Standard Publishers and Distributors. Ludhiana.
2. Murty, V. V. N. (1998). *Land and Water management Engineering* (2 ed.). Kalyani Publishers.

REFERENCES:

1. ICAR. (1971). *Soil and Water Conservation Research in India.*
2. Punmia, B.C. (1981). *Soil Mechanics and Foundations.* Standard Book House,Delhi.
3. Schwab, G.O, Frevert, R.K.,Edminister T.W., and Barnes,K.K. (1993). *Soil and water conservation engineering.* John Wiley and sons.
4. Alam Singh and Chowdhary, G. R. (1997). *Soil Engineering – in Theory and Practice. Part 3.* CBS Publishers and Distributers. New Delhi.
5. Bowles, Joseph. E. (1984). *Soil Mechanics and Foundation Engineering.* Mc Graw – Hill International Book Company.
6. Singh, G.,Venkataraman,C.,Sastri,C.,Joshi,B.P. (1985). *Manual of Soil Water conservation practices.* Oxford IBM Publishing Co Pvt.Ltd. New Delhi.

III Year II - Semester

L	T		T	C
3	1	-	4	4

AG312 Tractor Design and Testing

Course Description & Objectives:

To acquaint and equip with the latest design procedures of tractor and its systems with testing procedure.

Course Outcomes:

At the completion of the course the student will:

1. *have knowledge and skills on power transmission system of a tractor*
2. *know the design procedures of hydraulic systems and steering system.*
3. *understand design features and selection of engine for tractor.*

   know the testing procedures for tractor

Unit 1: Design and Development of Tractor:

Procedure for design and development of agricultural tractor, Study of parameters for balanced design of tractor for stability & weight distribution

Unit II: Power Transmission:

Hydraulic lift and hitch system design. Design of mechanical power transmission in agricultural tractors.

Unit III: Design of Hydraulic and Steering:

Design of Ackerman Steering and tractor hydraulic systems. Essential features of steering and hydraulic systems, problems associated in hydraulic systems.

Unit IV: Tractor Engines Design:

Study of special design features of tractor engines and their selection.

Unit V: Tractor Testing:

Design of seat and controls of an agricultural tractor. Tractor Testing.

TEXT BOOKS:

1. Barger, E.L., Liledahl, J.B., Carleton, W.M.and Mckibben, E.G. (1978). *Tractor and their power units.* Wiley Eastern pvt. Ltd, New York.
2. Kanafoshi, C.Z. and Karwawshi, T. (1976). *Agricultural Machines, Theory and Construction* (Vol. 1 and 2). USDA, Poland.

REFERENCES:

1. Kurtz, G.L., Thompson and Claer, P. (1984). *Design of Agricultural Machinery.* John Wiley & Sons, New York.
2. Radhey Lal and Datta, A.C. (1978). *Problems in Agricultural Engineering.* Sathya Prakashan, Allahabad.

3. Pandya, N.C. and Shah, C.S. (1981). *Elements of Machine Design.* Charotar Publishing House, Anand.

4.. http://cfmtti.dacnet.nic.in/12226.pdf

5. http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_tc_browse.htm?commid=47012

6 http://www.standardsbis.in/Gemini/scoperef/SR12036.pdf

		L	T	P	To	C
IV Year	**I - Semester**	**3**	**1**	**-**	**4**	**4**

AG407 Hydraulic Drive & Controls

Course Description & Objectives:

To expose the student to the fluids properties, hydraulic, pumps, valve and services used in agricultural machinery

Course Outcomes:

At the completion of the course the student will have:

1. *knowledge and skills on, hydraulic, pumps used in machinery.*
2. *knowledge on different kinds of valves.*
3. *skills on trouble shooting in valves.*
4. *knowledge on safety features and service requirements of various hydraulic and pneumatic circuits.*

Unit 1: Introduction to Hydraulic:

Hydraulic Basics: Pascal's Law, Flow, Energy, Work, and Power. Hydraulic Systems, Colour Coding, Reservoirs, Strainers and Filters, Filtering Material and Elements.

Unit II: Introduction to Pumps and Gauges:

Accumulators, Pressure Gauges and Volume Meters, Hydraulic Circuit, Fittings and Connectors. Pumps, Pump Classifications, Performance, Displacement, Designs, Gear Pumps, Vane Pumps, Piston Pumps, Pump Operation.

Unit III: Introduction to Valve:

Hydraulic Actuators, Cylinders, Construction and Applications, Maintenance, Hydraulic Motors. Valves, Pressure Control Valves, Directional Control Valves, Flow Control Valves, Valve Installation, Valve Failures and Remedies,

Unit IV: Troubleshooting of Valve:

Valve Assembly, Troubleshooting Valves Hydraulic Circuit Diagrams and Troubleshooting, United States of American Standards Institute USASI Graphical Symbols Tractor hydraulics, nudging system, ADDC.

Unit V: Safety and Services:

Pneumatics: Air services, logic units, Fail safe and safety systems Robotics: Use of Hydraulics and Pneumatics drives in agricultural systems, PLCs(Programmable Logic Controls).

TEXT BOOKS:

1. Ernst, W.(1960) *Oil Hydraulic Power and its Industrial applications.* New York: McGraw Hill.
2. Ian Mencal.(2003). Hydraulic operation and control of machine tools. Ronald Press.

REFERENCES:

1. John Watton (1989).. Fluid Power Systems: modelling, simulation and micro computer control. Prentice Hall International.
2. Khaimovitch. (2004). Hydraulic and Pneumatic control of Machine Tools.
3. Lewis, E.E., and H. Stern. (1962). Design of Hydraulic Control Systems. NewYork; Mc Graw Hill.
4. Pippenger, J.J., and R.M. Koff. (1959).Fluid Power control systems. New York: McGraw Hill.
5. Sterwart. (1977). Hydraulic and Pneumatic power for production. Industrial Press.
6. Thoma Jean U. (1964).Hydrostatic Power Transmission. Trade and Technical Press, Surrey, England.
7. Werner(1975). Deppert and Kurt Stoll. Pneumatic control An introduction totheprinciples. Vogel Verlag.
8. Anthony Esposito.(2008). Fluid Power with applications. Pearson Education.
9. Blackburn, J.F., G. Reethof and J.L. Shearer. (1960). Fluid Power Control. NewYork, Technology Press of M.I.T. and Wiley.
10 .Blaine W. Andersen.(1966). The analysis and design of pneumatic systems. John Wiley and Sons, Inc
11. Fitch, Jr., E.C. (1966).Fluid Power Control Systems. Mc Graw Hill, New York.

III Year I - Semester

L	T	P	To	C
3	1	-	4	4

AG311 Farm Power and Machinery Management

Course Description & Objectives:

To expose the student with the mechanization status in the country and management techniques for future requirements.

Course Outcomes:

At the completion of the course the student will:

1. *have knowledge about the present status of farm mechanization*
2. *be able to optimally select machinery for varying uses.*
3. *be able to plan for mechanization of the farm.*
4. *able to estimate the cost of machinery.*

Unit 1: Mechanization:

The role of mechanization and its relationship to productivity, employment, social and Technological change.

Unit II: Cost Analysis:

Performance and power analysis; cost analysis of machinery: fixed cost and variable costs, effect of inflation on cost;

Unit III: Machinery Selection:

Selection of optimum machinery and Replacement criteria; Break even analysis, reliability and cash flow problems;

Unit IV: Mechanization in India:

Mechanization Planning; case studies of agricultural mechanization in India.

Unit V: Human Safety:

Human Engineering aspects and gender studies.

TEXT BOOKS:

1. Donnel Hunt. (1995). *Farm Machinery and management.* Iowa State University Press, Ames, USA.
2. Kepner, R.A., Bainer Roy, and Barges, E.C. (1978). *Principals of Farm Machinery, .* CBS Publishers and Distributors, Delhi 17.

REFERENCES:

1. Mehta M.L. et al. (1995). *Testing and Evaluation of Agricultural Technology.*Information Centre, Ludhiana, India

2. Radhey Lal and Datta, A.C. (1978). *Problems in Agricultural Engineering.*Sathya Prakashan, Allahabad
3. RNAM . (1955). *Test codes and Procedure for farm machinery*
4. Barger, E.L., Liledahl, J.B., Carleton, W.M. and Mckibben, E.G. (1978). *Tractor and their power units.* Wiley Eastern pvt. Ltd, New York
5. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04
6. http://www.agmanager.info/farmmgt/machinery/mf2244.pdf
7. http://www.un-csam.org/Activities%20Files/A1310qingdao/7.pdf

IV Year II - Semester

L	T	P	To	C
4	0	-	4	4

AG416 Human Engineering and Safety

Course Description & Objectives:

To impart the fundamental knowledge to the student on the importance of human engineering and safety in the field of agriculture machinery.

Course Outcomes:

At the completion of the course the student will:

1. *understand the importance of human factors and their application in system development.*
2. *know the effect of visual, auditory and factual displays in human performance.*
3. *understand the importance of optimum work-rest cycles in endurance.*
4. *be able to ideally design the work space in accordance to anthropometry.*
5. *have the general understanding safety features and regulation acts in farm machinery.*

Unit 1: Human Factor:

Human factors in system development – concept of systems; basic processes in system development, performance reliability,

Unit II: Human Performance:

Human performance. Information input process, visual displays, major types and use of displays, auditory and factual displays. Speech communications.

Unit III: Human Controls:

Biomechanics of motion, types of movements, Range of movements, Strength and endurance, speed and accuracy, human control of systems. Human motor activities, controls, tools and related devices.

Unit IV: Introduction to Anthropometry:

Anthropometry: arrangement and utilization of work space, atmospheric conditions, heat exchange process and performance, air pollution.

Unit V: Safety of Human:

Dangerous machine (Regulation) act, Rehabilitation and compensation to accident victims, Safety gadgets for spraying, threshing, Chaff cutting and tractor & trailer operation etc.

TEXT BOOKS:

1. Ernest and Mc Cormick, E.L. (1970). *Human factors in engineering and design.* Mc Graw Hill Co., New York.
2. Grandjean, E. (1988). *Fitting the task to the man.* Taylor and Francis, London.

REFERENCES:

1. Liljedhal, J.B, Carleton, W.M, Smith, P.K and David, M. (1978). *Tractors and power units.* John Wiley and sons, New York.
2. Murrel, K.H.F. (1978). *Ergonomics, Man in his working environment.* Chapman and Hall, London.
3. Astrand, O.P and Rodhal, J. (1977). *Work Physiology.* Mc Graw hill Co. New York.
4. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/risk_management/ss_handbook/media/Chap17_1200.pdf
5. http://www.derby.ac.uk/online/course/ergonomics-msc
6. http://www.online.colostate.edu/certificates/ergonomics/
7. http://www.cdc.gov/nchs/data/nhanes/nhanes3/cdrom/nchs/manuals/anthro.pdf

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IV Year I I - Semester	L	T	P	To	C
	4	0	-	4	4

AG408 Production Technology for Agril. Machinery

Course Description & Objectives:

To expose the student with the latest design procedures of agriculture machinery and their different components.

Course Outcomes:

On completion of the course, the students will understand:

1. *the basic production techniques and criteria for the selection of raw materials*
2. *the basic foundry and forgery techniques used for production of machinery.*
3. *the coating processes used for various machinery.*
4. *maintenance of quality and use of various standards for quality check.*

Unit 1: Application of Software in Agriculture Machinery Production:

Critical appraisal in production of Agricultural Machinery; Modelling and stress analysis of Machinery parts by using standard software;

Unit II: Materials used in Machinery:

Advances in material used for tractor & Agril. Machinery. Cutting tools including CNC tools and finishing tools. Advanced manufacturing techniques like powder metallurgy, EDM (Electro Discharge Machining), Heat Treatment of Steels.

Unit III: Coating Process of Metals:

Ferrous metallurgy, iron carbon diagram, alloying of elements, phase diagram, TTT diagram, surface treatment techniques: thermo chemical treatment including pack carburizing shot pining process, chemical vapour deposition (CVD) etc.

Unit IV: Production and Quality Control:

Limits, Fits & Tolerances, Jigs & Fixtures, Microstructure Analysis. Industrial layout Planning, Quality management, Economics of process selection. Techno economic feasibility of Project Report. Selection of Standard/ critical components.

Unit V: Manufacturing Process:

Case studies of manufacturing of Agril. Machinery. Servomotors, drives & controllers, CNC controllers for machine tools. CNC programming. Assembly and plant automation. Storage and transportation.

TEXT BOOKS:

1. Everett.E.Adam and JR.Ronald. J.Ebert. (2002).*Production and operations management concepts, models and behaviour.* Prentice Hall of India Pvt Ltd, New Delhi.
2. Martand.T.Telsang. (2005). *Production management.* S Chand and company Ltd, Ram nagar.,New Delhi.

REFERENCES:

1. Paul Degram.E, Blach.J.T and Ronald A Kosher. *(2005). Materials and process in manufacturing.*Prentice Hall of India.
2. Prabhu Dev. *(*2010).*Handbook of heat treatment of steel.* Tata McGraw Hill.Ltd, New Delhi.
3. Callister, W.D. (2005) *Materials science and engineering.* Wiley, New Delhi.

IV Year I - Semester	L	T	P	To	C
	3	1	-	4	4

AG413 Mechanics of Tillage and Traction

Course Description & Objectives:

To present an overview of tillage and traction devices and systems to the students. To present fundamental concepts describing dynamic soil behavior in response to mechanical elements with methods for designing traction/ transport systems.

Course Outcomes:

After the competition of this course the student will be:

1. *able to measure and utilize physical and mechanical properties of soil.*
2. *Able to interpret and predict soil stress strain behavior.*
3. *able to design and implement safe and cost effective mechanical soil tillage systems*
4. *able to design and implement and cost effective mechanical traction/ transport systems*
5. *able to establish systems that produce specified performance and acceptable alteration of affected soil profiles.*

Unit 1: Mechanics of Tillage:

Introduction to mechanics of tillage tools, engineering properties of soil, principles and concepts, stress strain relationship,

Unit II: Design of Tillage Tools:

Design of tillage tools principles of soil cutting, design equation, force analysis, application of dimensional analysis in soil dynamics performance of tillage tools.

Unit III: Traction and Mechanics:

Introduction to traction and mechanics, off road traction and mobility, traction model, traction improvement, traction prediction,

Unit IV: Introduction of Tyre:

Tyre size, tyre lug geometry and their effects, tyre testing, soil compaction and plant growth,

Unit V: Application of GIS in Agriculture Machinery:

Variability and geo statistic, application of GIS in soil dynamics.

TEXT BOOKS:

1. Mc Kyes.E. (1989). *Agricultural engineering soil mechanics.* Elsevier Amsterdam.
2. Milligan, (1989).G.M.E and Houlsby, G.T. *Basic Soil mechanics,.* Butter worth scientific London.

REFERENCES:

1. Mc Kyes.E. (1990).*Soil Cutting.* Elsevier Amsterdam.
2. William Lambe.T.Whiteman and Robert.V. (1995).*Soil Mechanics.* Wiley Eastern Ltd., New Delhi.
3. http://ecourses.iasri.res.in/e-Leaarningdownload3_new.aspx?Degree_Id=04
4. http://www.elsevier.com/books/soil-cutting-and-tillage/mckyes/978-0-444-42548-5
5. http://bsesrv214.bse.vt.edu/grisso/ethiopia/books_resources/tillage/soildyn_table-of-contents.pdf

IV Year II - Semester

	L	T	P	To	C
	4	0	-	4	4

AG418 Environmental Engineering

Course Description & Objectives:

To understand nature, biodiversity, natural resources and facts about the environment and their interrelationships.

Course Outcomes:

On completion of the course, students will be able to:

1. *get fundamental concepts of environmental science*
2. *familiarize himself to protect the environment for better public utilization.*
3. *find and implement scientific, technological, economic and political solutions to environmental problems.*

Unit 1: Introduction to Water Supply System:

Importance of safe water supply system. Domestic water requirements for urban and rural areas.

Unit II: Water Supply:

Sources of Water supply. Intakes and transportation of water. Drinking water quality. Indian Standards of drinking water.

Unit III: Water Treatment:

Introduction to water treatment. Importance of sanitation. Domestic waste water: quantity, characteristics, disposal in urban and rural areas.

Unit IV: Design of Waster water:

Sewer: types, design discharge and hydraulic design. Introduction to domestic wastewater treatment. Design of septic tank. Solid waste: quantity, characteristics and disposal for urban and rural areas.

Unit V: Air Pollution:

Introduction to air pollution. Types of pollutants properties and their effects on living beings. ISI standards for pollutants in air and their abetments. Imparting awareness of domestic sanitation in women.

TEXT BOOKS:

1. Garg, S.K. (1992). *Environmental Engineering (vol 1) Water supply Engineering.* (Vol. 1). Khanna Publishers,Delhi.
2. Metcalf and Eddy. (1997). *Waste Water Engineering Treatment, Disposal, reuse.* Tata Mc Graw Hill Publishing Co. Ltd. New Delhi.

REFERENCES:

1 Peavy, H.S., Rowe, D.R. and Tchobanoglous, G.C. (1986). *Environmental Engineering.* Mc Graw Hill Book Co., New York.

2. Rangwala, S.C. (1992). *Water Supply and Sanitary Engineering.* Charotar Publishing House, Anand.

IV Year I I - Semester

L	T	P	To	C
4	0	-	4	4

AG412 Biomass Management for Fodder and Energy

Course Description & Objectives:

To impart the fundamental knowledge on the importance of Bio resources, Bio energy and reactors.

Course Outcomes:

At the completion of the course the student will have:

1. *knowledge and skills on bio energy source technology*
2. *understanding of important of biomass in agriculture fields.*
3. *knowledge on alcohol and ethanol production and energy and environment management.*
4. *skill about residue manag*ement in agriculture fields.

Unit 1: Introduction to Biomass:

Introduction to biomass management, biomass resource assessment management techniques/supply chains,

Unit II: Production of Biomass:

Processing of paddy straw, densification- Extrusion process, pellets, mills and cubers, Bailing-classification, uses;

Unit III: Residue Management for Soil Conservation:

Residue management for surface mulch and soil incorporation, Paddy Straw choppers and spreaders as an attachment to combine Harvester, Mulch seeder,

Unit IV: Fodder Management:

Paddy Straw Chopper-cum-Loader, Balar for collection of straw; Processing of straw/ fodder for animal use;

Unit V: Use of Biomass in other Production:

Agricultural and horticultural use, cushioning material for fruits and vegetables, Mulching and Composting, Paper and cardboard manufacturing, Straw as a fuel.

TEXT BOOKS:

1. Chahal, D.S. (1985). Food, Feed and Fuel from Bio mass . IBH Publishing . Pvt. Ltd. NewDelhi.
2. Chakravarty, A. (1989). Bio Technology and other Alternative Technologies for Utilisation of Bio mass/Agrl.Wastes. Oxford & IBH Pub.Co.Pvt Ltd.

REFERENCES:

1. Alba S. A.E. Humphery and N.E. Milles. (1973). Bio Chemical Engineering (2 ed.).
2. Baily, J.E and D.F. Ollies. (1986). Bi Chemical Engineering Fundamentals (2 ed.). Prescott and Dunn Industrial Micro Biology.

I

YEAR

BIOINFORMATICS

B.Tech.

I SEMESTER

- 16HS101 - Basic Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS106 - Basic Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16BT102 - Bioproducts and Bioentrepreneurship
- 16ME103 - Workshop Practice

COURSE CONTENTS

I SEM AND II SEM

16HS101 BASIC MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	30	10	45	-	-	-	-

Course Description and Objectives:

In this course the fundamental concepts of mathematics are introduced. A treatise of Matlab is also introduced in the practical session.

The objective of the course is to impart knowlege on progressions, partial fractions and binomial theorem. This course also deals with elementary concepts in geometry, trigonometry, differential and integral calculus. Numerical methods are also introduced for finding approximate solutions of algebraic equations. Besides, interpolation techniques and MATLAB environment are emphasized.

Course Outcomes:

The student will be able to:

- apply arithmetic and geometric progressions.
- understand coordinate geometry and different forms of straight lines.
- use basic concepts of trigonometric ratios and identities.
- understand the concept of limit, continuity and differentiability.
- familiar with basic concepts of integration.
- find roots of algebraic and transcendental equations.
- apply some interpolation techniques.
- use some commands of Matlab for mathematical computations.

SKILLS:

✓ *Compute sum of terms of given progression.*

✓ *Differentiate the given function.*

✓ *Evaluate the integral of given function.*

✓ *Interpret interpolation techniques to estimate the functional values.*

ACTIVITIES:

- *Compute the derivative and compare with Matlab output.*
- *Evaluate the integral and compare with Matlab output.*
- *Interpet the given data and estimate the functional values at a given point.*

Unit - 1 **L-9, T-3**

MATHEMATICAL PRELIMINARIES: Progressions, partial fractions and binomial theorem.

Unit - 2 **L-9, T-3**

TRIGONOMETRY AND GEOMETRY: Coordinate system, straight line, trigonometric functions and trigonometric identities.

Unit - 3 **L-9, T-3**

DIFFERENTIAL CALCULUS : Limits, continuity and differentiability.

Unit - 4 **L-9, T-3**

INTEGRAL CALCULUS: Concepts of integration - rules, integration by parts, integration by partial fractions and integration by inspection (standard forms).

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS: Bisection method, Newton-Raphson method, finite differences, forward and backward difference tables, interpolation by Lagrange's method, Newton's forward and backward methods, Gauss forward and backward methods.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Introduction to MATLAB environment.

Basic mathematical operations using MATLAB.

1. Solving simple expressions.
2. Trigonometric function values.
3. Limits.
4. Continuity.
5. Symbolic differentiation-1.
6. Symbolic differentiation-2.
7. Symbolic integration-1.
8. Symbolic integration-2.
9. Real roots of functions.
10. Newton-Raphson method.
11. Interpolation.

TEXT BOOKS:

1. C. W. Evans, "Engineering Mathematics, A Programmed Approach", Stanley Thornes (Special Indian Edition) 2011.

2. P. S. Rao, "A text book of Remedial Mathematics", 1st edition, Parma Med Press, Hyderabad, 2008.

REFERENCE BOOKS:

1. A.Jeffrey, "Mathematics for Engineers and Scientists", 6th edition, (Special Indian Edition),CRC Press, 2013.

2. R. Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	45	30	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as lasers, optical fibres, photonics, nano and funcational materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to :

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in non-destructive techniques.
- understand basic concepts of laser and optical fibre which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nanoscience and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*

✓ *Study the wavelengths of light sources and lasers.*

✓ *Estimate the efficiency of a given solar cell.*

✓ *Learn about the type of the optical fibre and their ability to propagate light waves from its numerical aperture.*

✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS : Introduction – production of ultrasonic waves, piezoelectric method, properties of ultrasonic waves, types of ultrasonic waves, determination of velocity of ultrasonic waves in solids and liquids; SONAR - medical applications.

NDT: Introduction- types, visual inspection and liquid penetrate testing; Ultrasonic testing systems; X - ray radiography.

UNIT - 2 **L-9**

LASERS : Characteristics of laser light – spontaneous and stimulated emission of radiation, He-Ne laser, CO_2 laser, semiconductor laser and applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS : Principle of optical fibre – acceptance angle, numerical aperture, types of fibres, dispersion and attenuation in optical fibres, optical fibre communication system and fibre optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS : Introduction- matter waves, Schroedinger's time independent wave equation, physical significance of the wave function, particle in one dimensional potential well and tunneling phenomenon.

FREE ELECTRON THEORY OF METALS : Introduction – classical free electron theory, electrical conductivity of metal, quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature

PARTICLE ACCELERATORS: Introduction- cyclotron, synchrocyclotron, betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, photovoltaic effect, solar cells, efficiency of solar cell and solar thermal energy conversion systems.

PHOTONICS: LED, LCD, photo conducting materials, photo detectors, photonic crystals, non- linear optical behaviour of materials and applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, fabrication of nano materials, ball milling, sol-gel, physical and chemical properties of nano materials and applications.

FUNCTIONAL MATERIALS: Smart materials, shape memory alloys, chromic materials (thermo, photo and electro), metallic glasses, advanced ceramics, composites, fiber reinforced plastics/ metals and biomaterials.

TEXT BOOKS:

1. V. Rajendran, "Engineering Physics", 7th edition, TMH Publications, 2014
2. D.K. Bhattacharya and P. Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu and P.G. Kshirsagar, "Engineering Physics", 1st edition, S. Chand and Company Ltd, 1992.
3. S.P. Sukhatme, "Solar Energy", 2nd edition, TMH Publication, 2005.
4. Dr. Arumugam, "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimate acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluate thermal conductivity of materials.*
- *Measure temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The teaching efforts in this course will be directed towards making students develop their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to :

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

✓ *Apply different sub skills like top down, bottoms up approachs to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **Environmental consciousness**
  (Climate change, green cover, pollution, renewable vs. non renewable energy sources (from energy unit)
- Grammar : Articles, prepositions, sentence types and construction
- Vocabulary : Root, prefixes and suffixes
- Composition : Paragraph writing (descriptive and narrative)
- Laboratory Practice : Introduction to phonetics (Organs of speech- consonants, vowels and diphthongs; Syllable, stress and intonation)

UNIT - 2 **L-9**

- Text : **Emerging technologies**
  (Solar power, cloud computing, nanotechnology, wind energy (to be covered from energy unit)
- Grammar : Time and tense (Present, past and future; Helping verbs; Modals)
- Vocabulary : Synonyms and antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **Travel and tourism**
  (Advantages and disadvantages of travel, tourism, *atithi devo bhava* – Tourism in India)
- Grammar : Subject-Verb agreement and sentence construction
- Vocabulary : Idioms and Phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role plays (Introducing, greeting, enquiring, informing, requesting and inviting)

UNIT - 4 **L-9**

- Text : **Engineering Ethics**
  (Challenger disaster, biotechnology, genetic engineering, protection from natural calamities, how pertinent is the nuclear option? An
  environment of energy (from energy unit)) Avoiding sexist language (Gender sensitization)
- Grammar : Sentence transformation (Degrees, voice, speech and synthesis)
- Vocabulary : Phrasal verbs
- Composition : Note-making on Nandan Nilekani's "In search of our energy solutions" (from energy unit) Summarizing on

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Complete graded grammar exercises in Rosetta Stone.*
- *Complete graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watch TED videos and making notes.*
- *Watch TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Prepare brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and group discussion.*

			"Flight from conversation" (New York Times)
•	Laboratory Practice	:	Situational conversations – Role plays (Emotions, directions, agreements, refusals and suggestions).

UNIT - 5 **L-9**

•	Text	:	**Media matters** (History of media, language and media, milestones in media, manipulation by media, thousands march against nuclear power in Tokyo (from energy unit), entertainment media and interviews)
•	Grammar	:	Common errors
•	Vocabulary	:	One-word substitutes
•	Composition	:	E-mail, short message service (SMS), writing advertisements, reporting; Social Media- blogging, facebook, twitter (acceptable and non acceptable content)
•	Laboratory Practice	:	Group discussions (topics from energy unit) – Dumping of nuclear wastes, exploration of eco-friendly energy options, lifting of subsidies on petrol, diesel, LPG etc)

TEXT BOOK:

1 "Mindscapes - English for Technologists and Engineers", Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. N. Swamy, "Strengthen Your Writing", 1st edition, Orient Longman, 2003.
2. T. E. Berry, "The Most Common Mistakes in English Usage", 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan Ltd., 2000.
4. V. Sasikumar and P.V. Dhamija, "Spoken English: A Self-Learning Guide to Conversation Practice", 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. M. M. Maison, "Examine your English", 1st edition, Orient Longman, 1999.
6. A. Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes and components associated with computers and internet. Students will get exposure to building blocks of computers, operating systems, application software, networking, internet, world wide web, security, maintenance, information systems and the application development processes.

Course Outcomes:

The student will be able to :

- understand the terms and concepts of computer science and information technology (hardware, software, networking, security, internet/web and technologies).
- use the products and services of computers.
- use internet/web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

- ✓ *Assemble and disassemble the personal computer system.*
- ✓ *Install different desktop operating systems.*
- ✓ *Use the basic text processing, simple data analysis and data presentation tools.*
- ✓ *Configure network parameters.*
- ✓ *Secure the personal computer and information from various external threats.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS : Introduction to computer, computers for individuals, importance of computers, parts of computer system, memory devices, input and out devices, types of monitors, types of printers, number systems, bits and bytes, text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS : Types of operating systems, user interfaces, PC operating systems, network operating systems, types of software, programming languages, compiler and interpreter, program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES : Networking basics, uses of network, types of networks, network hardware, introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW : Internet's services, world wide web, browser setups, using search engine, email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY : The need of computer security, basic security concepts, threats of users, online spying tools, threats to data, cybercrime and protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours: 30

1. Demonstrate the personal computer peripherals and get a report on each peripheral.
2. Demonstrate the personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate network interface card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java development kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using analysis tool.

ACTIVITIES:

- *Prepare a report on various generations of computers and their peripherals.*
- *Disassemble and assemble of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an ethernet and configure the same.*
- *Prepare an MS word document.*
- *Prepare a spread sheet with various mathematical operations, charts, sorting etc.*
- *Make a report on power point presentation for the given topic.*

   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort and filter using powerpoint tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. P. Norton, “Introduction to Computers”, 7th edition, Tata-McGraw Hill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. E. Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGraw Hill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files and the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile and debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and usage of dynamic memory.
- understand the usage of files and structures.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static and dynamic memory allocation.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO C PROGRAMMING : Structure of C program- comments, processor statement, function header statement, variable declaration statement and executable statement; C character set - constants, identifiers, operators, punctuations, keywords, modifiers, identifiers, variables, c scopes, basic data types, type qualifiers, storage classes, reading and writing characters and formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS : Operators- assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, size of, dot, arrow and parentheses operators; Expressions precedence of operators and associative rules; Control statements- category of statements, selection, iteration, jump, label, expression and block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS : Function- declaration, prototype, definition, calling by value and call by address, standard library functions and recursive functions; Array- declaration, initialization, reading, writing, accessing and passing as a parameter to functions, 2D-arrays and multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS : Strings- declaration, string library functions, array of strings and command line arguments; Pointers- declaration, initializing pointers, multiple indirection, relationship between arrays and pointers; Scaling up- array of arrays, array of pointers, pointer to a pointer, pointer to an array; pointer to functions and dynamic memory allocation functions.

UNIT - 5 **L-9, T-3**

STRUCTURES AND FILES : Structures - declaration, initialization and accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- choose programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours: 30

1. Compute the factors of a number.
2. Compute the average of 'n' numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0’s and 1’s as input and the array should consist of all 0’s first and then 1’s.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student’s information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

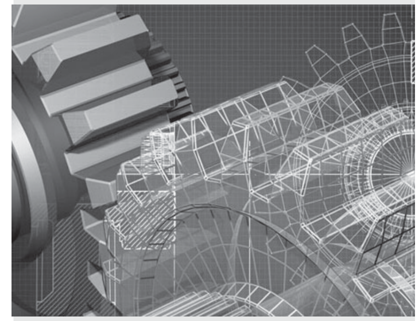
TEXT BOOK:

1. A. Mittal, “Programming in C - A Practical Approach”, Pearson Education, India, 2015

REFERENCE BOOKS:

1. R. Thareja, “Introduction to C Programming”, 2nd edition, Oxford University Press India, 2015.
2. C. H. Schildt, “The Complete Reference”, 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, “Programming in ANSI C”, 4th edition, Tata McGraw-Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a lighting scheme for specific working environment.*

✓ *Design a composition of hHeating element for a particular application.*

✓ *Troubleshoot issues relating to immersion heater and induction heater.*

✓ *Provide an earthing for domestic outlet.*

✓ *Select, configure and maintain a few engineering appliances such as TV, radio, telephone, mobile phone, wifi router, micro oven, PA system, etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassemble and Assemble of Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design Electric Wiring system for a prototype house.*
- *Design UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of air-conditioner and refrigerator- components, assembly and disassembly, working principle of centrifugal and reciprocating pumps; Types, parts and applications, working principle of screw jack and its components; Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS : General, qualities and classification of bricks; Tests for bricks; Size and weight of bricks;

Timber- definition, qualities of good timber, decay of timber and advantages of timber in construction.

CEMENTS : Types and composition of cement, setting of cement, tests for physical properties of

cement, and different grades of cement.

AGGREGATES : Classification of aggregates, source, size and shape of aggregates; Tests for aggregates.

STEEL: Types of steel, physical properties and mechanical properties of steel.

Simple layout design, paints, tiles, fittings, ventilation, furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS : Overview of power system structure; Conventional and non conventional generations - types of turbines, generators, substations, towers, earthing procedure, protection schemes, single phase and three phase systems.

Methods of electrical wiring systems - wiring procedure and calculations; Wiring methods.

Uninterruptible power supply (UPS)- components in UPS, its functionality and calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT : Light energy, evolution of light sources, working of incandescent, fluorescent, MV, SV and LED lamps, comparison and applications.

HEAT : Heat energy, modes of heat transfer, resistance and induction heating, comparison and applications.

MOTOR : Electric motors, classification, construction and working principles of motors used in domestic applications, mixer grinder, ceiling and exhaust fan, hair dryer, washing machine, water pump, air coolers, vacuum cleaner, computer cooling motor and electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, radio, remote control, telephone, microwave oven, cell phone, PA system, induction stove, wifi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box.
13. Ceiling Fan and Mixer.
14. Television

15 Radio

16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, “Concrete Technology”, 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition., Charotar Publishing House, Anad, 2009.
3. Govindasamy, A. Ramesh et al, “Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu Textbook Corporation, 2010.
4. Janakaraj, A Sumathi et al, “Electrical engineering - Electrical machines and Appliances Theory”, 1 st edition, Tamilnadu Textbook Corporation, 2011.
5. M. Brain, “How Stuff Works”, 1 st edition, John Wiley and Sons, 2001.
6. P. Kumar, “Basic Mechanical Engineering”, 1 st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. Students will strengthen their comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to :

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

- ✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*
- ✓ *Read and extract information from different texts & draw inferences by understanding elements like tone and transitional words.*
- ✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*
- ✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

Functions : Introducing self/others; Expressing needs/feelings/opinions (SWOT Analysis)

Skill Focus:

Reading	–	Understanding factual information
Writing	–	Word order and sentence formation
Listening	–	Decoding for meaning following elements of stress, intonation and accent
Speaking	–	Articulating syllables clearly, speaking fluently with correct pronunciation
Vocabulary	–	Discerning to use right word for the given context
Grammar	–	Spellings, use of nouns, adjectives, verbs, prepositions in the sentence structure

Practice : Objective PET Units 1 - 6

UNIT - 2 **P-6**

Functions : Defining and describing people, places, things and process.

Skill Focus:

Reading	–	Inferences from sentences and short messages – true/false
Writing	–	Rewording, sentence transformation and convincing
Listening	–	Understanding the short messages and conversations
Speaking	–	Role plays and short conversations
Vocabulary / Grammar	–	Use of adjectives/adverbs, comparatives and superlatives

Practice : Objective PET Units 7 – 12

UNIT - 3 **P-6**

Functions : Describing spatial and temporal relations; Giving directions/ instructions

Skill Focus :

Reading	–	Reading between the lines, inferences, true/false
Writing	–	Developing hints - Writing short messages/paragraphs
Listening	–	Searching for factual information - Gap filling
Speaking	–	Snap talks, JAM and elocution

Vocabulary / Grammar – Prepositions, phrasal verbs; PET word list

Practice: Objective PET Units 13 - 18

UNIT - 4 **P-6**

Functions : Narrating, predicting, negotiating and planning

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Skill Focus:

Reading – Reading for evaluation and appreciation, comprehension

Writing – Letters – e-mails – 7 C's

Listening – Following long conversations/interviews

Speaking – Discussions, debate and descriptions

Vocabulary / Grammar – Modals, conditionals and verb forms (time and tense)

Practice : Objective PET Units 19 – 24

UNIT - 5 **P-6**

Functions : Requesting, denying, suggesting and persuading

Skill Focus:

Reading – Understanding factual information

Writing – Short stories and explanatory paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements and presentations

Vocabulary / Grammar – Punctuation and cloze tests

Practice : Objective PET Units 25 – 30

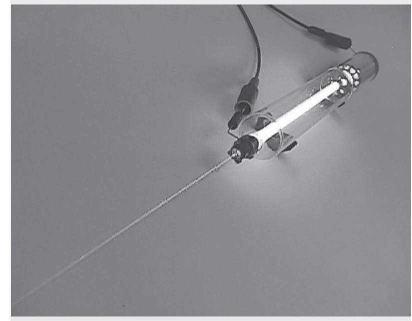
TEXT BOOK:

1. L. Hashemi and B. Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. A. Capel and R. Nixon, "Introduction to PET", Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Description and Objectives:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the following experiments.The students have to perform at least 10 experiments from the list of experiments.

Course Outcomes:

The student will be able to :

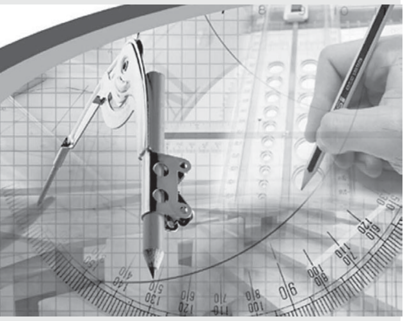
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory, thermal conductivity by conducting experiments of field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of velocity of ultrasonic waves in liquids.
2. Melde's experiment - transverse and longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect.

REFERENCE BOOKS :

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics Laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS106 BASIC MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

This course offers basic concepts on matrices, system of equations, differential equations of first and higher order. Further, numerical methods to solve differential equations are introduced.

The objective of the course is to provide the knowledge on the properties of matrices and solving system of equations using matrices. It is also aimed to offer various methods (analytical as well as numerical) to solve first and second order ordinary differential equations.

Course Outcomes:

The student will be able to :

- understand the basic concepts, properties and operations on matrices.
- determine when a system of equations is consistent or not and solve it whenever possible.
- determine when the matrix has an inverse and find it when it exists.
- identify the method to solve the differential equations.
- find the complete solution of a homogeneous and non homogenerous differential equations with constant coefficients.
- evaluate integrals and solving differential equations using numerical methods.
- compare the solutions of differential equations by numerical methods with exact solution of that equation using MATLAB.

SKILLS:

✓ *Compare the inverse of matrix.*

✓ *Solve given system of linear equations.*

✓ *Solve given differential equations.*

Unit - 1 **L-9, T-3**

MATRICES: Definition, types of matrices, algebra of matrices, determinant, minor, cofactor, adjoint, and inverse of a matrix; Elementary row operations, inverse by row operations, rank, determination of rank using Echelon form and normal form.

Unit - 2 **L-9, T-3**

SYSTEM OF EQUATIONS: System of linear equations, consistency of system of equations, solution by Cramer's rule, matrix inversion method, Gauss-Jordan method and Gauss elimination method.

Unit - 3 **L-9, T-3**

FIRST ORDER ORDINARY DIFFERENTIAL: Introduction, variable separable, linear equations, Bernoulli equation, homogenous equations and non-homogenous equations.

Unit - 4 **L-9, T-3**

SECOND ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations of second order with constant coefficients with RHS of type e^{ax}, $\sin ax$, $\cos ax$, x^n.

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS - II: Numerical integration by trapezoidal rule and Simpson's rules; Numerical solutions to Differential equations - Euler's method and Runga-Kutte method.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Matrix algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's rule).
5. System of equations (Matrix inversion method).
6. Solutions of first order ODE.
7. Trapezoidal rule.
8. Simpson's one-third rule.
9. Simpson's three-eight rule.
10. Euler's method.
11. RK Method.

TEXT BOOKS :

1. H. K. Dass and Er. R. Verma, “Higher Engineering Mathematics”, S. Chand and Co., 3rd edition, 2014.
2. B. S. Grawel, “Engineering Mathematics”, Khanna Publishers, 44th edition, 2014.

Reference BookS :

1. K. S. Rao, “Numerical Methods”, 3rd edition, PHI Publishers, 2007.
2. R. Pratap, “Getting started with MatLab”, Oxford University Publication, 2009.

ACTIVITIES:

- *Compute the inverse of matrix and compare with MATLAB output.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Solve given differential equations and compare with MATLAB output.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to :

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

✓ *Analyse the total hardness of water sample.*

✓ *Understand the basic principles involved in various batteries.*

✓ *Understand the mechanisms of corrosion and various controlling methods.*

✓ *Synthesize various polymers.*

✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L- 9**

WATER TECHNOLOGY : Introduction, WHO, BIS standards of water; Hardness of water-determination of hardness by EDTA (numerical problems), disadvantages of hard water, scales and sludges, caustic embrittlement, boiler corrosion, priming and foaming; Softening methods - zeolite process, ion exchange process; Desalination of brackish water- reverse osmosis and electrodialysis.

UNIT - 2 **L- 9**

ELECTRO CHEMISTRY: Electrode potential; Electrochemical series; Nernst equation; Reference electrodes - Calomel and standard hydrogen electrode, ion selective electrode and glass electrode; Determination of pH by pH meter, primary cell and secondary cell (lead-acid storage cell and lithium ion battery); Fuel cell - hydrogen oxygen and methanol oxygen.

UNIT - 2 **L- 9**

SCIENCE OF CORROSION : Introduction, dry corrosion, wet corrosion and mechanisms of wet corrosion; Bimetallic corrosion - concentration cell corrosion; Factors influencing the rate of corrosion; Corrosion control methods - cathodic protection, electroplating, electrolessplating and corrosion inhibitors.

UNIT - 4 **L- 9**

POLYMERS: Introduction; Types of polymerization - preparation, properties and applications of polyethylene, PVC, teflon, bakelite, urea, formaldehyde and silicones; Rubber – vulcanization; Synthetic rubbers - buna-S, buna-N and neoprene; Introduction to conducting polymers - poly thiophene.

UNIT - 5 **L- 9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV - Visible Spectroscopy, Beer - Lambert's law, qualitative and quantitative analysis; Block diagram of UV-Visible spectrophotometer; IR Spectroscopy - types of vibrations and block diagram of IR spectrophotometer.

TEXT BOOKS :

1. P.C Jain and M. Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. S. Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and M. Chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and DeMerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. G. Raj and C. Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
5. J.D. Bares, M.Thomas, B. S. Sankar, J.Mendham and R.C Denney, "Vogel's Text book of Qualitative Chemical Analysis", 6th edition, Pearson Publications, 2009.
6. Dr.S. Rattan, "Experiments in Applied Chemistry", S.K. Kataria and Sons Publications, 2008.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an "International language of Engineers". It is the most effective method of communicating technical ideas in 2D and 3D format.

Course Outcomes:

The student will be able to :

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*

✓ *Draw geometrical objects like polygons, solids of different types.*

✓ *Visualize the objects in real time situations.*

✓ *Develop 3D views (isometric views).*

UNIT - 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Introduction to engineering drawing- types of lines, lettering, dimensioning, construction of polygon and conics (ellipse, parabola and hyperbola by general method) and ellipse by oblong method.

UNIT - 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection-planes of projections, projections of points, projection of straight lines; Inclined to one plane and both the planes; Projections of planes; Simple planes; Planes inclined to one reference planes.

UNIT - 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, pyramids, cylinders, cones and solid axis inclined to one plane.

UNIT - 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects; Isometric view of prisms; Pyramids; Cone and cylinder; Simple orthographic views into isometric views through AutoCAD.

UNIT - 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS :

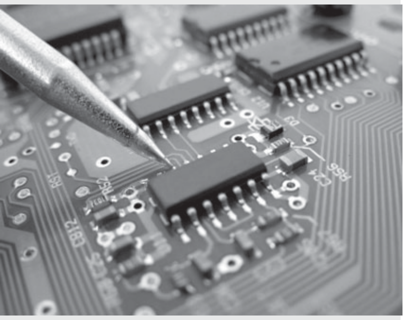
1. N.D.Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. B.Agrawal and C.M.Agrawal, "Engineering Drawing" , 2nd edition, Tata McGraw Hill, 2014.

REFERENCE BOOKS :

1. J. Hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both DC and AC machines. It also deals with the basic electronic components like P-N junction Diode, Zener diode, transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT - 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts; Concepts of network- active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law; Kirchhoff's Laws; Application to simple series, parallel circuits, mesh and nodal analysis of simple resistive circuits (simple numerical problems).

UNIT - 2 **L-9**

FUNDAMENTALS OF AC CIRCUITS: Generation of AC voltage - frequency, average value, RMS value, form factor, peak factor for sinusoidal only; Phasor representation of alternating quantities; Analysis of simple series and parallel AC circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (elementary treatment only).

UNIT - 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of magneto motive force, reluctance, flux and flux density, concept of self Inductance and mutual Inductance, coefficient of coupling (only elementary treatment and simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, constructional features, EMF equation (simple numerical problems).

UNIT - 4 **L-9**

DC MACHINES: Constructional details of a DC machine, DC generator, principle of operation; EMF equation, types of DC generators (simple numerical problems).

DC motor- principle of operation, torque equation, types of DC motors (simple numerical problems)

AC MACHINES: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, torque equation, constructional details of synchronous machine.

UNIT - 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory; Intrinsic and extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics; Half and full wave rectifiers; Zener diode and its characteristics; Voltage regulator; Bi polar junction transistor, operation, types and applications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of half wave rectifier without filter.
10. Implementation of full wave rectifier without filter.

ACTIVITIES:

- *Decode the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

TEXT BOOKS:

1. V.K. Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P. Kothari, “Basic Electrical and Electronics Engineering”, 1st edition, TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman and Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, “Electrical Technology”, Vol– II, S. Chand Publications, 2007.
3. U. Bakshi and A. Bakshi, “Basic Electrical Engineering”, 1st edition, Technical Publications, Pune, 2005.

WEB LINKS:

1. http://nptel.ac.in/courses/108108076/
2. https://books.google.co.in/books/about
   Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to :

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of total alkalinity of water.
2. Estimation of total hardness of water.
3. Find the percentage of available chlorine in bleaching powder.
4. Estimation of Fe (II) by dichrometry method.
5. Preparation of phenol - formaldehyde resin.
6. Synthesis of urea- formaldehyde resin.
7. Estimation of concentration of acid by pH metry.
8. Determination of strength of acid by conductometry.
9. Measurement of Mn^{+7} by colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-visible spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS :

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.S. Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Volume I, Pearson Publications, 2009.
2. Dr. S. Rattan, “Experiments in Applied Chemistry”, S.K. Kataria and Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	-	4	-

Course Description and Objectives:

Environmental science and technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to :

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES : Environmental Studies- definition, scope and its importance; Need for public awareness, natural resources, forest resources and deforestation; Water resources - properties and conflicts; Mineral resources - extraction and impacts; Food resources - modern agriculture methods, fertilizer-pesticide problems, water logging and salinity; Energy resources - renewable and non-renewable energy resources, harness technology, solar energy technologies; Land resources - land degradation, soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY : Ecosystem - concept, structure and functions of an ecosystem; Food chains, food webs, ecological pyramids, energy flow, energy regulation and succession; Biogeochemical cycles; Aquatic ecosystems; Biodiversity - introduction, bio-geographical classification, values of biodiversity, biodiversity at global, national and local levels, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India and conservation of biodiversity.

UNIT - 3 **L -6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY : Solid waste management - causes, effects and control measures of municipal and industrial wastes; Pollution - air, water, thermal, soil and noise pollutions; Role of an individual in prevention of pollution; Remote sensing / GIS - introduction, definitions, applications of the remote sensing; Innovative practices-objectives, innovative practices in agriculture, forest-community and bio-villages; Green technology for sustainable development, life cycle assessment and its concept.

UNIT - 4 **L -6**

SOCIAL ISSUES AND EIA : Sustainable development, water conservation, cloud seeding, rainwater harvesting methods, watershed management, global warming, acid rain, ozone layer depletion; Environmental legislation; wildlife protection act, water act, forest conservation act, air act, environmental protection act; Environmental impact assssment (EIA) - introduction, definition of EIA and EIS, scope and objectives, importance of EIA in proposed projects/industry/developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION : Food sanitation **-** food and drugs act, food preservations, milk sanitation, tests for milk, pasteurization of the milk; Water, air, soil and food borne diseases; Maintenance of sanitary and hygienic conditions; Role of youth in the development; Promoting activities -youth as initiators and activities; Field work/environmental visit - visit to a local area to document environmental assets river/ forest/grassland/hill/mountain; Study of local environment - common plants, insects, birds; Study of simple ecosystems - pond, river, hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

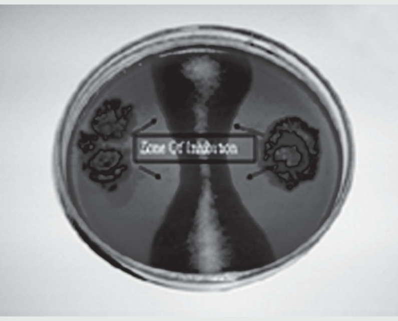
1. A. Kaushik and C.P. Kaushik, "Perspectives in Environmental Studies", 5th edition, 2016.
2. B. Joseph, "Environmental studies", 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, "A Text book of Environmental Studies", HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, "A Text book of environmental science and Technology", B S Publications, 2008.
3. Dr. K. Mukkanti, "A Text book of Environmental Studies", S.Chand and Company Ltd, 2009.
4. EHILRS and ST, "Text book of Municipal and Rural Sanitation", M.S Hill, 1998.
5. C. S. Rao, "Environmental Pollution Control Engineering", New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, "Introduction to Remote Sensing", B S Publications, 2004.
7. K. Joseph and R.Nagendram, "Essentials of environmental studies", Pearson Education Pt Ltd, Delhi, 2007. Education Pt Ltd, Delhi, 2007.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management- 3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*



Source:
Prof. S. Krupanidhi, HoD, BT

16BT102 BIOPRODUCTS AND BIOENTREPRENEURSHIP

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
5	45	2	12	2	5

Course Description and Objectives:

The course offers knowledge on various bio-products and their marketing. The objective of the course is to create awareness on a wide array of biologically derived products. In addition, it also encourages students to explore entrepreneurship in the arena of bioproducts.

Course Outcomes:

The student will be able to:

- gain insights on a wide range of bioproducts viz., biofuels, biomaterials, biochemicals of therapeutic and nutritional importance.
- analyse and perceive green entrepreneurship and bioproduct market.

SKILLS:

✓ *Evaluate the scope for bioentrepreneurship.*

✓ *Recycle and reuse biowaste.*

✓ *Design small scale industry setup.*

✓ *Analyze bioproducts market trend.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO BIOPRODUCTS: Definition of bioproducts; Categories of bioproducts; Importance of bioproducts; Bioproducts industry - strategies and action plans, global trends and current situation; Bioproducts used for decoration; Biofertilisers; Examples of clonal propagation of plants; Socio-economic and environmental impact of bioproducts.

UNIT - 2 **L-9, T-3**

ENERGY RELATED BIOPRODUCTS: Liquid fuels - ethanol and biodiesel; Carbon neutrality; Conversion mechanisms; Solid biomass for combustion to generate heat and power; Gaseous fuel such as biogas; Renewable energy opportunities for Indian entrepreneurs.

UNIT - 3 **L-9, T-3**

BIOMATERIALS: Bioplastics from plant oils and sugars; Biofoams and biorubber from plant oils and latex; Biocomposites manufactured from agricultural (e.g., hemp, flax, kenaf) and forestry; Biofibres.

UNIT - 4 **L-9, T-3**

BIOCHEMICALS: Industrial - basic and specific chemicals, resins, lubricants and solvents; Pharmaceuticals - examples of monoclonal therapeutic antibodies, interleukins, enzymes (therapeutic and detergent), hormones and vaccines; Antibiotics; Omega 3 fatty acids; Biocosmetics - soaps, body creams and lotions; Biorepellents - case study; Trichoderma.

UNIT - 5 **L-9, T-3**

ENTREPRENEURSHIP RELATED TO BIOPRODUCTS: Entrepreneurship ecosystem and bioeconomy; Perception and analysis of green entrepreneurship ecosystem by its stakeholders; Green entrepreneurship - case studies; Bioproducts manufacturers and suppliers in India.

TEXT BOOKS :

1. N.T. Dunford, “Food and industrial bioproducts and bioprocessing”, Wiley-Blackwell publishers, 2012.

2. J.C. Philp and K.C. Pavanan, “Perspectives- bio-based production in a bioeconomy”, Asian Biotechnology and Development Review, Vol. 15, No.2, pp 81-88, 2012.

REFERENCE BOOKS :

1. J. W. Lee, "Advanced Biofuels and Bioproducts", Springer New York, 2013.

2. C. T. Hou and J.F. Shaw, "Biocatalysis and Bioenergy", Wiley publishers, 2008.

ACTIVITIES:

- *Models on renewable energy- biomass, biofuels, biogas.*
- *Prepare vermicompost.*
- *Case studies on green entrepreneurship.*

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	45	-	-	-	20	-	-

Course Description and Objectives:

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes:

The student will be able to :

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows, etc.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs, etc.*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims, etc.*
- ✓ *CNC machines and various machining operations and processes.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin Smithy and Black Smithy.
4. House Wiring.
5. Foundry and Welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS :

1. S.K. Hazra Choudhury, "Elements of workshop Technology", 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice: Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

16HS202 PROBABILITY AND STATISTICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	35	4	10	2	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation and regression and their applications, probability, theoretical distributions and testing of hypothesis. The objective of this course is to enable the student to understand and apply statistical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L-9, T-3**

STATISTICS: Basic Definitions, Frequencies, Graphical representation, Histogram, Ogive curves, Measures of central tendency, Arithmetic mean, Median, Mode, Mean deviation, Standard deviation, Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT - 2 **L-9, T-3**

CURVE FITTING, CORRELATION & REGRESSION : Least squares method, Curve fitting (straight line and parabola only). Covariance, Correlation, Types, Pearson's coefficient of correlation, Rank correlation, Spearman's rank correlation. Regression, Regression lines.

UNIT - 3 **L-8, T-3**

PROBABILITY : Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L-8, T-3**

DISTRIBUTIONS: Random variables, Discrete and Continuous variables, Introduction to Distributions.

BINOMIAL DISTRIBUTION : Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION : Definition, Mean and Standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION : Definition, Normal curve, Mean and Standard deviation, Median, Mode, Normal Distribution applications.

UNIT - 5 **L-12, T-3**

SAMPLING METHODS : Population and Sampling, Parameters and Statistics, Types of sampling. Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion, T-distribution for small sample, difference between means of small sample, Chi square test for goodness of fit, Chi square test for test of independence.

TEXT BOOKS:

1. Miller and Freund, "Probability and Statistics for engineers", 8th edition, Pearson publishers, 2013.
2. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", S. Chand & Co., Third edition, 2014.

REFERENCE BOOK:

1. *S.C. Gupta* and *V.K. Kapoor*, "Fundamentals of Mathematical Statistics", Sultan Chand & Co., New Delhi, 2005.

16MS201 MANAGEMENT SCIENCE

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	5	5	-	-

Course Description and Objectives:

This course offers the framework for improving managerial skills and leadership qualities. The objective of the course is to provide skills related to making decisions, organization structure, production operations, marketing, human resource management, product management and other management strategies.

Course Outcomes:

The student will be able to :

- understand the nature and importance of managerial skills.
- identify the significance of Operations Management.
- carry out production operations in an effective manner through work study, time study etc.
- understand the current develoments in market variations, customer requirements and competitions stagegies.
- plan and control the HR function effectively.

SKILLS :

✓ *Improve productivity and marketing through production, sales and time management techniques.*

✓ *Create better ambience in the shop floor using better interpersonal relationship.*

✓ *Conduct / organise meetings, seminars and conferences in a professional manner.*

✓ *Effective managment of human resources.*

ACTIVITIES:

- *Identify various operational functions of management using case studies.*
- *Analyze and improve marketing stategies.*
- *Estimate human resources requirement and understand the interpersonal relationships in industries.*

UNIT - 1 **L-9**

INTRODUCTION TO MANAGEMENT: Concepts of Management and organization; nature, importance and Functions of Management; Systems approach to Management; Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Leadership Styles, Social responsibilities of Management.

UNIT - 2 **L-9**

OPERATIONS MANAGEMENT: Principles and Types of Plant Layout; Methods of production (Job, Batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement

UNIT - 3 **L-9**

MATERIALS MANAGEMENT AND STATISTICAL QUALITY CONTROL: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records; **Statistical Quality Control**: control charts for variables and attributes (simple Problems), Acceptance Sampling

UNIT - 4 **L-9**

HUMAN RESOURCES MANAGEMENT (HRM): Concepts of HRM, Basic functions of HR Manager; Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT - 5 **L-9**

MARKETING MANAGEMENT: Evolution of Marketing, Functions of Marketing Selling Vs Marketing; 4 P's of Marketing – Product Mix, Product Life Cycle, Place Mix – Channels of Distribution, Price Mix – Pricing Methods, Promotion Mix, Tools of Promotions.

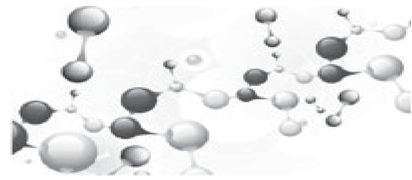
TEXT BOOKS :

1. P. Vijay Kumar, N. Appa Rao and A. Chnalill, "Introduction to Management Science" Cengage Learning India, 2012.
2. Stoner, Freeman and Gilbert, "*Management*", 6th edition, Pearson Education, New Delhi, 2004.

REFERENCE BOOKS :

1. K. Philip and K. Kevin. Lane, "Marketing Mangement" 12th edition, PHI, 2005.
2. Koontz and Weihrich, "Essentials of Management", 6th edition, TMH, 2005.

16BT201 BIOCHEMISTRY



Source:
www.medipharmlab.com/

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	50	-	8	2	2

Course Description and Objectives:

This course provides various chemical processes associated with living cell machinery. In addition, it offers a clear-cut idea about various molecular mechanisms, metabolic pathways and biochemical processes regulating the production of energy for the functioning of cells. The objective of this course is to familiarize students on the complex structures of biomolecules, their synthesis, interaction and metabolism.

Course Outcomes:

The student will be able to

- understand the structures and functions of biological molecules and interactions between them.
- gain sufficient insights into redox biochemistry.
- acquire adequate knowledge on various pathways in intermediary metabolism and bioenergetics.
- judge whether a proposed or hypothetical reaction is consistent with the general framework of catabolic and anabolic metabolism.
- assess how common foodsstuffs are turned into metabolic energy and predict the energy levels of different classes of biomolecules.

SKILLS:

✓ *Identify biomolecules by colorimetric and biochemical assays.*

✓ *Quantify macromolecules using UV-VIS Spectrophotometer.*

✓ *Proficiency in paper, thin layer and gel chromatographic techniques.*

✓ *Operation of HPLC.*

ACTIVITIES:

- *Analyze bio-molecules in food samples.*
- *Estimate macromolecules in biological fluids.*
- *Model exercises on building structures of macromolecules.*

UNIT - 1 **L-9**

CARBOHYDRATES: Structure and properties of mono-, di-, oligo- and polysaccharides, complex carbohydrates; Confirmation of pyranose and furanose ring, glycosidic bond; Structure and function of glycogen, starch, dextran, cellulose, glycoproteins, glycosaminoglycans and lectins.

UNIT - 2 **L-9**

BIOENERGETICS AND METABOLISM OF CARBOHYDRATE: Aerobic and anaerobic respiration-glycolysis, glucogenesis, glycogenolysis and gluconeogenesis; Entner–Doudoroff (ED) pathway; Pentose phosphate shunt and TCA cycle.

UNIT - 3 **L-9**

METABOLISM OF AMINO ACIDS: Amino acids - classifications, physico-chemical properties; Protein structure, folding and function; Nitrogen cycle; Nitrogen balance; Reductive amination; Transamination and urea cycle; Synthesis of amino acids - glutamate pathway, serine pathway and shikimate pathway.

UNIT - 4 **L-9**

LIPIDS AND THEIR METABOLISM: Classification, structure and roles of fatty acids; Synthesis and breakdown of fatty acid; Synthesis and metabolism of triglycerides; Cholesterol structure and function; Lipoproteins - classification and function.

UNIT - 5 **L-9**

NUCLEIC ACIDS AND INTERMEDIARY METABOLISM: Structure and properties of purines, pyrimidines, nucleosides and nucleotides; Biosynthesis and degradation of nucleic acids; Interconnection of pathways and metabolic regulation.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Preparation of buffers and pH measurement.
2. Qualitative and quantitative tests for carbohydrates by 3,5-dinitro salicylic acid (DNS) method.
3. Qualitative and quantitative tests for amino acids.
4. Protein estimation by Biuret / Lowry / Bradford methods.
5. Separation of different macromolecules by paper and thin layer chromatography.
6. Extraction of lipids through solvents.
7. Analysis of cholesterol by Zak method.
8. Estimation of RNA by Orcinol methods.
9. Separation of proteins by electrophoresis.

TEXT BOOKS:

1. A.L. Lehninger, O.L. Nelson and M.M. Cox , "Principles of Biochemistry" 3rd edition, CBS Publications, 2005.

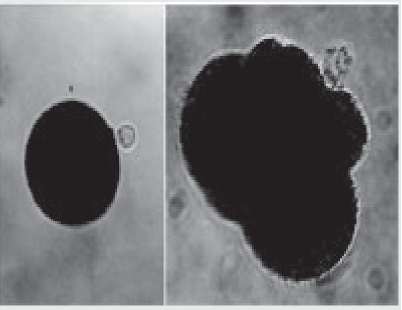
2. J.L. Jain , "Fundamentals of Biochemistry ", 7th edition, S. Chand Publishers, 2009.

REFERENCE BOOKS:

1. L. Stryer, J.M. Berg and J.L. Tymockzo, "Biochemistry" 5th edition, WH Freemen and Co., 2002.

2. K. Mathews, K.E. Van Holde, K. G. A. Hern, "Biochemistry", 3rd edition, Pearson education, 2005.

3. K. Wilson and J. Walker, “Techniques of Practical Biochemistry", 5th edition, Cambridge University Press, 2000.



Source:
Prof. S. Krupanidhi, HoD, BT

16BT202 CELL BIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	50	-	12	2	3

Course Description and objectives:

This course provides an understanding of various cell organelles, their functions and inter-organellar interactions. The objective of the course is to impart knowledge on complexity involved in cell signaling and cell cycle. In addition, laboratory experiments are designed to familiarize students with the functioning of cell and its organelles.

Course Outcomes:

The student will be able to

- understand the basic structure of cell and their organelles.
- acquire knowledge on cell cycle and its regulation.
- possess in-depth knowledge on *in-vitro* fertilization.
- understand embryo and organ formation.

SKILLS:

✓ *Differentiate various blood cells for hematological profile.*

✓ *Identify various stages of cell division and differentiation.*

✓ *Handle fluorescence microscope.*

Unit - 1 **L-9**

STRUCTURE OF CELLS: Structure of prokaryotic and eukaryotic cells; Overview of organelles-mitochondria, chloroplasts, endoplasmic reticulum, golgi complex, nucleus; Cytoskeletal proteins - contractile proteins - actin, myosin and nebulin.

Unit - 2 **L-9**

TRANSPORT ACROSS CELL MEMBRANES: Organization of plasma membrane; Passive and active transport; Na-K pump; Ca^{2+} ATPase pump; Lysosomal and vacuolar membrane; ATP dependent proton pumps - cotransport, symport, anti-port, ion-gated and ligand gated channels; Endocytosis and exocytosis.

Unit - 3 **L-9**

REGULATION OF CELL CYCLE AND CANCER: Cell division- mitosis and meiosis; Cell cycle and regulation; Cancer- types, development and causes; Mutagenesis - tumor suppressor genes and oncogenes.

Unit - 4 **L-9**

CELL SIGNALING: Intracellular signaling; Types of signal receptors; Signal transduction by hormones - steroid/peptide hormones; secondary messengers - cAMP, cGMP, protein kinases; G Proteins - receptor mediated tyrosine kinases.

UNIT - 5 **L-9**

GAMETE BIOLOGY: Heterogamy in eukaryotes; Leydig cells- morphology and differentiation; Spermatogenesis; Semen formation; Sperm bank; Artificial insemination; *in vitro* fertilization; Stages of development - zygote, blastula, gastrula and neurula.

LABORATORY EXPERIMENTS

List of Experiments Total Hours-30

1. Media Preparation for *in vitro* animal cell culture and propagation.
2. Microscopic analysis of cells and cell organelles.
3. *In vitro* primary cell culture and maintenance.
4. Quantitative assessment of cell attachment to different surfaces.
5. Trypsinization of cells from cell culture plates.
6. Cell counting by Haemocytometer.
7. Passaging of cells for further culturing of cells *in vitro*.
8. Differential cell count by staining to differentiate between cell types.
9. Smear preparation for microscopy and immunohistochemistry.

TEXT BOOKS :

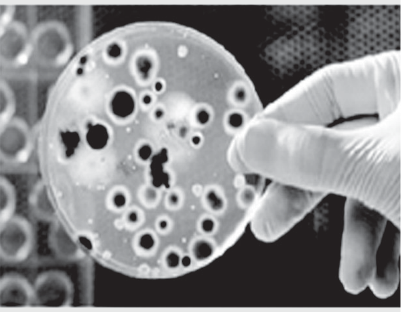
1. P. S. Verma and V.K. Agarwal, "Cell Biology, Genetics and Molecular Biology", S. Chand and company, New Delhi, 2000.
2. E.D.P. De Robertis and E.M.F. De Robertis, "Cell and Molecular Biology", 8th edition, B.I. Waverly Pvt. Ltd., New Delhi, 2006.
3. G.M. Cooper, “The Cell-A Molecular Approach", 3rd edition, Sinauer Publications, 2004.

REFERENCE BOOKS :

1. G. Karp, "Cell and Molecular Biology", 5th edition, Wiley Publishers, 2008.

ACTIVITIES:

- *Demonstrate various stages of chick embryo development.*
- *Culture different cell lines.*
- *Assess cell viability.*
- *Identify individual cell organelles by staining.*



Source: www.medipharmlab.com/

16BT203 MICROBIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	50	-	8	3	3

Course Description and Objectives:

This course provides the classification of microorganisms, culturing methods and their control. The objective of this course is to impart knowledge on scope and relevance of microbes and microscopic examination. In addition, the course also imparts knowledge on microbial genetics and genetically modified microbes suitable for industries.

Course Outcomes:

The student will be able to:

- maintain sterile conditions in microbiology laboratory.
- understand the principles of microscopy.
- understand the scope and historical developments in the field of microbiology.
- identify and classify the microorganisms based on various attributes.
- cultivate pure cultures using specific as well as enrichment media.

SKILLS:

✓ *Handle different microscopes.*

✓ *Isolate microbes.*

✓ *Differentiate between microbial species.*

✓ *Aseptic maintenance of lab and hood.*

✓ *Maintain stock cultures.*

UNIT - 1 **L-9**

INTRODUCTION TO MICROBIOLOGY: Discovery of microorganisms; Theory of spontaneous generation, Germ theory of diseases; Major contribution and events in the field of Microbiology; Scope and relevance of microbiology; Microscopy-types; Fixation of microorganisms; Principle dyes, principles of different staining techniques- simple staining, differential staining, spore staining, flagellar staining, acid fast and capsular staining.

UNIT - 2 **L-9**

MAJOR GROUPS OF MICROORGANISMS: Diversity classification proposed by Woese et al; Three Domains of life; Classification systems- phylogenetic, phenetic, genetic; Taxonomic ranks; Major characteristics used in taxonomy; Molecular approaches to microbial taxonomy.

UNIT - 3 **L-9**

NUTRITION FOR MICROORGANISMS: Nutritional classes of microbes, Macro and micronutrients, their sources and physiological functions of nutrients, growth factors and their functions in metabolism; Aerobic and anaerobic metabolism; Growth curve and kinetics.

CULTIVATION OF MICROORGANISMS: Culture media-synthetic and complex media; Solidifying agents; Types of media - selective, differential and enrichment media; Pure culture methods - spread plate, pour plate and streak plate; Special techniques for cultivation of anaerobes.

UNIT - 4 **L-9**

MICROBIAL DISEASES AND HOST PATHOGEN INTERACTION: Classification of infectious diseases; Emerging infectious diseases; Molecular basis of pathogenicity and identification methods; Human diseases caused by viruses, bacteria and fungi.

UNIT - 5 **L-9**

STERILIZATION AND CONTROL OF MICROORGANISMS: Sterilization processes- autoclaves, UV radiations, filter sterilization, disinfection; Physical agents - moist and dry heat; Chemical agents - characteristics and mode of action of antimicrobial agents; Classes of disinfectants - phenol, phenolics, alcohol, halogens (chlorine, chloramines, bromine, iodine, tinctures of iodine, iodophores), surfactants (soaps and detergents), alkylating agents (formaldehyde, glutaraldehyde, 3-propiolactone and ethylene oxide), heavy metals (mercury, silver and copper containing compounds); Evaluation of effectiveness of antimicrobial agents.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Sterilization techniques in microbiology: wet method, dry method and filter sterilization methods.
2. Study of Microscopes- dark field, bright field, phase contrast and fluorescence microscopy.
3. Microscopical identification of bacterial cells in permanent fixed slides.
4. Preparation of nutrient broth and agar for culturing *E. coli*.
5. Different inoculation methods of microorganisms in culture media.
6. Isolation of pure culture by streak plate and pour plate technique.
7. Gram staining of bacteria and observation under microscope.
8. Hanging drop method to observe bacterial motility.
9. Biochemical tests.

ACTIVITIES:

- *Isolate microbes from different sources – air, soil and water.*
- *Identify pathogens from local hospitals and dairy farms.*
- *Purify different strains of bacteria and fungi.*
- Carryout *sterilization processes.*

TEXT BOOKS:

1. L.M.Prescott, J.P. Harley and D.A.Klein, "Microbiology", 2nd edition, McGraw Hill, 2005.
2. A.Nigam and A. Ayyagari, "Lab manual in Biochemistry, Immunology and Biotechnology", 1st edition, Tata McGraw Hill, 2007.

REFERENCE BOOKS:

1. J.L.Ingraham and C.A.Ingraham, "Introduction to Microbiology - A Case History Approach" 3rd edition, Thomson Publications, 2004.
2. K.R. Aneja, "Experiments in Microbiology, Plant Pathology and Biotechnology", 4th edition, New Age International Publishers, 2007.
3. M.J.Pelczar, E.C.S.Chan and N.R. Krieg, "Microbiology", 5th edition, Tata McGraw Hill, 2006.

16CS254 SCRIPTING LANGUAGES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

CS	WA/RA	SSH	SA	S	BS
5	5	40	8	5	2

Course Description and Objective:

This course offers the concepts of scprting language Python. The objective of this course is to enable the students to understand design automation and testing tools using scrpting languages.

Course Outcomes:

The student will be able to:

- develop tools using Python.
- design of algorithms to retrieve information across various domains.
- implement advanced network applications.
- develop text processing and GUI applications.

Skills:

✓ *Design and develop applications for data processing, automation and testing in various domains such as web mining and semantic web.*

✓ *Develop and test web applications.*

✓ *Develop tools for network simulation.*

✓ *Create test scripts for automated testing of standalone and web applications.*

ACTIVITIES :

- *Implementation of data types such as scalars, arrays, lists using Python.*
- *Implementation of simple matching expressions using Python.*
- *Develop functions using Python.*
- *Finding the similarity of text documents.*

UNIT - 1 **L-9**

INTRODUCTION TO PROCEDURAL PROGRAMMING: Running python programs, data types, object references, collection data types, logical operations, control flow statements, arithmetic operators, input/output, creating and calling functions; Data types- identifiers and keywords, integral types, floating-point types and strings; Collection data types- sequence types, set types, mapping types, iterating and copying collections.

UNIT - 2 **L-8**

CONTROL STRUCTURES AND FUNCTIONS: Control structures, exception handling, custom functions; Modules- modules and packages, overview of python's standard library, string handling, command-line programming, mathematics and numbers, times and dates, algorithms and collection data types, file formats, encodings, and data persistence, file, directory and process handling; Networking and internet programming; XML.

UNIT - 3 **L-9**

OBJECT-ORIENTED PROGRAMMING: The object-oriented approach, custom classes, custom collection classes; File handling- writing and reading binary data, writing and parsing text files, writing and parsing XML files and random access binary files.

UNIT - 4 **L-10**

PROCESSES AND THREADING: Using the multiprocessing module, using the threading module; Networking- creating a TCP client and creating a TCP server; Database Programming - DBM databases and SQL databases.

UNIT - 5 **L-9**

REGULAR EXPRESSIONS: Python's regular expression language, characters and character classes, quantifiers, grouping and capturing, assertions and flags; The regular expression module. Introduction to GUI Programming - dialog-style programs, main-window-style programs, creating a main window and creating a custom dialog.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hrs:30

1. Program to print given string on the screen.
2. Accept a user name as string and wish the user like "Hello Vignan".
3. Read two integers and perform all arithmetic operations on those two numbers.
4. Develop a program to accept three numbers from user and find biggest, smallest and average of the same.
5. Print numbers from 1 to 100 using all types of loops.
6. Develop a function to display "Hello <<USER>>".
7. Compute factorial of a number.
8. Find the sum of first N numbers.
9. Compute sum of first N even numbers.
10. Find sum of first N odd numbers.

11. Print Fibonacci series up to a number.
12. Calculate square root of a number.
13. Handle divide by zero exception.
14. Demonstrate sequence type.
15. Demonstrate set type.
16. Create a dictionary of student data and search for a student.
17. Create a class called student and perform operations such as display, calculate percentage, add, delete and modify student data.
18. Find number of occurrences of distinct words from a text file.
19. Store student data such as Regd No., Name, Dept, Percentage, DOB in an XML file.
20. Program to create two threads.
21. Implement a program to connect to vignanuniversity.org and display number of bytes received.
22. Insert student data in a database.
23. Find all mobile numbers in a text file and store them in other file.

TEXT BOOKS:

1. M. Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language", 2nd edition, Addison Wesley, 2009.
2. M. Lutz, "Programming Python", 1st edition, O' rRielly, 2007.

REFERENCE BOOKS:

1. A. Martelli, "Python in a NutShell", 1st edition, O' Reilly, 2007.
2. M. Pilgrim, "Dive into Python 3", 1st edition, A PRESS, 2009.

Source:
www.sparticl.org

16BT205 GENETICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	0

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	1	10	2	2

Course Description and Objectives:

The course introduces basic principles of Mendelian laws of Genetics and organization of genetic material. It also describes fine structure and function of chromosomes. The objective of this course is to provide insight into Laws of inheritance, chromosomes, genetic aberrations, genetic linkage and extra-chromosomal inheritance.

Course outcomes:

The student will be able to:

- understand the genetic basis of heredity with appropriate examples.
- gain knowledge on organization of genetic material, chromosomes and their functions.
- know the basics of genetic linkage and genetic diseases.

SKILLS:

✓ *Solve genetics problems related to Mendelian Laws of inheritance.*

✓ *Disease mapping by pedigree.*

✓ *Karyotype human chromosome.*

✓ *Map chromosome.*

UNIT - 1 **L-9, T-3**

PHYSICAL BASIS OF HEREDITY: Historical perspectives of genetics; Mendelian laws/Basic laws of inheritance- monohybrid, dihybrid and trihybrid cross; Modification of Mendel's ratios due to gene interactions; Multiple alleles and lethality; Multiple factors of inheritance; The concept of linkage, crossing over and recombination; Two point, three-point test crosses and gene mapping; Probability in Mendelian inheritance.

UNIT - 2 **L-9, T-3**

GENETIC MATERIAL AND ITS ORGANIZATION: Identification of the genetic material; Classical experiments- Hershey-Chase, Avery–MacLeod–McCarty and Meselson-Stahl. Packing and organization of genetic material in prokaryotes and eukaryotes; Chromosome morphology, classification and karyotyping; Special chromosomes.

UNIT - 3 **L-9, T-3**

BACTERIAL GENETICS AND EXTRA CHROMOSOMAL INHERITANCE: Conjugation, transformation and transduction; Phages and their life cycles; Retroviruses; Introduction to extra chromosomal inheritance with examples; Petite phenotypes in yeast; Uniparental inheritance in algae.

UNIT - 4 **L-9, T-3**

GENE STRUCTURE AND MUTATIONS: Spontaneous and induced mutations; Selection of mutants- Ames test; Chromosomal aberrations; Fine structure of genes in prokaryotes and eukaryotes; Genetic control of development in Drosophila.

UNIT - 5 **L-9, T-3**

CONCEPTS OF HUMAN GENETICS (SEX DETERMINATION, LINKAGE AND DOMINANCE): Introduction - population genetics, eugenics and euthenics; Mechanisms of sex determination and differentiation; Sex influenced dominance; Sex linked inheritance and sex limited gene expression; Molecular basis of genetic diseases and applications.

TEXT BOOKS:

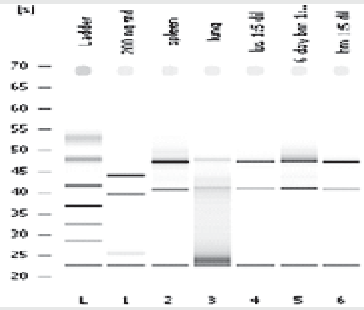
1. P.K. Gupta, "Genetics", 3rd edition, Rastogi Publications, 2005.
2. E. J. Gardner, M.J. Simmons and D. P. Snustad, "Principles of Genetics", 8th edition, Wiley India, 2007.

REFERENCE BOOKS:

1. M.W. Strickberger, "Genetics", 3rd edition, Prentice Hall of India Publications, 2006.
2. W. H. Elliott and D.C. Ellioit, "Biochemistry and Molecular Biology", 3rd edition, Oxford University Press, 2007.

ACTIVITIES:

- *Examine Mendelian Laws using pea plant by applying Punnett squares.*
- *Design Ames test to understand mutation.*
- *Solve the crossover problems using Drosophila as an example.*
- *Conduct conjugation experiment using E. coli model.*



Source:
Dr. D. Vijaya Ramu, BT, VU

16BT208 MOLECULAR BIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
6	50	-	8	2	-

Course Description and Objectives:

This course describes the structure, synthesis and processing of nucleic acids and protein synthesis in prokaryotes and eukaryotes. The objective of this course is to impart the concepts of genetic materials, central dogma, mutations and DNA repair.

Course Outcome:

The student will be able to

- learn the structure of genetic materials.
- understand the concepts of central dogma of life.
- understand biochemical synthesis and molecular processes that occur during cell growth.
- acquire concepts of genetic code.

SKILLS:

✓ *Determining purine-pyrimidine complementation.*

✓ *Handling of micro-pipette.*

✓ *Setting up chemical reactions in micro-volumes.*

✓ *Handling reagents, enzymes and biochemicals related to molecular biology.*

UNIT - 1 **L-9**

STRUCTURE OF DNA AND RNA: Discovery-structure of DNA; B, A and Z models; Denaturation and melting curves; m-RNA, r-RNA, t-RNA structures.

UNIT - 2 **L-9**

DNA REPLICATION: Models of DNA replication: semi-conservative model, mitochondrial (D-loop), viral DNA (Rolling circle); Single stranded- DNA phages (M13, phi-174); Mechanism of DNA replication in *E.coli* (bi- directional); Inhibitors of DNA replication; Enzymes involved in replication; Eukaryotic telomeres.

UNIT - 3 **L-9**

RNA BIOSYNTHESIS AND POST TRANSCRIPTIONAL PROCESSING: Transcription apparatus; Mechanism of transcription in prokaryotes and eukaryotes; RNA polymerases and proteins involved in transcription; Inhibitors of transcription; Post transcriptional processing of mRNA.

UNIT - 4 **L-9**

PROTEIN BIOSYNTHESIS IN PROKARYOTES AND EUKARYOTES: The genetic code and Wobble Hypothesis; Protein synthesis in prokaryotes and eukaryotes; Differences between prokaryotic and eukaryotic protein synthesis; Post translation modifications; Inhibitors of protein synthesis.

UNIT - 5 **L-9**

MUTAGENESIS: Types of mutagens and their actions; Types of mutations- spontaneous, induced and lethal; Characteristics of mutations and applications; Site- directed mutagenesis and reverse genetics; DNA damage and repair mechanisms; Nucleotide excision repair mechanisms; Mismatch repair mechanism and base excision repair mechanism.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total Hours-30

1. Isolation of genomic DNA from plants.
2. Isolation of genomic DNA from animals.
3. Isolation of genomic DNA from bacteria.
4. Quantification of DNA by UV Spectrophotometer.
5. Isolation of RNA.
6. Quantification of RNA by UV Spectrophotometer.
7. Agarose gel electrophoresis to visualize and quantify DNA isolated from bacteria, plants or animals.
8. SDS-PAGE technique for separation of proteins.
9. Staining of PAGE gels with Coomassie brilliant blue.
10. Staining of PAGE gels with silver nitrate.

ACTIVITIES:

- *model the double-helix of DNA using ball and stick kit.*
- *Identify complements, palindromes, loops and bends.*
- *Predict DNA complexity by gel electrophoresis.*
- *Amplify gene using PCR.*

TEXT BOOKS:

1. D. Freifelder, "Molecular Biology", 2nd Edition, Narosa Publishing Home 1987.
2. Channarayappa, "Molecular Biotechnology: Principles and Practices", 1st Edition, Universities Press, 2006.
3. M.R.Green and J. Sambrook. "Molecular Cloning: A Laboratory Manual", 4th Edition, Cold Spring Harbor Lab. 2013.

REFERENCE BOOKS:

1. H.Lodish, A. Berk, S.L. Zipursky, P. Matsudaira, D. Baltimore and J. Darnell, "Molecular Cell Biology", 6th edition, W.H. Freeman & Company, 2007.
2. J.E. Krebs, E.S. Goldstein, S.T. Kilpatrick, "Lewin's Genes XI", 11st Edition, 2015.

16BI201 BIOLOGICAL DATABASES

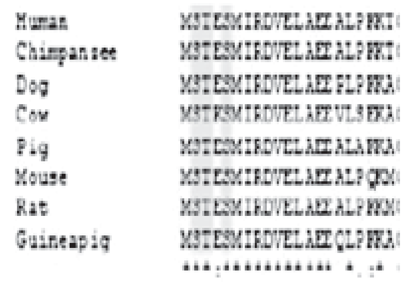
Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	50	-	8	2	5



Source:
Dr. D. Vijaya Ramu
BT, VU, Dirisala etal., (2015)
Mediators of Inflammation,
Article ID 619480.

Course Description and Objectives:

The course offers insights on concepts related to biological databases. The objective of this course is to provide knowledge on design, development and implementation of biological database systems.

Course Outcomes:

The student will be able to:

- understand the utility of database systems.
- perform various operations in structural databases.
- understand the role of various enzymes in metabolic pathways.

SKILLS:

✓ *Design model ontologies for biomedical data dependencies.*

✓ *Design systems biology databases.*

✓ *Design protein classification databases.*

ACTIVITIES:

- *Retrieve file formats of various public databases such as Genbank and PDB.*
- *Perform biomolecular sequence analysis.*
- *Perform biomolecular structure analysis.*

UNIT - 1 **L-9**

INTRODUCTION TO BIOINFORMATICS: Basic concepts of cell, gene, genome and genetic code; Central dogma; Nucleic acids and proteins; Biological sequence data; Need for biological databases.

UNIT - 2 **L-9**

SEQUENCE DATABASES: Nucleotide databases - Genbank, DDBJ, EMBL, NCBI; Protein sequence databases- PIR, SWISSPROT, TrEMBL.

UNIT - 3 **L-9**

STRUCTURAL DATABASES: Secondary,tertiary and quarternary structures of proteins; Ramachandran plot; Databases - PDB, SCOP, CATH, SSEP, CADB, THGS, SMS, Pfam and GDB.

UNIT - 4 **L-9**

PATHWAY DATABASES: Role of enzymes in biochemical pathways; Enzyme databases - MEROPS, BRENDA and EXPASY; Pathway databases - CAZy and KEGG; Disease databases and literature databases - EXPLORE ENZ.

UNIT - 5 **L-9**

SPECIAL TOPICS IN BIOINFORMATICS: New directions of bioinformatics research; essential prerequisites; Scope of bioinformatics; Application of bioinformatics in pharmacy and IT industries.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

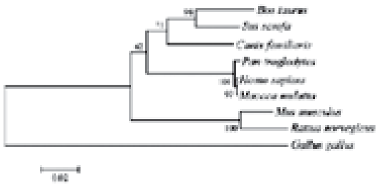
1. GenBank- Retrieval of DNA, RNA and protein sequences.
2. NCBI ENTREZ- Searching research articles through PubMed.
3. EMBL- Retrieval of DNA, RNA and protein sequences.
4. DDBJ- Retrieval of macromolecular sequences for analysis.
5. SWISSPROT- Searching and retrieval of protein sequences in different formats for analysis by various softwares.
6. PIR- Using of protein information resource to support genomic and proteomic research activities.
7. TrEMBL- A supplement of SWISS-PROT for analysing and evaluating protein sequences.
8. PDB- Retreival of protein sequences for sequence analysis.
9. SCOP- Analyze proteins having structural similarities for checking the common evolutionary origin.
10. CATH- Classification of protein structures based based on sequences downloaded from PDB.
11. Pfam- Multiple sequence alignment of proteins in to clans and families.
12. PROSITE and BLOCKS- Database of protein families and domains.
13. UCSC Genome Browser- Using UCSC on-line genome browser access to genome sequence data from a variety of vertebrate and invertebrate species integrated with a large collection of aligned annotations.

TEXT BOOKS:

1. O.Bosu and S.K.Thukral, "Bioinformatics databases, tools and algorithms", Oxford University Press, 2007.
2. D. Mount, "Bioinformatics: Sequence and genome analysis", 2^{nd} edition, 2004.

REFERENCE BOOKS:

1. T.K. Attwood and D.P. Smith, "Introduction to Bioinformatics", Pearson Education, 2001.
2. R. Durbin, R. Eddy, K. Anders and M. Graeme, "Biological sequence analysis: probabilistic models of proteins and nucleic acids", Cambridge University Press, 1997.



Source:
Dr. D. Vijaya Ramu
BT, VUDirisala et al., (2007)
Biotechnology and Bioprocess
Engineering 12:424-432.

16BI202 MOLECULAR EVOLUTION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	45	-	8	2	5

Course Description and Objectives:

This course imparts knowledge on species concepts and causative features of evolution. The objective of this course is to provide insights into gene evolution, exon shuffling and intron hypothesis. In addition, software programs used in the construction of phylogentic trees are also dealt with.

Course Outcomes:

The student will be able to:

- explain evolutionary concepts.
- infer the cladograms obtained through software packages.
- correlate and extend the principles to all groups of living organisms.
- create relations among the chosen species.
- demonstrate the cause for epidemics.
- evaluate the genetic similarity and distances among the test organisms.

SKILLS:

✓ *Analyze molecular clock in the estimation of species diversity.*

✓ *Construct phylogenetic trees using software tools: Mr. Bayes and Paup.*

✓ *Utilize online software tools to convert files such as FASTA, Phylip and NEXUS.*

UNIT - 1 **L-9**

SCIENCE OF TAXONOMY: Contribution of systematics to biology; Systematics as the science of organic diversity; The history of taxonomy; Systematics as a profession and the future of systematics; Description of terms - taxonomy, classification and systematics; Taxonomic characters; Biological species concept - reproductive isolating mechanisms; Modes of speciation - allopatric, sympatric, parapatric and cryptic.

UNIT - 2 **L-9**

MOLECULAR EVOLUTION: Gene evolution; Evolution of gene families; Exon shuffling; Intron hypothesis; Concerted evolution; Neutrality hypothesis; Molecular clock hypothesis; Applications of molecular trees; Molecular basis of macroevolution.

UNIT - 3 **L-9**

PHYLOGENETIC TREES: Construction of phylogenetic tree; Terms used in representing a phylogenetic tree; Rooted trees and unrooted trees; Rooting phylogenetic trees; Tree confidence-bootstrapping and estimating the reliability of phylogenetic trees; Types of trees; Cladogram; Phylogram; Dendrogram; Gene tree vs. species tree; Ultrametric trees; Perfect phylogeny.

UNIT - 4 **L-9**

FILE FORMATS AND DISTANCE VS. CHARACTER-BASED METHODS: File Formats - FASTA , Clustal, Nexus, Phylip, GCG/MSF, NBRF/PIR and interconverting formats; Distance vs. character-based methods; Character-based methods - Parsimony, maximum likelihood and Bayesian analysis; Distance methods - UPGMA and Neighborhood joining.

UNIT - 5 **L-9**

CONSTRUCTION OF PHYLOGENETIC TREES : Query sequence (DNA/Protein); Sequence similarity search; Methods of multiple sequence alignments; BLAST Analysis; Construction of a dendrogram using online ClustalW2 program; Creating parsimony tree using PAUP; Creating maximum likelihood DNA trees using PAUP; Using MrBayes to create Bayesian DNA trees.

ACTIVITIES:

- *Deduce evolutionary relationships using phylogenetic trees.*
- *Construct rooted and unrooted trees.*
- *Construct dendrogram.*
- *Perform multiple sequence alignment using software tools.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Applications of trees (UPGMA; NJ plots; PAUP and MEGA).
2. History and philosophy of phylogenetics, concept of homology, choice of characters.
3. Sequences as phylogenetic characters.
4. Sequence alignment, datamatrices.
5. Introduction to parsimony, rooting trees.
6. Parsimony methods, weighting characters.
7. Assessing support; Introduction to maximum likelihood.
8. Maximum likelihood and models of sequence evolution.
9. Maximum likelihood and models of sequence evolution.
10. Distance-based phylogenetic methods; Comparison of tree reconstruction methods.
11. Species concepts; Gene trees versus species trees
12. Study of Phylogeography with reference to animal species (Eg. Snails; Butterflies etc.)

TEXT BOOKS:

1. E. W. Mayr, P. D. Ashlock, "Principles of systematic Zoology", McGraw Hill,1991.
2. D. Graur and W.Li, "Fundamentals of Molecular Evolution", 2nd edition, Sinauer Associates Inc. 2000.
3. M.Nei and S. Kumar, "Molecular evolution and phylogenetics", Oxford University press, 2000.

REFERENCE BOOK:

1. B. G. Hall, "Phylogenetic trees made easy: A how-to manual for molecular biologists", Sinauer Associates, 2001.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs equip with requisite professional and inter-personal skills.
- think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- identify and introspect on individual strengths and weaknesses.
- improve levels of self-awareness and self-worth for greater efficacy at workplace.

SKILLS:

✓ *Communicate and understand the difference between soft skills and hard skills.*

✓ *Professionalism and employability skills.*

✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*

✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*

✓ *Prepare resumé and learn how to face interview.*

✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - the process of communication, levels of communication, flow of communication, choice of diction and style with reference to setting (formal, semi-formal or informal); communication networks, barriers to communication, miscommunication, noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, need for soft skills, professionalism, employability skills.

C) CAREER PLANNING:

Job vs. career, goal setting, SWOT analysis, planning and prioritization, four quadrant time management system, self-management, stress-management.

ACTIVITY: Johari Window for SWOT analysis; Setting a SMART goal using the provided grid; Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, roots, prefixes & suffixes, synonyms and antonyms, collocations, one-word substitutes, analogies, idioms and phrases, contextual guessing of unfamiliar words, task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student) – vocabulary exercises with hand-outs; Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, role plays (including small talk), self introduction, opening and closing a telephonic conversation, making an appointment, making a query, offering/ passing on information, communicating with superiors, expressing agreement/objection, opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, dynamics of group discussion, intervention, summarizing and conclusion, voice modulation, content generation, key word approach (KWA), social, political, economic, legal and technical approach (SPELT), view point of affected part (VAP), language relevance, fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics- controversial, knowledge, case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, preparing the resume, writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, understanding employer expectations, pre-interview planning, opening strategies, impressive self-introduction, answering strategies, other critical aspects such as body language, grooming, other types of interviews such as stress-based interviews, tele- interviews, video interviews, frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, techniques for speed reading, understanding the tone, skimming and scanning, appreciating stylistics, impediments for speed reading, eye fixation, sub-vocalization, critical reading, reading based on purpose, reading for information, reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (handouts); Newspaper activity with students divided into 4 groups; Each group looks at critical component of communication such as listening, speaking, reading and writing enabling them to be better communicators as well as be more aware about the current affairs, which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, different types of listening, active and passive listening, top-down approach, bottom-up approach, understanding the non verbal cues of communication; intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British and American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, cultural sensitivity, social awareness, emotional intelligence, good manners, self-grooming, positive body language, accepting and handling responsibility, assertiveness, problem solving, negotiating skills, networking and creating a good first impression.

Seven essential skills for a team player; attentive listening, intelligent questioning, gently persuading, respecting other's views, assisting others, sharing and participating actively.

ACTIVITY: Johari window, games and case studies.

Reference books:

1. E. Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. A. Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. J. A. K. Page, "Leadership for Innovation" 1st edition, Kogan, 2007.
4. M.A. Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. K. Mohan and N.P. Singh, "Speaking English Effectively" 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. R. K. Mishra, "Personality Development", Rupa and Co., 2004.

VFSTR UNIVERSITY

III Year - B.Tech.

SYLLABUS

I SEM & II SEM

III Year B.Tech. Bioinformatics I - Semester

L	T	P	To	C
4	-	-	4	4

BI 301 MOLECULAR EVOLUTION AND PHYLOGENETIC TREES

Course Description and Objectives:

This course deals with the basic concepts behind molecular evolution. This course aims to combine the concepts of molecular biology, evolutionary biology and population genetics to understand recent discoveries on the structure and function of nucleic acids and proteins.

Course Outcomes:

1. The students will be able analyze the techniques and methods used in molecular evolution and phylogeny in processing the molecular data in building phylogenetic trees.
2. They will be able to study epidemiology based on molecular data.
3. They will be able to measure genetic change by performing sequence alignment
4. They will understand the basic principles behind molecular clock hypothesis
5. They will understand the applications of molecular phylogeny approaches in reconstructing species trees.

UNIT I : Introduction To Molecular Evolution :

Archaeology of the genome- fundamentals of Population genetics-The nature of molecular evolution- Driving forces in evolution, evolutionary changes in nucleotide sequences.

UNIT II : Molecular Phylogenetics :

Terminology of phylogenetic trees- Trees and distances- Molecular phylogenetic archaeology - Molecular phylogenetic examples- The universal phylogeny.

UNIT III : Measuring Genetic Change- Sequence Alignment and Homology :

Genetic distance-Measuring evolutionary change on a tree- kinds of data- Methods of reconstruction- Distance matrix methods, Maximum parsimony methods, Maximum likelihood methods- analysis of true tree- Problems associated with phylogenetic reconstruction

UNIT IV: Models Of Molecular Evolution- Modes Of Evolutionary Process :

Functional constraints and the rate of substitution patterns of codon usage and base composition- Molecular clocks, evaluation of molecular clock hypothesis - Neutral theory- Genetic variation within species- Natural selection.

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UNIT V : Applications Of Molecular Phylogenetics :

Organismal phylogeny- Gene trees and species trees- Age and rates of diversification phylogeny in molecular epidemology- Host parasite co- speciation.

TEXT BOOK :

1. Dan Graur and Wen-Hsiung Li.Fundamentals of Molecular evolution, II edition, Sinauer Associates, INC. 2000.

REFERENCE BOOK :

1. Roderic D. M. Page, Edward C. Holmes Molecular evolution, A phylogenetic approach, Blackwell Science Inc; (October 1998).

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(CS 223) OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Description and Objectives:

This course deals with the various aspects of object oriented programming through java. The main objective of this course is to make students aware of the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.

Course Outcomes:

1. Students will understandOOP concepts and basics of java programming (Console and GUI based)
2. They will acquire the skills to apply OOP and Java programming in problem solving
3. They will gain the ability to extend his knowledge of Java programming further on his/her own.
4. They will be able to understand the Applet Class, Applet Architecture and how to pass parameters to Applets
5. They will be able to utilize the knowledge gained from this course to write programs effectively.

UNIT I : Introduction, Classes and Objects :

Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects Class fundamentals – Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT II : Microbial growth kinetics :

Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces.

UNIT III : Exception Handling, Multithreading :

Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating own exception Sub classes, Concepts of Multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, deadlocks, Thread groups.

UNIT IV: Applets, Event Handling & AWT Controls:

Applets: Applet Class, Applet Architecture, Applet Skeleton - Applet Initialization and Termination, Overriding update(), Simple Applet, Display Methods, Requesting Repainting - A simple banner Applet, Using The Status Window, The HTML APPLET Tag, Passing parameters to Applets, Applet Context and show Document.

Event Handling & AWT Controls : Event sources, Event classes – ActionEvent, AdjustmentEvent, ComponentEvent, Container Event, Focus Event, InputEvent, ItemEvent, KeyEvent and MouseEvent, Delegation event model, Event Listeners, Handling mouse and Keyboard events, Adapter classes.

UNIT V: AWT & Swing :

AWT: Concepts of components, Container, Panel, Window, Frame, Canvas, Font class, Color class and Graphics. AWT Controls : Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers - Flow, Border, Grid, Card and Grid bag.

Swing: JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, Text fields, Buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and ables.

TEXT BOOKS:

1. Herbert Schildt, “The Complete Reference Java J2SE”, 7th ed., TMH Publishing Company Ltd, New Delhi, 2008.
2. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd ed., TMH, 2009.

REFERENCE BOOK :

1. Cay Horstmann, “Big Java”, 2nd ed., John Wiley and Sons, 2006.

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IT 314 SCRIPT PROGRAMMING

Course Description and Objectives:

The course introduces students to algorithmic programming using two scripting languages widely used for web applications: PHP and JavaScript. Because web applications typically draw parts of their content from online databases, the course will make them aware of PHP's facilities for interacting with database systems.

Course Outcomes:

1. Students will be able to explain the structure of the HTTP protocol for exchanging messages over the Internet
2. Identify the features of web servers needed to support PHP and a local database
3. They will be able to perform python programming
4. They will be able to perform Php programming
5. They will be able to perform Windows powershell programming

UNIT I : Script and Perl :

Introduction to Script programming in Linux and MS-windows, Perl programming.

UNIT II : Python programming :

Running Your Python Scripts from a Command Prompt Making Your Scripts Behave Like Normal Programs A Simple CGI Script Writing the Editor Script Writing the Save Script Running the Editor. Writing the Main Script Writing the View Script Writing the Edit Script Writing the Save Script Trying It Out.

UNIT III : Php programming :

Writing php first script, a script to acquire user input, file upload forms and scripts, Calling an External CGI Script with the virtual function getting information about php and your script.

UNIT IV : Windows Power shell programming :

Using power shell scripts, debugging power shell script.

UNIT V : Application Development :

Applications development with Client/server architecture, graphs, GUI and graphics programming using script languages searching and search engine development using script languages.

TEXT BOOKS :

1. Programming Perl, 3rd Edition By Larry Wall, Tom Christiansen, Jon Orwant O'Reilly
2. Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress, 2003.

REFERENCE BOOKS :

1. Windows Power Shell™ 3.0 Step by Step Ed willson Microsoft publisher.
2. PHP A Beginner s Guide Vikram Vaswani McGrawhill

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MS 310 MANAGERIAL ECONOMICS (ELECTIVE - III)

Course description and ObjectiveS:

To make the students familiar with Economic, Accounting & Financial concepts used to help the managers in taking Business Decisions.

Course Outcomes:

1. Student will be able to undesrastand the basic concepts of managerial economics
2. They will gain adequate knowledge in cost analysis
3. They will acquire sufficient skills to interpret pricing and profit management
4. They will be able to perform various ratio analyse

UNIT – I : Introduction to Managerial Economics :

Nature & Scope relation of Managerial Economics with the functional areas of business organization. Role of Managerial Economist

Demand Analysis: Types of Demand, Demand determination, Demand elasticities, Demand forecasting, Survey & Statistical methods.

UNIT – II : Production and Cost Analysis production function:

Marginal rate of technical substitution, iso-quants and iso-costs, production function with one/two variables, cobb-douglas production function, Factor productivities and returns to scale.

Cost Analysis: Cost concepts, cost determinants, cost output relationship in the short and long run.

UNIT – III : Pricing and Profit Management:

Features and types of different competitive situations – Perfect competition, monopoly, monopolistic and oligopoly, pricing methods in practice.

UNIT – IV : Profit Management:

Nature and theories of profit. Cost – Volume – Profit Analysis.

UNIT – V : Ratio Analysis :

Introduction to ratios, Advantages and disadvantages of ratio analysis, Types of ratios – liquidity, solvency, turnover and profitability ratios.

TEXT BOOKS :

1. Gupta, “Managerial Economics” TMH, 1/e, 2005.
2. M.E. Thukaram, “Accounting for Managers” TMH, 2/e, 2006.

REFERENCE BOOKS :

1. Dominic Salvatore, “Managerial Economics”, Thomson, 3/e, 2006.
2. Mote Paull, “Managerial Economics” TMH, 1/e, 2004.
3. S.N.Maheswari, “Financial Accounting” Thomson, 2/e, 2006.

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BT 307 PLANT BIOTECHNOLOGY (ELECTIVE-I)

Course Description and Objectives:

The Course is designed to provide concepts and industrial applications in the field of agricultural biotechnology. Production of high yielding,disease resistant crop varieties by using plant transformation technology. Concepts of Plant Molecular farming and production of plantibodies from Genetically modified organisms. To enable students to participate in R&D projects, develop laboratory and research skills.

Course Outcomes:

The students will develop fundamental knowledge in Plant Biotechnology and its application in laboratory and industry settings.

The students will:

1. Acquaint with principles, technical requirement, scientific and commercial applications in Plant Biotechnology,
2. Become familiar with sterile techniques, media preparation, DNA extraction methods, gene isolation and sequence analysis,
3. A knowledge of *Agrobacterium* and its development as a transformation vector & critically assess various plant genetic modification strategies
4. Knowledge of how plants can be transformed with respect to pest resistance, herbicide tolerance,
5. Support methodologies in plant tissue/cell culture to plant improvement, understanding how breeding strategies can be targeted to crops

UNIT I : Introduction to Tissue Culture & Applications:

Introduction to cell and tissue culture; Tissue culture media (composition, preparation); Initiation and maintenance of callus and cell suspension culture, organogenesis; Protoplast isolation culture and fusion;Production of haploids, Somaclonal variations,Germplasm conservation (Cryopreservation); Hardening & Field transformation of cultured Plants; Bioreactors systems and models for mass cultivation of plant cells.

UNIT II: PLANT TRANSFORMATION TECHNOLOGY:

Agrobacterium mediated gene transfer; Agrobacterium based vectors, viral vectors and their application. Direct gene transfer methods; chemical methods, electroporation, microinjection, particle bombardment.

UNIT III:PLANT GENETIC ENGINEERING FOR PRODUCTIVITY AND PERFORMANCE (BIOTIC STRESS & ABIOTIC STRESS):

Herbicide resistance, Insect resistance, Disease resistance, virus resistance,. Abiotic stress tolerance ;(Drought, temperature, salt).

UNIT IVII MOLECULAR FARMING & INDUSTRIAL PRODUCTS:

Application of Plant biotechnology for the production of quality oil, Industrial enzymes, Therapeutic Proteins ,Antigens (edible vaccine) and plantibodies.

UNIT V: METABOLIC ENGINEERING:

Concepts of Production of secondary metabolites from plant; Metabolic engineering for plant primary metabolites and secondary metabolites.

TEXT BOOKS:

1. H.S. Chawla, A Text Book of “Plant Biotechnology”, 2nd ed., Oxford & IBH, New Delhi, 2002.
2. H.K.Das, Text Book of Biotechnology -Wiley India, (P) Ltd. New Delhi, 5th edition, 2007.

REFERENCEBOOKS:

1. Roberta Smith, Plant Tisssue Culture: Techniques and Experiments. 2nd ed.Academic Press, 2000.
2. Freifelder D, Molecular Biology, Jones and Bartlett Publishers inc. 1987.
3. Bhojwani, S.S. and Rajdan, Plant Tissue Culture: Theory and Practice. 2004.
4. R.C., Dubey, “A Text Book of Biotechnology” 4 th ed. S. Chand , Publishers, 2006.
5. Primrose, S B, Twyman, Richard M Old, R W, Principles of gene manipulation, Blackwell Scientific publishers, 2001.

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BI 303 HERBAL BIOTECHNOLOGY

Course Description and Objectives:

This course deals with utilization of medicinal plant wealth in India. The main objective of this course is to generate interest in learning the medicinal plant wealth of India also to provide adequate knowledge in utilization of medicinal properties of various medicinal plants.

Course Outcomes:

Upon completion of the course, student will

1. Be able to identify major plants used in traditional system of herbal medicines
2. Be able to cultivate and utilize the available major medicinal plants in India
3. Be able to perform tissue culture for extraction of secondary metabolites
4. Be able to perform various assays of herbal drugs
5. Be able to extract secondary metabolites from various plant parts

Unit –I: Medicinal Plants and Crude drugs :

Medicinal plants in the traditional system (Ayurveda, Siddha, Unani and Homeopathy). Crude Drugs – Scope & Importance, Classification (Taxonomical, Morphological Chemical, Pharmacological); Cultivation, Collection & processing of Crude Drugs

Unit-II : Production of Medicinal Plants

Cultivation and Utilization of Medicinal & Aromatic Plants in India. Tissue Culture of medicinal Plants. Plant Tissue Culture as source of medicines, Plant Tissue Culture for enhancing secondary metabolite production (Withania somnifera, Rauwolfia serpentina, Catheranthus roseus, Andrographis paniculata, Dioscorea sp.).

Unit-III : Extraction and evaluation of crude extracts

Herbal extraction methods: steps, solvents, equipments. Types of herbal extract preparations and storage methods. Methods of Drug evaluation (Morphological, Microscopic, Physical & Chemical). Preliminary methods.

Unit-IV : Types of phytochemicals

Carbohydrates & derived products; Glycosides - extraction methods (Digitalis, Aloe, Dioscorea,); Tannins (Hydrolysable & Condensed types); Volatile Oils - extraction methods. Alkaloids - extraction methods (Taxus, Papaver, Cinchona); Flavonoids- extraction methods, Resins- extraction methods. Application of phytochemicals in industry and healthcare; Biocides, Biofungicides, Biopesticides

Unit-V: Methods to identify adulterants in Herbal medicines

PDrug adulteration – Types of adulterants. Chemical Methods of Analysis and Detection of Adulterants: Chemical estimations, Spectrophotometry & Fluorescene analysis. Molecular methods of Analysis and Detection of Adulterants in herbal medicines (RAPD, SSR, SCAR and RFLP). Plant DNA barcoding.

TEXT BOOKS:

1. Pharmacognosy, C. K. Kokate, A. P. Purohit & S. B. Gokhale (1996), Nirali Prakashan, 4th Ed.
2. Natural Products in medicine: A Biosynthetic approach (1997), Wiley.

REFERENCE BOOKS:

1. Hornok,L. (ed.) (1992). Cultivation & Processing of Medicinal Plants, Chichister, U. K: J. Wiley & Sons.
2. Trease & Evans, Pharmacognosy – William Charles Evans, 14th ed. (1989), Harcourt Brace & Company.

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(BI305) NATURAL SELECTION : METHODS & APPLICATIONS (ELECTIVE-I)

Course Description and Objectives:

This course provides an overview about various evolutionary processes. The main objective of this course is to enable the students to understand the concept of evolution in biology.

Course Outcomes:

Upon completion of the course, the student will:

1. Be able to differentiate Darwinisim, Neutral theory and Neo-Darwinism
2. Be able to utilize the concepts of natural selection and neutral variation to critically understand the process of speciation
3. Be able to correlate nucleotides, genetic codes and codon biases
4. Be able to utilize the statistical tools to detect/measure molecular adaptation
5. Be able to explain process of aging with the help of Hamiltonian theory and other non-evolutionary theories of aging

Unit I: Introduction to Evolutionary Biology :

Introduction to Evolutionary Biology: meaning and importance of evolution in biology. A brief history of life. The development of evolutionary theoryLamarckism, Darwinism, Natural selection, Neo-Darwinism and Mutation theory. Evolution of diseases: some examples.

Unit II: Natural selection, Genetic drift and Mutation :

Variations- nature and types. Mechanisms that decrease and increase variations (natural selection, genetic drift, mutation, recombination and gene flow). Speciation: Modes of speciation, isolating mechanisms, speciation in time. Fitness landscape of an evolving population.

Unit III : Identifying Evolution Signatures in Molecules and Neutral theory :

Structure of the genetic material, Mutation of genetic sequences, Genetic code, Nucleotide and Codon Biases, Synonymous and Non-synonymous nucleotide substitution, Neutral theory of molecular evolution.

Unit IV : Statistical methods for detecting molecular adaptation :

Measuring selection using the nonsynonymous/synonymous (dN/dS) rate ratio, Estimation of dN and dS between two sequences, Detecting lineage-specific episodes of darwinian selection, Detecting amino acid sites under darwinian selection, Limitations of current methods and future directions.

Unit V : Evolution of Ageing and Late life :

Evolutionary theories of aging : Hamilton's Forces of Natural Selection, Comparative Biology of Aging, Specific Population Genetic Hypotheses for Aging. Hamiltonian theories of aging. Evolutionary biology of late life: The Discovery of Late Life, Explaining Late Life with Hamiltonian Theory, Explaining Late Life with Nonevolutionary Theories.

Text Books :

1. Natural Selection: Methods and Applications. Mario A. Fares (Editor). CRC Press.
2. Experimental Evolution: Concepts, Methods, and Applications of Selection Experiments, edited by Theodore Garland, Jr., and Michael R. Rose.

References Book :

1. Statistical methods for detecting molecular adaptation. Ziheng Yang and Joseph P. Bielawski. TREE vol. 15, no. 12 December 2000.

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SR 004 SEMINAR

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CS 229 OBJECT ORIENTED PROGRAMMING LAB

Course Description and Objectives :

Write programs using the Java language. Basic topics considered are programs and program structure in general, and Java syntax, data types, flow of control, classes, methods, objects, arrays, exception handling, recursion, and graphical user interfaces (GUIs). Writing and testing applets for potential inclusion in web pages. Understanding how to access enterprise data bases from the application programe.

Course Outcomes :

The student is expected to have hands on experience with the following:

1. Students will learn the basics of java programming, multi-threaded programs and Exception handling
2. They will be able to apply the OOP in Java programming in problem solving
3. They will be able to use use GUI components (Console and GUI based)

LIST OF EXPERIMENTS :

1. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that. Integer.
2. Write a Java program that checks whether a given string is a palindrome or not.

   Ex: MADAM is a palindrome.
3. Write a Java program for sorting a given list of names in ascending order.
4. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (use StringTokenizer class)
5. Write a Java program that reads a file and displays a file and displays the file on the screen, with a line number before each line.

6. Write a Java program that displays the number of characters, lines and words in a text file.
7. Write a Java program for creating multiple threads

   a) Using Thread class.

   b) Using Runnable interface.
8. Write a Java program that illustrates how run time polymorphism isachieved.
9. Write a java program that illustrates the following
   a) Creation of simple package.
   b) Accessing a package.
   c) Implementing interfaces.
10. Write a java program that illustrates the following
    a) Handling predefined exceptions.
    b) Handling user defined exceptions
11. APPLETS
    a) Working with Frames and various controls.
    b) Working with Dialogs and Menus.
    c) Working with Panel and Layout.
    d) Incorporating Graphics.
    e) Working with colors and fonts
12. SWINGS

    Jpanel- Jframe – Jtoolbar—JwindowFramework

TEXT BOOKS

1. Dietel & Dietel, Java How to Program, 5th Edition, Pearson Education, 2009.
2. P.J.Deitel and H.M.Deitel, Java for Programmers, Pearson education, PHI, 2008.

REFERENCE BOOKS

1. P.Radha Krishna, Object Oriented Programming through Java, Universities Press, 2010.
2. Bruce Eckel, Thinking in Java, Pearson Education, 2010.
3. S.Malhotra and S.Choudhary, Programming in Java, Oxford Univ. Press, 2009.

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IT 305 SCRIPT PROGRAMMING LABORATORY

Course Description and Objectives :

This course deals with the concepts and basics of Perl programme for a beginner. The major objective of this course is to train students to write their own programs using perl language.

Course Outcomes:

1. Students will be able to wite Perl program for concatenating two sequences
2. They will be able to write Perl program for calculating the length, total bases, GC and AT counts
3. They will be able to write Perl program for DNA to RNA transcription
4. They will be able to write Perl program **to** translate DNA into protein.

LIST OF EXPERIMENTS:

1. Perl program for concatenating two sequences
2. Perl program for file handling
3. Perl program for handling scalar and array variables
4. Perl program for calculating the length, total bases, GC and AT counts
5. Perl programme-Depicting loop functions
6. Perl program for DNA to RNA transcription
7. Retrieving protein sequences and locating motifs
8. Evaluating In silico Salient features of DNA
9. Perl Program to translate DNA into protein
10. Bio-perl programme to retrieve DNA sequence from swissprot.

TEXT BOOK :

1. S. Sai Giridhar and S. Krupanidhi. Introductory Workbook on Perl for Biology Students. http://www.biology-online.org/articles/introductory-workbook-perl-biology-students.html.

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BI 307 CONSTRUCTION OF PHYLOGENETIC TREES LABORATORY

Course Description and Objectives:

This lab course offers training in performing various methods to construct phylogenetic trees. The major objective of this lab course is to provide student adequate hand-on experience to work with softwares.

Course Outcomes :

1. Student will be able to perform pairwise and multiple sequence alignment
2. They will be able to perform neighbor joining method for tree construction
3. They will be able to perform Minimum evolution method for tree construction
4. They will be able to perform Maximum likelihood method for tree construction
5. They will be able to perform basic analysis in phylogeography

List of Experiments:

1. Introduction – uses of trees.
2. History and philosophy of phylogenetics, concept of homology, choice of characters.
3. Sequences as phylogenetic characters.
4. Sequence alignment, data matrices.
5. Introduction to parsimony, rooting trees.
6. Parsimony methods, weighting characters.
7. Assessing support; Introduction to maximum likelihood.
8. Maximum likelihood and models of sequence evolution.
9. Maximum likelihood and models of sequence evolution.
10. Distance-based phylogenetic methods; Comparison of tree reconstruction methods.
11. Species concepts; Gene trees versus species trees
12. Phylogeography.

TEXT BOOK :

1. Molecular evolution and Phylogenetics 2000. Nei & Kumar.

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CS 222 DATABASE SYSTEMS

Course Description and Objectives:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcomes:

1. Students will be able to describe the fundamental elements of relational database management systems
2. They will be able to explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
3. They will be able to design ER-models to represent simple database application scenarios
4. They will be able to convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
5. They will be able to improve the database design by normalization.

UNIT- I : Database System- concepts and architecture:

Data modelling using the Entity Relationship (ER) modelling and Enhanced Entity Relationship (EER) modelling, Specialization and Generalization.

UNIT-II : The Relational Model:

Relational database design using ER to relational mapping, Relational algebra and relational calculus, Tuple Relational Calculus, Domain Relational Calculus, SQL.

UNIT-III : Database design theory and methodology:

Functional dependencies and normalization of relations, Normal Forms, Properties of relational decomposition, Algorithms for relational database schema design.

UNIT-IV : Transaction processing concepts:

Schedules and serializability, Concurrency control, Two Phase Locking Techniques, Optimistic Concurrency Control, Database recovery concepts and techniques.

UNIT-V : Data Storage and indexing:

Single level and multi level indexing, Dynamic Multi level indexing using B Trees and B+ Trees, Query processing and Query Optimization, Introduction to database security.

TEXT BOOK:

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems (5/e), Pearson Education, 2008

REFERENCE BOOKS:

1. Silberschatz, Korth, “Data base System Concepts”, 4th ed., McGraw hill, 2006.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill, 2003.
3. Peter Rob and Carlos Coronel, Database Systesm- Design, Implementation and Management (7/e), Cengage Learning, 2007.

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BI 302 GENETIC ENGINEERING & EPIGENETICS

Course Description and Objectives:

This course deals with the basics of gene regulation and expression in prokaryotes as well as eukaryotes. The main objective of this course is to provide fundamental knowledge in DNA technology and also to provide basic concepts of epigenetics.

Course Outcomes

Student will:

1. Student will be able to demonstrate the mechanisms behind regulation of gene expression in prokaryotes and eukaryotes
2. They will be able to choose the appropriate vector for their research work
3. They will be able to construct cDNA library
4. They will be able to devise various strategies in recombinant DNA technology to be used in epigenetic technology

Unit I: Gene Regulation and Expression in Prokaryotes & Eukaryotes:

Lactose, Arabinose and Tryptophan operons, Repressors and activator, Sigma switch in Bacillus subtilis. Gene regulation in Eukaryotic system, Repetitive DNA, Gene rearrangement, Promoters, enhancer elements, gene amplification

Unit II: Plasmids, Transposons / Vectors for Gene Transfers :

Plasmids: Definition, types, Identification, classification and purifications and transfer of Plasmids. Host restriction in transfer. Transposable elements: Definition, detection of transposition in bacteria, types of bacterial transposons, mechanisms of transposition and excision, applications of transposons. Retrotransposons.

UNIT III: DNA Technology :

Purification of genomic DNA from living cells, Manipulation of purified DNA; construction of prototype vector (pBR 322), different types of cloning vectors (plasmid – pUC 19, ? phage, cosmid, M13). Enzymes involved in genetic engineering; cloning strategies, Introduction of DNA into living cells. Methods of Gene transfer, Restriction mapping.

UNIT –IV Expression and Detection of clones :

Detection of clones and its expression: Expression of cloned genes in yeast & E.coli. Blot analysis - Southern, Northern & Western blot; dot and slot blot. Immunological techniques. DNA methylation, DNA hybridization. Genomic and cDNA library construction and application. DNA sequencing.

Unit V: Introduction to Epigenetics :

The basics of DNA methylation and histone modification, Epigenetic technology, Model organisms of epigenetics, Functions of epigenetics, Epigenetics and human diseases.

TEXT BOOK :

1. Old RW, Primrose SB, principles of Gene manipulation, An introduction to Genetic engineering, Blackwell Scientific Publications, 1993

REFERENCES BOOKS :

1. Ansubel FM., Brent A, Kingston AE, Moore DO, Current protocols in Molecular Biology, Greene Publishing Associates, NY, 1988.
2. Berger SL, Kimmer AR, Methods in Enzymology, Vol 152, Academic Press, 1987.
3. Molecular Cell Biology – Gerald Carp.

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(BI 304) ETHNOBOTANY GENOMICS (ELECTIVE - II)

Course Descritpion and Objectives:

This course deals with the concepts and principles of ethnobotany genomics. The main objective of this course is to provide sufficient insights into the concept of DNA barcoding and relate it to the the contemporary Issues in Ethnobotany.

Course Outcomes:

1. Students will learn the he sociological and anthropological terms of Ethnobotany genomics.
2. They will be able to understand the link between the ethnobotanical knowledge and tribal communities.
3. They will acquire skills in various methods of ethnobotanical research methods such as Practical and field skills; Prior Informed Consent, PRA techniques, interviews and questionnaire methods
4. They will be able to make plant voucher specimens for further utilization
5. They will be able to utilize the concept of Plant DNA barcoding for the correct identification of species.
6. They will be able to choose the right barcode for DNA barcoding.

Unit I : An Introduction to Ethnobotany :

A brief history of ethnobotanical studies in the world and in India. Scope of ethnobotany. Subdisciplines of ethnobotany. Interdisciplinary approaches. Knowledge of sociological and anthropological terms. Distribution of tribes in Southern India. Ethnobotanical knowledge and communities: Ethnobotanical classification; Folk Taxonomy of Plants.

Unit II : Collection, Documentation and Study Design

Sources of ethnobotanical data: Primary - archeological sources and inventories, Secondary - travelogues, folklore and literary sources, herbaria, medicinal texts and official records. Methods in ethnobotanical research. Research design and cautions in data collections, Practical and field skills; Prior Informed Consent, PRA techniques, interviews and questionnaire methods, choice of resource persons.

Unit III : Assemblage of traditional & scientific knowledge :

Ethnobotany Genomics: Identification and preservation of plant voucher specimens. Concept of DNA barcoding. Single locus and multi locus barcodes. Characterestics of an Ideal Barcode. Procedure of DNA barcoding. Data Standards for BARCODE Records by CBOL. Utility of BOLD (Barcode of Life Data systems). Single nucleotide polymorphisms (SNPs) as Species Specific Marker.

Unit IV : Choosing and Using a Plant DNA Barcode :

Various loci as plant DNA barcodes (plastid and nuclear regions). Selection of a core-barcode. Alternative sources of markers. Factors Influencing the Discrimination Success of Plant Barcodes**: Impacts of intra-specific gene flow on species discrimination success.** Informatics support tools for data management and analysis.

Unit V : Contemporary Issues in Ethnobotany :

The multidimensionality of human-plant interactions. Ethnobotany, socio-environmental change and globalization. Ethnoecology and symbolic ecology. Ethnobotany and forest product development. Conservation and environmental governance

Text Books :

1. Ethnobotany: Principles and Applications. C. M. Cotton. 2003. Wiley Publications.
2. DNA Barcodes: Methods and Protocol. 2007. W. John Kress, David L. Erickson

References Book :

1. Choosing and Using a Plant DNA Barcode. Peter M. Hollingsworth mail, Sean W. Graham, Damon P. Little. Plos One, 2011.

III Year B.Tech. Bioinformatics II - Semester

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4	-	-	4	4

(BI 306) CODON EVOLUTION AND TEMPORAL DYNAMICS (ELECTIVE - II)

Course Description and Objectives :

This course deals with the basics of evolution of codons. The main objective of this course is to provide the students adequate knowledge about evolution of codons also to provide them an introduction about various models of codon evolution

Course Outcomes :

1. Students will be able to understand the basic concepts of codon evolution
2. They will be able to able to utilize various models of codon evolution to conduct independent study on various model organisms
3. They will be able to Identify the influence of natural selection in shaping codon usage
4. They will be able to detect and analyse conservation at synonymous sites
5. They will be able to devise machine learning approaches for codon usage analyses.

Unit 1: Introduction :

Background, Parametric Models of Codon Evolution, Empirical and Semi-empirical Models of Codon Evolution.

Unit II: Monte Carlo and LiBaC approaches for Codon Models :

Monte Carlo Computational Approaches in Bayesian Codon Substitution Modeling, Likelihood Based Clustering (LiBaC) for Codon Models, Detecting and Understanding Natural Selection

Unit III: Parametric Codon Models and Natural Selection :

Codon Models as a Vehicle for Reconciling Population Genetics with Interspecific Sequence Data, Robust Estimation of Natural Selection Using Parametric Codon Models.

Unit IV: Codon Models :

Simulation of Coding Sequence Evolution, Use of Codon Models in Molecular Dating and Functional Analysis, Codon Models Applied to the Study of Fungal Genomes

Unit V: Codon Usage Bias :

Measuring Codon Usage Bias, Detection and Analysis of Conservation at Synonymous Sites, Distance Measures and Machine Learning Approaches for Codon Usage Analyses

Text Book :

1. Codon Evolution:Mechanisms and Models Edited by Gina M. Cannarozzi and Adrian Schneider. Oxford University Press.

References Book :

1. Mugal CF, Wolf JB, Kaj. Why time matters: codon evolution and the temporal dynamics of dN/dS. Mol Biol Evol. 2014 31(1) : 212-31.

III Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BT 302 ANIMAL BIOTECHNOLOGY (ELECTIVE-II)

Course Description & Objectives :

The course provides an overview of current developments in different areas of animal biotechnology. It imparts in vitro reproductive techniques for sperm, ovum and embryo manipulation.It helps in ellucidating structural, functional and comparative genomics of farm animals and its application for livestock improvement.The course comprehends the application of immunological techniques in biotechnology and appreciates the principles of animal cell culture and its application.

Course Outcomes :

At the end the students will demonstrate the ability in / to

1. Development of primary cultures
2. Development of established cell culture.
3. Assess the effect of factors and their role in cell functions.
4. Develop awareness in interlinking of different fields for the development of biological organs.

UNIT- I: Animal cell culture techniques and media :

Cell culture techniques including primary and secondary culture, cell lines, suspension culture, organ culture etc. Different type of cell culture media, growth supplements, serum free media, balanced salt solution, culture of different tissues and its applications. Behavior of cells in culture conditions, division, growth pattern and metabolism, estimation of cell number and cell viability, MTT assay. Quantification of cells by trypan blue dye exclusion method.

UNIT-II: Development and maintenance of Cell Lines :

Development of cell lines, characterization and maintenance of cell lines, stem cells, cryopreservation, common cell culture contaminants. Cryopreservation of primary cell cultures and cell lines. Effect of viruses on cultured mammalian cells. Cloning of domestic animals. Conservation of endangered species.

UNIT-III: Immunodiagnostics :

Somatic cell hybridization, hybridoma technology, commercial production of antibodies using monoclonal antibodies, screening of hybrids for production of monoclonal antibodies. Application of antibodies in chemiluminescence and fluorescence assay used, antibody based nucleic acid probes and their applications in ELISA.

UNIT-IV : Reproductive Technology :

Assisted reproductive biotechnology in man and animal, introduction to embryo biotechnology, endocrine therapeutics. methodology of super ovulation, *in vitro* fertilization, embryo culture and micromanipulation, preparation of sperm for IVF. Different methods of gene transfer and their limitations, sperm mediated gene transfer, embryo splitting, production of transgenic livestock by nuclear transfer and its application, regulatory issues.

Unit-V : Animal Genomics :

Characterization of animal genomes, SNP, STR, QTL, RFLP, RAPD, genetic basis for disease resistance, transgenic animal production and application in expression of therapeutic proteins. Nucleic acid based methods for identification of animal species, detection of meat adulteration using DNA based methods, identification of wild animal species using DNA based methods. Brief introduction on Software tools for molecular phylogeny

Test Books:

1. M M Ranga (2014) Animal Biotechnology, 2nd Ed. Riddhi International.
2. P C Trivedi (2014) Advances in Biotechnology, Riddhi International

Reference Books:

1. Gordon I. 2005. Reproductive Techniques in Farm Animals, CABI.
2. Kindt TJ, Goldsby RA & Osbrne BA. 2007. Kuby Immunology. WH Freeman.

III Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BI 310 BIOMEDICAL INFORMATICS

Course Description and Objectives :

This course deals with the basics and applications of Biomedical informatics. The main objective of this course is to introduce the basic concepts of Biomedical informatics and to provide the students adequate knowledge about computer applications in health care and biomedicine

Course Outcomes :

1. Student will be able to acquire, store and use biomedical data.
2. They will be able to acquire a general understanding about the computer application in healthcare and biomedicine
3. They will gain knowledge in the ethics that must be followed in Biomedical and health informatics
4. They will be able to to know the functioning of electronic health record systems and management of information in health care organizations.

Unit I: Introduction to Biomedical Informatics :

Biomedical Informatics: The Science and the Pragmatics, Biomedical Data: Their Acquisition, Storage, and Use, Biomedical Decision Making: Probabilistic Clinical Reasoning, Cognitive Science and Biomedical Informatics.

Unit II: Computer architecture and standards in Biomedical Informatics :

Computer Architectures for Health Care and Biomedicine, Software Engineering for Health Care and Biomedicine, Standards in Biomedical Informatics, Natural Language Processing in Health Care and Biomedicine.

Unit III: Biomedical and Health Information Resources :

Biomedical Imaging Informatics, Ethics in Biomedical and Health Informatics: Users, Standards, and Outcomes, Evaluation of Biomedical and Health Information Resources.

Unit IV: Information management :

Electronic Health Record Systems, Health Information Infrastructure, Management of Information in Health Care Organizations, Patient-Centered Care Systems, Public Health Informatics, Consumer Health Informatics and Personal Health Records

Unit V: Health care management :

Telehealth, Patient Monitoring Systems, Imaging Systems in Radiology, Information Retrieval and Digital Libraries, Clinical Decision-Support Systems, Computers in Health Care Education

Text book :

1. Biomedical Informatics by Shortliffe and Cimino. 2007, Springer

Reference Book :

1. Health Care Informatics: An Interdisciplinary Approach by Sheila P. Englebardt, Ramona Nelson, 2010.

III Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BI 312 UNIX PROGRAMMING

Course Description and Objectives :

This course deals with the design, build, and use of software tools that fit well into Unix, writing such tools both in the Bourne Shell and in C, using Unix arguments and standard input and output facilities. The main objective of this course is to train the students to design modest-sized program using independent modules (abstract data typesHrs), that offer some potential for reuse·

Course outcomes :

1. Students will be able to use standard C libraries and their associated header files effectively in writing programs.
2. The course will enable students to effectively use Unix and C to write, test, debug, and maintain modest-sized programs.
3. They will be able to design modest-sized program using independent modules (abstract data typesHrs)
4. They will gain adequate insights into the Signal Concepts, Signal handling.
5. They will gain expertise in writing Inter Process Communication

UNIT - I : Unix Utilities :

Introduction to UNIX file system, file handling utilities, security by file permissions,vi editor, process utilities, diskutilities, networkingcommands, cp,mv, ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, umask, ulimit, ps,who, w, finger, arp, ftp, telnet, rlogin.

UNIT - II : Unix Utilities :

Text processing utilities and backup utilities detailed commands tobe covered are: cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join,tee, more, pg, comm., cmp, diff, tr, awk, tar. What is a shell, shell responsibilities,pipes and input redirection, output redirection, shell variables, conditions,history and control structures and shell programming.

UNIT - III : File I/O :

File descriptor, open function, close function, creat function, lseek, read, write, Filesharing, dup and dup2 functions, fcntl, ioctl functions.

Files and Directories :

File status,stat,fstat,lstat Functions, File types, Permission, ownership of new files and Directories, File system, Links, File times, Directory related functions.The System calls to be covered are access, umask, chmod, fchmod, chown, link, unlink, symlink, mkdir, rmdir, chdir, fchdir, getcwd, utime. **Standard I/O Library:** Streams, Buffering, open, read & write on streams, Binary I/O, Formatted I/O TemporaryFiles (fopen, fread, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putchar).

UNIT - IV : Environment of Unix Process:

Process invocation and termination,Environment variables & List, Memory Layout of C program & memory management routines.

Process control : Process identifiers, fork, vfork, exit, wait, waitpid, wait3, exec Functions. Race conditions, Zombie process.

Signals : Signal Concepts, Signal handling, Important signals: kill, raise, alarm, pause, and abort.

UNIT - V : Advanced I/O :

Record Locking , Streams, I/O Multiplexing, Memory Mapped I/O, various Read and write.

Inter Process Communication :

Pipes, FIFO, System V IPC (Message Queue,Semaphore, Shared Memory Hrs).

Text Books :

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson.

Reference Books :

1. Sumitabha Das - Unix: Concepts & Applications 4/e - TMH.
2. Advanced Programming in the UNIX environment W.R.Stevens

III Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
-	-	1	1	1

SR 005 SEMINAR

III Year B.Tech. Bioinformatics II - Semester	L	T	P	To	C
	-	-	3	3	2

CS 228 DATABASE SYSTEM LABORATORY

Course Description and Objectives :

This lab course will enhance database handling, data manipulation and data processing skills in student through SQL & PL/SQL, and helps them gain knowledge in designing forms, Menus and also helps them in developing database applications.

Course Outcomes:

1. Students will be able to create and manipulate various DB objects for a table.
2. They will be able to create views, partitions and locks for a particular DB
3. They will be able to write PL/SQL block for transaction operations of a typical application using triggers
4. They will be able to implement the query in sql for
   (a) insertion (b) retrieval (c) updation (d) deletion.

List of Experiments :

1. Execute a single line and group functions for a table.
2. Execute DCL and TCL Commands.
3. Create and manipulate various DB objects for a table.
4. Create views, partitions and locks for a particular DB.
5. Write PL/SQL procedure for an application using exception handling.
6. Write PL/SQL procedure for an application using cursors.

7. Write a DBMS program to prepare reports for an application using functions.
8. Write a PL/SQL block for transaction operations of a typical application using triggers.
9. Implement the query in sql for a) insertion b) retrieval c) updation d) deletion
10. Creating Views
11. Writing Triggers
12. Implementing operation on relation using PL/SQL

Typical Applications : Banking, Course registration, Electricity Billing, Library Management, Pay roll, Insurance, Inventory etc.

Text books :

1. Oracle certified associate Mysql beginner's guide.
2. Oracle certified associate Oracle 10g &11g SQL fundament.

III Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
-	-	3	3	2

BI 314 UNIX PROGRAMMING LABORATORY

Course description and Objectives:

This course deals with the basics of UNIX programming protocols. This lab course will provide adequate exposure to students about shell scripting

Course outcomes:

1. Students will be able to gain adequate knowledge about the basics of UNIX Programming
2. They will be able to write a shell script to generate a multiplication table.
3. They will be able to write a shell script that copies multiple files to a directory.
4. They will be able to write a shell script which counts the number of lines and words present in a given file.
5. They will be able to write a shell script which displays the list of all files in the given directory.

Recommended Systems/Software Requirements:

Intel based desktop PC with minimum of 166 MHZ or faster processor with atleast 64 MB RAM and 100 MB free disk space LAN Connected.

Any flavour of Unix / Linux

Session - 1 :

a) Log into the system

b) Use vi editor to create a file called myfile.txt which contains some text.

c) Correct typing errors during creation.

d) Save the file

e) Logout of the system

Session - 2 :

a) Log into the system

b) open the file created in session 1(vi,cat,touch)

c) Add some text (cp,mv,rm,mkdir,rmdir,ls)

d) Change some text

e) Delete some text

f) Save the Changes

g) Logout of the system

session - 3 : Filters : (Text processing utilities) Wc, od, cmp, comm., diff, head, tail, cut, paste, sort,grep,uniq Disk&backup utilities Du,df,tar,cpio,ps,who

session - 4 :

1. Write a shell script to generate a multiplication table.
2. Write a shell script that copies multiple files to a directory.
3. Write a shell script which counts the number of lines and words present in a given file.
4. Write a shell script which displays the list of all files in the given directory.
5. Write a shell script(small calculator) that adds, subtracts,multiplies and divides the given two integers. There are two division options: one returns the quotient and the other returns reminder. The script requires 3 arguments: The operation to be used and two integer numbers. The options are add(-a), subtract(-s),multiply(-m), quotient(-c) and reminder(-r).
6. Write a shell script to reverse the rows and columns of a matrix

Session - 5 :

1. Write a C program that counts the number of blanks in a text file. using standard I/O using systemcalls. Imp a) using standard I/O b) using systemcalls.
2. Implement in Cthe following Unix commands using systemcalls.

   (a) cat (b) ls (c) mv
3. Write a programthat takes one ormore file/directorynames as command line input and reports the following information on the file: (a) File type. (b) Number of links, (c) Time of last access. (d) Read,Write and Execute permissions.
4. Writea C programthat illustrates howto execute two commands concurrentlywith a command pipe.
5. Write a Cprogramthat illustrates the creation of child process using fork systemcall.
6. Writea C programthat displays the real time ofa day every 60 seconds.
7. Writea C programthat illustrates file locking using semaphores.
8. Write a C program that implements a producer-consumer system with two processes. (using semaphores)
9. Write a C program that illustrates inter process communication using shared memory system calls.
10. Write a C program that illustrates the following:

    a) Creating a message queue (b) Writing to a message queue.

    c) Reading from a message queue.

Text Books:

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Advanced Programming in the UNIX environment W.R.Stevens

Reference Books:

1. Unix internals,the new frontiers Uresh vahalia.
2. The C Odyssey UNIX Meeta Gandhi.

III Year B.Tech. Biotechnology	II - Semester	L	T	P	To	C
		-	-	3	3	2

BI 316 MINI PROJECT LABORATORY

VFSTR UNIVERSITY

IV Year - B.Tech

SYLLABUS

I SEM & II SEM

IV Year B.Tech. Bioinformatics **I - Semester**

L	T	P	To	C
4	-	-	4	4

BI 401 MOLECULAR MODELING & DRUG DESIGN

Course Description and Objectives :

This course provides an overall understanding about the critical relationship among biomolecular structure, function and force field models. The main objective of this course is to train students to utilize basic modeling techniques to explore biological phenomena at the molecular level.

Course Outcomes :

1. Students will be introduced to the principles and practice of Molecular modeling and modern drug discovery.
2. They will gain an awareness of rational drug design, based on understanding the three-dimensional structures and physicochemical properties of drugs and receptors will be created.
3. They will be able to perform monte carlo simulation
4. The will be able to predict the structure of a protein by 'Threading'
5. They will acquire fundamental principles of chemoinformatics.

Unit I: Introduction to Molecular Modelling:

Introduction - Useful Concepts in Molecular Modelling: Coordinate Systems. Potential Energy Surfaces. Molecular Graphics. Surfaces. Computer Hardware and Software. The Molecular Modelling Literature.

UnitII: Force Fields:

Force Fields. Bond Stretching. Angle Bending. Introduction to Non-bonded Interactions. Electrostatic Interactions. Van der Waals Interactions. Hydrogen Bonding in Molecular Mechanics. Force Field Models for the Simulation of Liquid Water.

Unit III : Energy Minimisation and Computer Simulation :

Energy Minimisation and Related Methods for Exploring the Energy Surface. Non-Derivative method, 1st and 2nd order minimisation methods. Computer Simulation Methods. Simple Thermodynamic Properties and Phase Space. Boundaries. Analyzing the Results of a Simulation and Estimating Errors. GROMACS and CNS.

Unit IV : Molecular Dynamics & Monte Carlo Simulation :

Molecular Dynamics Simulation Methods. Molecular Dynamics Using Simple Models. Molecular Dynamics with Continuous Potentials. Molecular Dynamics at Constant Temperature and Pressure. Metropolis Method. Monte Carlo Simulation of Molecules. Models Used in Monte Carlo Simulations of Polymers. Molecular Modeling software: BIOSUITE

Unit V : Structure Prediction and Drug Design :

Protein Structure Prediction - Introduction to Comparative Modeling. Sequence Alignment. Constructing and Evaluating a Comparative Model. Predicting Protein Structures by 'Threading', Molecular Docking, AUTODOCK and HEX. Structure based De Novo Ligand design, Drug Discovery - Chemoinformatics - QSAR.

Text book :

1. A. R. Leach, Molecular Modelling Principles and Application, Longman, 200l.

Reference Books:

l. J.M.Haile, Molecular Dynamics Simulation Elementary Methods, lohn Wiley and Sons, 1997.

3. Satya Prakash Gupta, QSAR and Molecular Modeling, Springer - Anamaya Publishers, 2008.

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		4	-	-	4	4

BI 403 R - STATISTICS

Course Description and Objectives :

This course deals with the basic concepts of R-statistics. The main objective of this course is to provide students the skills to utilize R for basic statistics.

Course Outcomes :

1. Acquire basic concepts of R-Statistics
2. Be able to perform basic statistics using R
3. Gain adequate insights to the graphics in R
4. Be able to perform various models of simulations using R.

Unit I: Overview :

R help; help.search( ), R mailing list, contributed documentation on CRAN. Data types in R : numeric/character/logical; real/integer/ complex, strings and the paste command, matrices, dataframes, lists, Creation of new variables, Creation of patterned variables, Saving workspace/history.

Unit II: Graphics in R

The plot command, histogram, barplot, boxplot, points, lines, segments, arrows, inserting mathematical symbols in a plot, pie diagram, Customisation of plotsetting graphical parameters, adding text, saving to a file; Adding a legend.

Unit III: Basic statistics using R

One and two sample t tests, Bartletts test for variance,F test for equality of variances, multi sample means, Nonparametric tests, Chi squared tests, Exact tests and confidence intervals, Checking assumptions, distribution fitting.

Unit IV: Vector matrix operations :

Matrix operations such as addition, subtraction, multiplication,; Linear equations and eigenvalues, matrix decomposition – LU, QR and SVD; matrix inverse, G inverse : finding a basis, orthonormalisation, finding rank.

Unit V: Linear models :

The lm function; ANOVA/ANCOVA/regression, models, the summary function, goodness of fit measures, predicted values and residuals; the ANOVA table, confidence intervals and confidence ellipsoids; Multiple testing. Random no. generation & Simulations :rnorm, rchisq,rt, rbinometc; sample; set.seed, Monte Carlo techniques. Programming in R.

Text Book :

1. P.Dalgaard : Introductory Statistics with R, Springer, 2nd,2008.

Reference Books :

1. J.Maindonald&J.Braun : Data Analysis and Graphics Using R , Cambridge University Press, Cambridge, 2nd edition, 2007.

2. J.J.Faraway : Linear Models with R ,Chapman& Hall/CRC Texts in Statistical Science.

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		4	-	-	4	4

BI 405 IMMUNOLOGY AND IMMUNOINFORMATICS

Course Description and Objectives :

This course deals with the basics of immune system. The main objective of this course is to provide the students adequate knowledge about host defense parameters and apply informatics tools to study immune diversity.

Course Outcomes :

1. Students will be able gain an overall understanding of the components of immune system.
2. They will learn various immunotechniques to evaluating the immune system
3. They will understand the degree of variation in immune susceptibility .
4. They will be able to evealuate degree of variation in immune susceptibility using immunoinformatics tools .

Unit I : Overview of Immune System:

Types of Immunity - Innate and Adaptive. Cells and organs of the immune system. Antigens – epitopes, antigenicity, factors influencing antigenicity. Antigen processing and presentation.

Unit II : Immunoglobulins:

Structure and types of Immunoglobulins, Biological activities. Monoclonal antibodies- production and applications. Cytokines – types and immune response. Complement system

Unit III : Antigen Antibody Interactions :

Antibody affinity and activity –precipitation, agglutination, Radio Immuno Assay, ELISA, Western blotting, Immunoprecipitation, Immunofluorescence, Flow cytometry for separation of immune cells. Major Histocompatiblity Complex (MHC). MLR.

Unit IV : T Cell & B Cell Activation :

T cell & B cell maturation, activation and differentiation. Leukocyte migration and inflammation. Hypersensitive reactions. Transplantation immunology

Unit V : Immunoinformatics :

Immunoinformatics - Introduction & Methods. Applications – prediction of epitopes, vaccine design, Web based tools for vaccine design. IMGT: the international ImMunoGeneTics database.

Text Books :

1. Richard A. Golds, Thomas J Kindt: Kuby Immunology, eds. Barbara Osborne. W.H.Freeman & Company, 4th edition, 2000.

2. Kenneth Murphy: Janeway's Immunobiology, Eighth Edition, Garland Science.

Reference Books :

1. K. Chakravarthy, Immunology & Immunotechnology, Oxford University Press, 2006.

2. Darren R.Flower, Immunoinformatics: Predictive Immunogenicity insilico, Humana Press, 2007.

3. http://imgt.cines.fr:8104

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		4	-	-	4	4

BI 407 POPULATION GENETICS (ELECTIVE-III)

Course Description and Objectives :

This course deals with the basics of genetic and phenotypic variation and the organization of genetic variation. The main objective of this course is to provide adequate knowledge in Major evolutionary forces such as Selection, Mutation, Genetic Drift

Course Outcomes :

1. Student will be able to utilize Hardy-Weinberg equation to test the Hardy-Weinberg equilibrium

2. They will be able to identify the causes of linkage disequilibrium

3. They will be able to correlate random genetic drift and Coalescence theory

4. They will be able to understand the rationale behind the origin of various theories of Evolution

5. They will be able to utilize the concept of molecular clock in evolutionary biology research.

Unit I: Genetic and phenotypic variation :

Relevance of population genetics, Phenotypic variation in natural populations, Multiple-factor inheritance, Maintenance of genetic variation, Molecular population genetics, Polymorphisms in DNA sequences, Utility of genetic polymorphisms :

Unit II: Organization of genetic variation :

Random mating, the Hardy-Weinberg principle, testing for Hardy-Weinberg equilibrium, Extensions of the Hardy-Weinberg principle. Linkage and linkage disequilibrium, Causes of linkage disequilibrium.

Unit III: Random genetic drift :

Mutation and random genetic drift, Random genetic drift and binomial sampling, The Wright–Fisher model of random genetic drift, The diffusion approximation, Random drift in a subdivided population, Effective population size, Gene Trees And Coalescence, Theoretical Implications Of Coalescence.

Unit IV: Darwinian Selection and Neutral Theory :

Neutral Theory of Molecular Evolution, The Infinite-Alleles Model, Infinite-Sites Model, Mutation and recombination. Selection in haploid organisms, Selection In Diploid Organisms, Change In Allele Frequency In Diploids, Equilibria With Selection, Mutation-Selection Balance, Complex Types Of Selection, Interdeme Selection In Geographically Subdivided Populations, Selection In A Finite Population

Unit V: Inbreeding, Population Subdivision, and Migration :

Inbreeding, Population Subdivision, The Wahlund Principle, Assortative Mating, Migration, Estimating Rates Of Molecular Sequence Divergence, Molecular Clock. Patterns Of Nucleotide And Amino Acid Substitution, Polymorphism And Divergence In Nucleotide Sequence— The Mcdonald-Kreitman And Hka Tests.

Text Book :

1. Principles Of Population Genetics Fourth Edition, Daniel L. Hartl and Andrew G. Clark. Sinauer Associates, 2011 Inc. Publishers

Reference Book :

1. Population Genetics by Matthew Hamilton, 2009, Wiley Blackwell.

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		4	-	-	4	4

BI 409 PROTEOMICS AND GENOMICS (ELECTIVE - III)

Course Description and Objectives :

This course deals with the basic concepts of proteomics and genomics. To develop skills of the students in the area of genomics and proteomics in both theory and research. To provide knowledge on genome, transcriptome and proteome analysis through computational methods.

Course Outcomes:

1. Students get interest in gene, genome, transcriptome and proteome analysis through computational methods.
2. Students come to know well about the genome features of prokaryote and eukaryote and also they may develop sequence analysis tools based on any genome and proteome feature.
3. Students will get interest in personalized medicine research.
4. Knowledge in the technique, methodology and application of Proteomics tools.
5. An overview of application of microarrays in medicine.

Unit I : Overview :

Research areas and related journals in genomics and proteomics - Concepts of central dogma - Structure and organization of prokaryotic & eukaryotic genome - Changes andregulation of genome activity in prokaryote and eukaryote - Brief outlook of various genome projects and their outcomes - Human genome project.

Unit II : Genome mapping and sequencing :

Mapping techniques - Genetic markers - RFLP, SSLP, STRs, VNTRs - Physical markers - EST, STS, FISH, SNP - Radiation hybrids - Mapping resources - Sequencing methods: chemical and enzymatic method - High throughput method - Automated sequencing methods - Whole genome shotgun sequencing method.

Unit III: Sequence assembly and annotation: Assembly of contiguous DNA sequence - shotgun, directed shotgun and clone contig approach - Genomic DNA library - cDNA library - Primer walking, Chromosome walking, Chromosome jumping - Tools for sequence assembly - Structural and functional genomics - Transcriptome and Microarray approach - Comparative genomics - Population genomics - Pharmacogenomics.

Unit IV : Proteomics :

Introduction to proteome - Proteome and technology - Information and the proteome - Importance of 2D Electrophoresis in proteomics - Protein identification in proteome projects - Primary and secondary attributes for protein identification -Cross species protein identification - Detection and analysis of co- and post-translational modification.

Unit V : Proteome databases :

Protein sequence databases - SWISS-PROT and TiE.MBL - Pattern and profile databases - PROSITE and BLOCKS - 2D PAGE databases - Structure databases - PDB - Metabolic databases - post translational modification databases - Application of proteomics to medicine, proteomics, toxicology and pharmaceuticals.

Text Books :

1. T.A. Brown, Genomes, 2nd edition, BIOS Scientific Publishers Ltd, 2002.
2. Marc R. Wilkins, Keith L. Williams, Ron D. Appel and Denis F. Hochstrasser Proteome Research: New Frontiers in Functional Genomics, Springer, 1997.

Reference books :

1. Greg Gibson, Spencer V. Muse, A primer of genome science, Sinauer associates Inc. Publishers, 2002.
2. David W. Mount, Bioinformatics: sequence and genome analysis, 2nd edition, CBS publishers, 2004.
3. Pennington, Proteomics from protein sequence to function, 2nd edition, Viva Books Ltd, 2002.

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT310 BIOETHICS, SAFETY AND INTELLECTUAL PROPERTY RIGHTS (ELECTIVE - III)

Course Description and Objectives :

This course helps to adhere to the ethical practices appropriate to the discipline at all times and to adopt safeworking practices relevant to the bioindustries & field of research :

Course outcomes :

1. Students will gain awareness about Intellectual Property Rights (IPRs) to take measure for the protecting their ideas
2. They will able to devise business strategies by taking account of IPRs
3. They will be able to assists in technology upgradation and enhancing competitiveness.
4. They will acquire adequate knowledge in the use of genetically modified organisms and its effect on human health
5. They will gain more insights into the regulatory affairs.

UNIT I: Engineering Ethics & Bioethics :

Senses of “Engineering Ethics”’ - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg’s theory - Gilligan’s theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories. Introduction to Bioethics. Social and ethical issues in Biotechnology Definition of Biosafety. Biosafety for human health and environment. Social and ethical issues. Use of genetically modified organisms and their release in to the environment. Special procedures for r-DNA based products, Transgenic plants and Animals.

UNIT II : Regulatory Affairs :

Regulation, national and international guidelines of Biosafety, r-DNA guidelines, Regulatory requirements for drugs and Biologics GLP and GMP.

UNIT III : Intellectual Property Rights :

Intellectual property rights and protection, patents and methods of application of patents, Trade Secrets copyrights, Trade Marks, legal implications, farmer's rights, plant breeder's rights. International and National conventions on biotechnology and related areas, WTO guidelines.

UNIT IV : Safety, Responsibilities and Rights:

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights.

UNIT V : Global Issues :

Multinational corporations - Environmental ethics - computer ethics - weapons development and bioterrorisms - engineers as managers-consulting engineers - engineers as expert witnesses and advisors - moral leadership-sample code of Ethics.

Text Books :

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

Reference Books :

1. Sasson A, Biotechnologies and Development, UNESCO Publications, 1988.
2. Sasson A. Biotechnologies in developing countries present and future, UNESCO publishers, 1993. 7. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001. 9. Singh K. "Intellectual Property Rights on Biotechnology", BCIL, New Delhi.

IV Year B.Tech. Bioinformatics I - Semester

L	T	P	To	C
4	-	-	4	4

BI 411 FORENSIC SCIENCE (ELECTIVE - IV)

Course Description and Objectives :

This course deals with the basics of forensic science. The main objective of this course is to provide adequate knowledge to the students about the Organization set-up of forensic laboratories.

Course Outcomes :

Upon completion of the course, the students will:

1. Gain sufficient knowledge in the various methods of Investigation
2. Know the significance of Narco Analysis as an Inverstigative tool
3. Gain certain insights into the Criminal Profiling
4. Acquire background knowledge in the history and development of police as an institution
5. Know about the qualifications and duties of a forensic scientist
6. Be able to differentiate various types of DNA finger prints and their applications

Unit I : Introduction to the basics of Forensic science :

History and Development of Forensic Science, Definition of Forensic Science, Scope of Forensic Science, Need of Forensic Science, Basic Principles of Forensic Science, Tools and Techniques of Forensic Science.

Unit II : Organization setup of forensic laboratories :

Organizational setup of Forensic Science Laboratories, CFSL, FSL, GEQD, FPB, NICFS, Central Detective Training School, NCRB (Maintenance of Crime Records), NPA Mobile Forensic Science Laboratory, Branch of Forensic Science, Forensic Science : its International Perspective.

Unit III : Methods of Investigation :

Modus Operandi and MOB and its role in Criminal Investigation, Methods of Investigation : Narco analysis :History, Importance as an investigative tool, methods as use of drugs, Hypnosis etc. Limitations and legal aspects. Ethics in Forensic Science.

Unit IV: Brain finger printing :

Concepts, History, Significance, method, future perspective of the technique, limitations. Criminal Profiling : Introduction, Importance, Profile of the victim and culprit, understanding *modus operandi*, investigative strategy, crime scene characteristics, criminal behavior on the internet, limitations. Various Police Organisations, Organisation of Police Station, Evolution of Police as an Institution, Role & Functions of Police,

Unit V: History and Development of Finger Print as a tool for Personal Identification :

Education of Forensic Science, Role of Media, Human Rights & Criminal Justice System. Duties of Forensic Scientist, Qualification of Forensic Scientist. Development of Finger Print as Science for Personal Identification, Type of Finger Prints, Classification of Finger Prints, Latent Finger Print, Causes of Formation of latent Finger Prints, Comparison of Finger Prints, ridge details. Presentation of Expert Evidence: Data, Reports, Evidence in the Court

Text Books :

1. Nanda, B.B. and Tewari, R.K. (2001) : Forensic Science in India : A vision for the twenty first century Select Publisher, New Delhi.
2. James, S.H and Nordby, J.J.. (2003) Forensic Science : An introduction to scientific and investigative techniques CRC Press, Barnett (2001): Ethics in Forensic Science.

Reference Books :

1. O'Hara & Osterburg : Introduction to Criminalistics, 1949, The MacMillan Co., 1964.
2. Osterburg : Crime Laboratory. Saferstien : Forensic Science, Handbook, Vol. I, II & III, Prentice Hall Inc. USA.

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		4	-	-	4	4

BT415 BIOPHARMACEUTICAL TECHNOLOGY (ELECTIVE-IV)

Course Description and Objectives :

To give an awareness to the student about history, sources of drugs, pharmocodynamics and pharmacokinetics and drug manufacturing. Also about production and applications of biopharmaceuticals and drug delivery systems.

Course Outcomes :

Student gains knowledge on

1. History and sources of drugs, different dosage forms and routes of drug administration.
2. Pharmacodynamic and pharmacokinetic mechanisms
3. GMP, Manufacturing facilities, sources, production procedures, analysis and formulation of drugs and Biopharmaceuticals
4. Production and medical applications of therapeutic proteins like interferons, interleukins, insulin, erythropoietin, hGH etc.,
5. Biomaterials and different drug delivery systems.

UNIT I : Introduction to Pharmaceuticals :

History & Definition of Drugs. Sources of Drugs - Plant, Animals, Microbes and Minerals, Different dosage forms, Routes of drug administration.

UNIT II : Pharmacodynamics and Pharmacokinetics :

Physico-Chemical Principles, Pharmacodynamics- Mechanism of drug action, Drug receptors, and Physiological receptors: structural and functional families. Pharmacokinetics - Drug absorption, Factors that affect the absorption of drugs, Distribution of drugs, Biotransformation of drugs, Bioavailability of drugs.

UNIT III : Drug manufacturing processes :

Good manufacturing practices, Manufacturing facilities, Sources of Biopharmaceuticals, Production & analysis of Biopharmaceuticals. Recent advances in the manufacture of drugs using r-DNA technology.

UNIT IV : Production and Applications of Biopharmaceuticals:

Production of Therapeutic Proteins, Hormones, Cytokines - Interferon's, Interleukins I & II, Tumor Necrosis Factor (TNF); Nucleic acids. Role of Biopharmaceuticals in treatment of various health disorders

UNIT V : Drug Delivery Systems, Biomaterials & their Applications :

Controlled and sustained delivery of drugs. Biomaterial for the sustained drug delivery. Liposome mediated drug delivery. Drug delivery methods for therapeutic proteins.

TEXT BOOKS :

1. Leon Lachman, H.A. Lieberman & J.L.Kanig, Theory & Practice of Industrial Pharmacy, 3rd ed. Varghese Publishg House, Bombay, 1987.

2. Gary Walsh - Biopharmaceuticals: Biochemistry & Biotechnology, 2nd Ed. John Wiley & Sons Ltd., England. 1998.

REFERENCE BOOKS :

1. Milo Gibaldi - Biopharmaceutics and Clinical Pharmocokinetics, First edition, Pharma Book Syndicate, 2006.

2. Remington's Pharmaceutical Sciences, Mark Publications & Co.

3. Tripathi K.D. - Essentials of Medical Pharmacology, 6th edition, Jaypee Publication, 2006.

4. Brahmankar, D.M., Sunil, B.Jaiswals - Biopharmaceutics & Pharmacokinetics a Treatise , 2nd edition, M.K.Jain Publication, Delhi, 2009.

IV Year B.Tech. Biotechnology	I - Semester	L	T	P	To	C
		4	-	-	4	4

BI 413 NEXT GENERATION SEQUENCING & ANALYSIS (ELECTIVE - IV)

Course Description and Objectives :

This course deals with the analysis and interpretation of data obtained using NGS.

Course Outcomes :

1. Students will be able to differentiate general and unique aspect of sequencing methods
2. Students will be able to apply concepts of next generation sequencing (NGS)
3. They will be able to understand NGS data
4. They will be able to analyze NGS data
5. They will be able to utilize various tools available in NGS databases for performing various analyses.

UNIT I - DNA Sequencing :

DNA Sequencing, First generation DNA sequencers, Drawbacks of the first generation sequencing methods.

UNIT II - NGS :

Emergence of Next generation sequencing, 454 Pyro-sequencing, Illumina Genome Analyzer, Applied Biosystems Sequencing, Ion Torrent Sequencing, Polonator Technology, Nanopore Sequencing, Single Molecule Real Time DNA sequencing, Comparison of Next generation sequencing techniques, Drawbacks of NGS, NGS File formats, & applications.

UNIT III - Assembly of Sequence Data :

De novo Genome sequence assembly, Reference sequence assembly, Challenges of Genome assembly, Use of paired – end reads in the assembly, Data Preprocessing methods and sequencing read correction methods, Assembly Errors, Evaluation of assembly methods.

UNIT IV : Applications of NGS :

Transcriptome (RNA) sequencing, Exome sequencing, Genome Annotation, Using NGS to detect sequence variants, ChIP-sequence, Biological theories on ChIPsequence, analysis, Understanding the non – coding genome, Disease gene identification, DNA fragment evaluation, Peak identification, Two condition comparison, Saturation analysis, Motif finding and related theories.

UNIT V : NGS Databases & Analysis of NGS Data :

NGS databases, Sequence Analysis: Pairwise and multiple sequence alignment methods.

TEXTBOOKS :

1. Ali Masoudi-Nejad, Zahra Narimani, Nazanin Hosseinkhan; “Next Generation Sequencing and Sequence Assembly”, Methodologies and Algorithms, Springer; 2013.

2. Stuart M. Brown, “Next-Generation DNA Sequencing Informatics”, Cold Spring Harbor Laboratory Press, 2013.

REFERENCES BOOK :

1. Mark I. Rees, “Challenges and Opportunities of Next-generation Sequencing for Biomedical Research”, Academic Press, 2012.

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		4	-	-	4	4

BI 415 STRUCTURAL BIOINFORMATICS

Course Description and Objectives :

This course aims to study the strategy and tactics of biophysical concepts of macromolecules and the conformational analysis and forces that determine the protein and nucleic acid structure and ligand interaction with macromolecules. Study of the size and shape of the macro molecule using different techniques using various tools like X-ray Crystallography and NMR is explained in the course.

Course Outcomes :

1. Student will learn the different structural levels of biological macromolecules, its size, shape, their conformations and the forces that are involved in stabilizing these molecules.
2. They will be able to utilize the tools by which this analysis is done will be learned.
3. The student would also learn about the ligand interaction with macromolecules.
4. They will understand the basic principles of various methods of spectroscopy and its applications
5. They will understand the concepts behind X-ray diffraction and X-ray crystallography.

Unit I : Introduction: Levels of structures in Biological macromolecules :

Basic strategies in biophysics- Principles and concepts used in biophysical analysis of life processes - Biomolecules and their interactions, size and shape of macromolecules.

Unit II: Conformational Analysis :

Forces that determine protein and nucleic acid structure, basic problems, polypeptide chains geometries, potential energy calculations, observed values for rotation angles, hydrogen bonding, hydrophobic interactions and ionic interactions, disulphide bonds.

Unit III : Structural Analysis of Macromolecules :

Prediction of proteins structure, nucleic acids, general characteristics of nucleic acid structure, geometries, glycosidic bond rotational isomers and those puckering backbone rotational isomers and ribose puckering forces stabilising ordered forms, base pairing, base stacking tertiary structure of nucleic acids.

Unit IV : Spectroscopy and methods of visualization :

Absorption spectroscopy, Linear and Circular Dichroism, Emission spectroscopy, Nuclear Magnetic Resonance spectroscopy. Methods of direct visualisation, macromolecules as hydrodynamic particles, macromolecular diffusion, ultracentrifugation, viscometry.

Unit V : X-ray diffraction :

X-ray crystallography - X-ray diffraction, determination of molecular structures, electron microscopy, neutron scattering, light scattering.

Text Book :

1. Cantor R., Schimmel P.R., Biophysical Chemistry, Vol. I, II, W.H. Freeman & Co., 1985.

Reference Books :

1. Daniel. M, Basic Biophysics for Biologists, 1998.
2. Kensal E. van Holde, W. Curtis Johnson and P. Shing Ho, Principle of Physical Biochemistry, Prentice Hall, New York, 1998.

IV Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		-	-	3	3	3

BI 316 IMMUNOINFORMATICS LABORATORY

Course description and objectives :

This course deals with the basic experiments in immunoinformatics. The main objective of this course is to provide the students adequate skills for understaking miniprojects in immunoinformatics.

Course outcomes:

1. Students will be able perform epitope prediction
2. They will be able to perform target recognition and domain analysis
3. They will be able to predict MHC-I binding sites
4. They will be able to predict MHC-II binding sites
5. They will be able to perform promiscuous regions predictions

LIST OF EXPERIMENTS :

1. Immuno informatics – Epitope prediction
2. Target recognition & Domain analysis
3. MHC-I binding sites predictions using BIMAS for genome polyprotein
4. MHC-I binding sites predictions using BIMAS for domain sequence
5. MHC-I binding sites predictions using SYFPHEITI for genome polyprotein
6. MHC-I binding sites predictions using SYFPHEITI for domain sequence
7. Proteosome cleavage prediction
8. MHC-II binding sites predictions
9. Promiscuous regions predictions
10. Domain modeling using swiss model
11. Sequential epitope prediction using swiss pdb viewer
12. Conformational epitope prediction using swiss pdb viewer

Text Book :

1. "Immunoinformatics, Bioinformatic strategies for better understanding of Immune function - Novartis Foundation" 2003.

IV Year B.Tech. Bioinformatics I - Semester

L	T	P	To	C
-	-	3	3	3

BI 419 R - STATISTICS LABORATORY

Course Description and Objectives :

This course deals with the performance of basic statistical analysis using R-interface. The main objective of this course is to provide training to students to perform basic statistics using R programming.

Course Outcomes:

1. Students will be able to perform Exploratory data analysis
2. They will be able to do sampling from standard discrete and continuous distributions
3. They will be able to use R to illustrate probabilistic notions such as conditioning, convolutions and the law of large numbers.

List of Experiments :

1. Introduction to R.
2. Exploratory data analysis: methods of visualisation and summary statistics.
3. Sampling from standard discrete and continuous distributions (Bernoulli, Geometric, Poisson, Gaussian, Gamma).
4. Generic methods for sampling from univariate distributions
5. The use of R to illustrate probabilistic notions such as conditioning, convolutions and the law of large numbers.
6. Examples of modelling real data (but without formal statistical inference) and the use of visualisations to assess fit.

Test Books:

1. J.Maindonald&J.Braun : Data Analysis and Graphics Using R , Cambridge University Press, Cambridge, 2nd edition, 2007.
2. J.J.Faraway : Linear Models with R ,Chapman& Hall/CRC Texts in Statistical Science.

V Year B.Tech. Bioinformatics	I - Semester	L	T	P	To	C
		-	-	3	3	3

BI 421 MOLECULAR MODELING LABORATORY

Course Description and Objectives :

This course deals with the modelling of protein structures using software tools. The main objective of this course is to provide hands-on training in modelling proteins.

Course outcomes :

1. Students will be able to perform alignments
2. They will be able to do homology modelling
3. They will gain sufficient insights into the empirical energy field
4. They will be able to perform molecular dynamics

List of Experiments :

1. Comparison/validation alignments.
2. Protein visualization.
3. Homology modelling.
4. Empirical force fields.
5. Molecular dynamics: set up and analysis.
6. Molecular docking.

TEXT BOOK:

1. A. R. Leach, Molecular Modelling Principles and Application, Longman, 200l.

IV Year B.Tech. Bioinformatics II - Semester	L	T	P	To	C
	4	-	-	4	4

MS 402 PRINCIPLES AND PRACTICE OF MANAGEMENT

Course Description & Objectives :

The main object of the course is to explain about concepts, principles and practice of management.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand what is management and evolution of management thought
2. Importance of planning and decision making in organizations
3. Process of organizing and delegation of authority
4. Theories of motivation and leadership styles
5. Coordination and control process in the organizations

UNIT - I : Management - Overview:

Definition, nature, purpose and scope of management - Functions and Roles of a manager - an overview of planning, organizing and controlling - Is managing a science or art? Ethics in managing and social responsibility of managers - Evolution of management thought. Contributions made by Taylor, Fayol, Weber, Elton Mayo, Maslow, Herzberg, and McGergor. Various approaches to Management - Decision Theory approach. Systems Approach: Key concepts in systems - Closed system versus open system. Subsystems, System Boundary. McKinsey's 7-S Approach needs - Leadership.

UNIT – II Planning & Decision Making:

Types of plans, steps in planning, and process of planning.Nature of objectives, setting objectives. Concept and process of Managing by Objectives.Nature and purpose of strategies and policies. Strategic planning process. SWOT analysis,Portfolio matrix, premising and forecasting. Decision Making: Meaning, Importance and steps in Decision Making - Traditional approaches to decision-making - Decision making under certainty, programmed decisions – Introduction to decision-making under uncertainty,non-programmed decisions, decision tree- group-aided decisions; Brain storming – Creativity, creative problem solving.

UNIT – III : Organizing :

Concept of organization, process of organizing, bases of Departmentation,Authority & power - concept & distinction. Various types of organization structures -Delegation - concept of delegation; elements of delegation - authority, responsibility, accountability. Reasons for failure of delegation & how to make delegation effective.Decentralization - concept, reasons for decentralization and types (or methods) of decentralization. Span ofManagement - concept, early ideas on span of management.

UNIT – IV : Directing :

Motivation and Motivators: Concept, Theories of Motivation: Hierarchy of Needs, Motivation-Hygiene Expectancy, Equity, Reinforcement, McClelland's needs - Leadership:
Meaning, Definition, Ingredients of Leadership – Trait Approaches of Leadership – Leadership Behavior and Styles – Contingency Approaches to Leadership – Communication: Meaning, Process, and Importance in Functions of Organization – Barriers in Communication – Effective Communication

UNIT – V : Coordination and Control:

Concept and importance of coordination; factors which make coordination difficult; techniques or methods to ensure effective coordination. Control: Concept, planning-control relationship, process of control - setting objectives, establishing standards, measuring performance, correcting deviations. Human response to control. Dimensions or Types of Control: Feed forward control, Concurrent Control (Real TimeInformation & Control), Feedback Control - Techniques of Control: Brief review of Traditional and Modern Techniques of Control.

Text Books:

1. Stoner, Freeman and Gilbert, Jr. Management, 6/e, Pearson Education, New Delhi, 2006.
2. Heinz Weihrich, Harold Koontz: Management A Global Perspective, 10/e, Tata McGraw Hill, 2007.

Reference Books:

1. Daft, The New Era of Management, Thomson, 7/e New Delhi, 2007.
2. Schermerhorn: Management 8ed,Wiley India 2006.

IV Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BI 402 ECO INFORMATICS AND PREDICTIVE ECOLOGY (ELECTIVE-V)

Course Description and Objectives:

This course links the concepts of fuzzy logic and artificial neural networks for ecological applications. The main objective of this course is to provide insights into the design and application genetic algorithms in ecology and also enabling the students to utilize the knowledge of evolutionary computation in prediction and elucidation of Stream Ecosystems in Prediction and Elucidation of Stream Ecosystems

Course Outcomes :

1. Students will be able to perform Fuzzy knowledge based modeling
2. They will able to perform the designing of genetic algorithms
3. They will able to predict the future of ecosystems
4. They will able to incorporate the scope of utilizing adaptive agents in ecological studies
5. They will able to conduct independent study in river ecosystems for river management

Unit I: Ecological Applications of Fuzzy Logic and unsupervised artificial neural networks :

Fuzzy Sets and Fuzzy Logic, Fuzzy Approach to Ecological Modelling and Data Analysis, Fuzzy Classification, Fuzzy Regionalisation, Fuzzy Knowledge-Based Modelling, Computation of Self organizing Map with an abundant Datasets: SOM algorithm, Utilization of Self organizing Map

Unit II: Ecological Applications of Genetic Aigorithms :

Ecology and Ecological Modelling, Genetic Algorithm Design Details, Applications of Genetic Algorithms to Ecological Modelling, Predicting the Future with Genetic Algorithms, The Next Generation: Hybrids Genetic Algorithms.

Unit III: Ecological Applications of Evolutionary Computation

The Challenges of Ecological Modelling, The Basic Evolutionary Algorithm, Equation Discovery, Optimisation of Difference Equations, Evolving Differential Equations, Rule Discovery, Modelling Individual and Cooperative Behaviour, Predator-Prey Algorithms, Modelling Hierarchical Ecosystems.

Unit IV: Ecological Applications of Adaptive Agents :

Adaptive Agents Framework, Individual-Based Adaptive Agents, State Variable-Based Adaptive Agents (Explain the concept using Algal Species Simulation by Adaptive Agents: Embodiment of Evolutionary Computation in Agents, Adaptive Agents Bank, Pelagic Food Web Simulation by Adaptive Agents).

Unit V: Prediction and Elucidation of Stream Ecosystems :

Study Sites, Data Sources and Modelling Techniques (Explain with an example of any river basin), Classification Trees: Model Development and Validation, Application of Predictive Classification Trees for River management, Artificial Neural Networks: Model Development and Validation, Application of Predictive Artificial Neural Networks for River Management, Prediction of environmental standards.

Text Book :

1. Ecological Informatics, Dr. Friedrich Recknagel (Ed.), 2006 Springer-Verlag Berlin Heidelberg

Reference book :

1. Ecoinformatics Tools & Techniques R. A. Reddy, 2003, Sbs Publishers & Distributors Pvt.

IV Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BI 316 COMPUTATIONAL EPIGENETICS

Course Description and Objectives :

This course deals with the the basic concepts and principles of Epigenetics. This course will Provide basic knowledge to the students about the mechanisms that form the basis of Epigenetics.

Course Outcomes :

1. Student will be able to utilize the concepts of mammalian epigenetics in comparative genomics
2. They will be able to understand the role of istone modifications in DNA repair
3. They will be able to utilize epigenetic databases for retrival of epigenetic data
4. They will be able to utilize computational epigenetic tools
5. They will be able to perform computational analysis of histone modification.

Unit I: **Epigenetics: New Science of Genetics :**

The basics of DNA methylation and histone modification, Epigenetic technology, Model organisms of epigenetics, Functions of epigenetics, Epigenetics and human diseases.

Unit II : **Mechanisms of DNA Methylation, Methyl-CpG Recognition, and Demethylation in Mammals :**

Mammalian DNA MTases, Dnmt3L as a regulatory factor for *de novo* DNA methylation, Base flipping mechanism, UHRF1-histone interactions, Replication-coupled crosstalk between DNA methylation and histone modifications.

Unit III: **Mechanisms of Histone Modifications :**

Histone modifications: Proline Isomerization, Sumoylation, Ubiquitination, ADP-ribosylation, Phosphorylation. Role of histone phosphorylation in transcription regulation, Role of histone phosphorylation in DNA repair. Methylation, Role of histone methylation in transcription regulation. Acetylation, Role of histone acetylation in transcription regulation, Role of histone acetylation in DNA repair.

Unit IV : **Epigenetic Technology :**

Analysis of Gene-specific DNA Methylation, Methods for Assessing Genome-wide DNA Methylation, Methylation of Lysine 9 of Histone H3: Role of Heterochromatin Modulation and Tumorigenesis, Chromatin Modifications Distinguish Genomic Features and Physical Organization of the Nucleus.

Unit V : Computational Epigenetics :

Introduction to epigenetic databases, Computational tools for Epigenetic research, Computational analysis of DNA methylation, Computational analysis of histone modifications, Cancer informatics, Stem cell informatics

Text Books :

1. Handbook of Epigenetics by Trygve Tollefsbol, 2006
2. Epigenetics by Danny Reinberg, 2010

Reference Book :

1. Epigenetics **by Lyle Armstrong, 2011.**

IV Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BI 406 METABOLIC ENGINEERING (ELECTIVE - V)

Course Description and Objectives :

This course deals with the basic and applications of metabolic engineering. This course helps the student for understanding purposeful modification of metabolic pathways to achieve desired goals such as enhanced production of metabolites, creation of novel metabolites and utilization of new carbon substrates

UNIT I : Introduction & Applications of Metabolic Engineering :

Identification of metabolic regulation is a key point in metabolic engineering. Basic concepts of Metabolic Engineering – Overview of cellular metabolism – Different models for cellular reactions, induction – Jacob Monod model and its regulation, Differential regulation by isoenzymes, Feed back regulation. Application in pharmaceuticals, chemical bioprocess, food technology, agriculture, environmental bioremediation and biomass conversion.

UNIT II : Synthesis of Primary & Secondary Metabolities :

Amino acid synthesis pathways and its regulation at enzyme level and whole cell level, Alteration of feed back regulation, Limiting accumulation of endproducts. Regulation of secondary metabolite pathways, precursor effects, prophase, idiophase relationship, Catabolite regulation by passing control of secondary metabolism, producers of secondary metabolites, applications of secondary metabolites.

UNIT III : Bioconversions & Regulation of Enzyme Production :

Applications of Bioconversions, Factors affecting bioconversions, Specificity, Yields, Co metabolism, Product inhibition, mixed or sequential bioconversions, Conversion of insoluble substances. Strain selection, Genetic improvement of strains, Gene dosage, metabolic pathway manipulations to improve fermentation, Feed back repression, Catabolite Repression, optimization and control of metabolic activities. The modification of existing - or the introduction of entirely new - metabolic pathways.

UNIT IV : Metabolic Flux :

Integration of anabolism and catabolism, metabolic flux distribution analysisbioprocess, material balance, kinetic types, equilibrium reaction. Experimental determination method of flux distribution, Metabolic flux analysis and its applications, Thermodynamics of cellular processes.

UNIT V : Metabolic Engineering with Bioinformatoics :

Metabolic pathway modeling, Analysis of metabolic control and the structure metabolic networks, Metabolic pathway synthesis algorithms.

TEXT BOOKS:

1. Stanbury P.F., and Whitaker A., Principles of Fermentation Technology, Pergamon Press, 1984 - ELSEVIER, 2nd Edition, 2008.

2. Zubay G., Biochemistry, Macmillan Publishers, 1989 - 3rd Edition, WMC Brown Publisher, 1990.

REFERENCE BOOKS:

1. Metabolic engineering principles and methodologies-Gregory N.Stephanopoulos, Aristos et al-Elsevier, First Edition, 2006.

2. http://ocw.osaka-u.ac.jp/contents/19/ME040512.pdf

3. http://ocw.osaka-u.ac.jp/contents/19/ME040421.pdf

4. http://ocw.osaka-u.ac.jp/contents/19/ME040526.pdf

5. http://ocw.osaka-u.ac.jp/contents/19/ME040602.pdf

IV Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BI 408 MOLECULAR FORENSICS (ELECTIVE-VI)

Course Description and Objectives:

This course deals with the basic concepts of DNA forensics and various tools employed. The main objective of this course is to provide gain adequate knowledge in various types of PCR and techniques in DNA forensics.

Course Outcomes:

1. Students will be to choose the proper PCR method and technique for molecular forensic analysis
2. They will be able to demonstrate the process of paternity testing
3. They will be able to interpret DNA typing results
4. They will be familiarized with various legal perspectives of permissibility of DNA testing
5. They will be able to use various population databases of DNA markers.

Unit I: Introduction to Bioinformatics :

Bioinformatics: Introduction, Theory and practice of database searching, Integrated information retrieval, Internet access, Searching for sequence homology and alignment. Basic concepts of UNIX database and programming, Computing concepts of the UNIX operating system. Patent laws and Intellectual rights.

Unit II: Introduction to DNA forensics and types of PCR :

Introduction to DNA forensics, Scope and application of DNA forensics in animal and human criminal investigations in variety of situations. Types of PCR: Nested PCR, Touchdown PCR, Gradient, PCR, Hot-starts PCR, Quantitative PCR, multiplex PCR. DNA quantification by Slot- blot assay, Pico-green micro-titer plate assay, AluQuant human DNA quantification system, endpoint PCR, PCR inhibitors & solutions, Contamination Issues, etc.

UNIT III: Techniques in DNA forensics :

Uni-parentally inherited genetic markers in ethnic and geographical origin detection, DNA Profiling Kits (Easy DNA, Pro-filer, etc.) DNA fingerprinting of degraded samples, Slot-blot assay for quantification of DNA, DNA-DNA Hybridization, SNP microarray for supplementary paternity testing. Genetic analysis of chromosome X (pentaplex/heptaplex PCR assay), multicopy Y-STR analysis, mitochondrial DNA analysis, DNA multi-reverse parental analysis, cytochrome b analysis, eDNA Personal Effects and DNA analysis(sources and problems)

UNIT IV: Forensic DNA evidence interpretation :

Advantages, disadvantages and limitations of DNA forensics. Interpretation of DNA typing results: Complicating Factors (Multiple contributors, degradation, and extraneous substances), System-specific Interpretational Issues (RFLP, PCR systems). Assessing strength of evidence: Determination of Genetic Concordance, Evaluation of Results, Frequency Estimate Calculations, Population Substructure, Likelihood Ratios, and Uniqueness of DNA Profile.

UNIT V: DNA Fingerprinting Applications :

Case studies in disputed paternity cases, child swapping, missing person's identity, civil immigration, veterinary, wild life and agriculture cases ;Legal perspectives – legal standards for admissibility of DNA profiling – procedural & ethical concerns, status of development of DNA profiling in India & abroad; Limitations of DNA profiling; Population databases of DNA markers –STRs, Mini STRs, SNPs. Uses of STR Typing, New & future technologies: Microarrays technology, Synthetic DNA, analysis of Degraded DNA, Low Copy Number DNA, MALDI-ToF, Mass Spectrometry.

Text Books :

1. Molecular Forensics - by Ralph Rapley (Editor), 2004, David Whitehouse (Editor)
2. Principles and Techniques of Biochemistry and Molecular Biology - Keith Wilson and John Walker, 2010

References Book :

1. PCR (Basics: from Background to Bench) - M. J. McPherson and S. G. Moller.

IV Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BI 410 COMPARATIVE GENOMICS (ELECTIVE-VI)

Course Description and Objectives:

This course deals with genomes of various organisms and their comparisons. The main objective of this course is to find genomic information and resources also to provide students adequate knowledge in annotating genes

Course Outcomes :

1. Student will be able to understand the basic concepts of Comparative genomics
2. Student will be acquire adequate insights into the human genome project
3. Student will be learn the utility of phylogenetic trees in evolutionary thinking
4. Student will be understand the fundamentals of bacterial and vertebrate evolution

Unit I: Introduction to comparative genomics :

What is “comparative genomics”?. Timeline of comparative genomics developments. Databases for genomics resources: NCBI. The history of the Human Genome Project. Why, when, who and how. Why sequence the human genome?. Ethical and societal issues: Iceland’s Genomic Database as a case study

Unit II: Obtaining and Assembling Sequences :

Hierarchical shotgun sequencing, Large-scale sequencing methods: cloning and BAC library creation, Sequence quality scoring, vector screening (phred), Sequence assembly into contigs and skeleton frameworks (phrap), Introduction to evolutionary thinking: Phylogenetic analyses: tree terminology and parsimony, Concept of homology

Unit III: Gene Identification and Annotation :

Sequence alignment: global versus local Databases and tools for annotating sequence (FASTA, BLAST) Modifying search strategies; searching different databases, Inferring gene function from relatedness to other genes, Finding Open Reading Frames (ORFs) distinguishing introns from diverged exons.

Unit IV: Genome Comparisons I: Organelles :

Phylogenetic analyses: introduction to programs, Mitochondrial Genomes: size, content, and gene order, The minimal genome, Survey of bacterial genomes.

Unit V : Genome Comparisons II: Bacteria and Vertebrates :

Microbial genes in the human genome: lateral transfer or gene loss?. Phylogenetic analyses to determine relationships and interpret character evolution in Bacteria. Vertebrate evolution based on genome comparisons. Human and chimpanzee genome comparisons.

Research Publications as source of information :

1. Pennisi, E. 2001. The Human Genome. *Science* 291:1177-1180.
2. Roberts, L. 2001. Controversial from the start. *Science* 291:1182-1188.
3. Baltimore, D. 2001. Our genome unveiled. *Nature* 409:814-816.
4. Wolfsberg, T. G., J. McEntyre, and G. D. Schuler. 2001. Guide to the draft human genome. *Nature* 409:824-826.,
5. Birney, E., A. Bateman, M. E. Clamp, and T. J. Hubbard. 2001. Mining the draft human genome. *Nature* 409:827-828.
6. Rokas, A., B. L. Williams, N. King, and S. B. Carroll. 2003. Genome-scale approaches to resolving incongruence in molecular phylogenies. *Nature* 425:798-804

IV Year B.Tech. Bioinformatics II - Semester

L	T	P	To	C
4	-	-	4	4

BT409 BIOSENSORS & BIOELECTRONICS (ELECTIVE - IV)

Course Descriptions and Objectives:

This course deals with the basics and applications of Biosensors. This course helps to understand the use of biomolecues as recognition elements for detection of a particular analyte and the use of biological elements such as proteins in place of silicon chips.

Course Outcomes:

1. Students will be able to understand various transducers and their applications
2. They will be able to develop low cost biosensors for various purposes
3. They will understand the design and applications of enzyme electrodes
4. They will understand the potential advantages of a biocomputer
5. They will understand the basics of bimolecular photonic computer

Unit I: Introduction:

Biosensors- Advantages and limitations, various components of biosensors Biocatalysis based biosensors, Bioaffinity based biosensors & Microorganisms based biosensors, Biologically active material and analyte. Types of membranes used in biosensor constructions.

Unit II: Transducers In Biosensors:

Various types of transducers; principles and applications - Calorimetric, Optical, Potentiometric / Amperometric, Conductometric / Resistometric, Piezoelectric, Semiconductor, Impedimetric, Chemiluminiscene - based Biosensors.

Unit III: Application And Uses of Biosensors:

Biosensors in clinical chemistry, medicine and health care, biosensors for veterinary, agriculture and food Low cost - biosensor for industrial processes for online monitoring; biosensors for environmental monitoring. Application of enzymes in analysis; design of enzyme electrodes and their application as biosensors in industry, healthcare, food and environment.

Unit IV: Bioelectronics :

Potential advantages & Developments towards a biomolecular computer, development of molecular arrays as memory stores; molecular wires and switches; mechanisms of unit assembly.

Unit V: Design for A Biomolecular Photonic Computer:

Assembly of photonic biomolecular memory store; Information processing; commercial prospects for biomolecular computing systems.

Text Books:

1. Brian R Eggins - Biosensors an Introduction , First edition, John Wiley & Sons Publishers, 1996.

2. Loic J Blum, Pierre R Coulet - Biosensors Principles and Applications, First edition, Marcel Dekker,Inc, 1991.

Reference Books :

1. Elizabeth A Hall - Biosensors, First Edition, Open University, Milton Keynes, 1990.

2. Graham Ramsay - Commercial Biosensors, First edition, John Wiley & Sons, Inc. 1998.

3. Tran Minh Canh - Sensor Physics & Technology - Biosensors , First Edition, Champan & Hall, 1993.

4. Donald G. Buerk - Biosensors Theory and Applications, First Edition

   Technomic Publishing. Co, Inc, 1993. Reference Books:

IV Year B.Tech. Bioinformatics	II - Semester	L	T	P	To	C
		-	-	10	10	10

BI 412 PROJECT WORK

IV Year B.Tech. Bioinformatics	II - Semester	L	T	P	To	C
		-	-	10	10	10

BI 414 INTERNSHIP

I

YEAR

FOOD TECHNOLOGY

B.Tech.

I SEMESTER	16HS101	-	Basic Mathematics - I
	16HS102	-	Engineering Physics
	16HS105	-	Technical English Communication
	16CS101	-	Basics of Computers and Internet
	16CS102	-	Computer Programming
	16EE101	-	Basics of Engineering Products
	16HS104	-	English Proficiency and Communication Skills
	16HS110	-	Engineering Physics Laboratory
II SEMESTER	16HS106	-	Basic Mathematics - II
	16HS107	-	Engineering Chemistry
	16ME101	-	Engineering Graphics
	16EE102	-	Basics of Electrical and Electronics Engg.
	16HS111	-	Engineering Chemistry Laboratory
	16HS109	-	Environmental Science and Technology
	16FT101	-	Biochemistry and Nutrition
	16ME103	-	Workshop Practice

COURSE CONTENTS

I SEM AND II SEM

16HS101 BASIC MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

In this course the fundamental concepts of mathematics are introduced. A treatise of Matlab is also introduced in the practical session.

The objective of the course is to impart knowlege on progressions, partial fractions and binomial theorem. This course also deals with elementary concepts in geometry, trigonometry, differential and integral calculus. Numerical methods are also introduced for finding approximate solutions of algebraic equations. Besides, interpolation techniques and MATLAB environment are emphasized.

Course Outcomes:

The student will be able to:

- apply arithmetic and geometric progressions.
- understand coordinate geometry and different forms of straight lines.
- use basic concepts of trigonometric ratios and identities.
- understand the concept of limit, continuity and differentiability.
- familiar with basic concepts of integration.
- find roots of algebraic and transcendental equations.
- apply some interpolation techniques.
- use some commands of Matlab for mathematical computations.

SKILLS:

✓ *Compute sum of terms of given progression.*

✓ *Differentiate the given function.*

✓ *Evaluate the integral of given function.*

✓ *Interpret interpolation techniques to estimate the functional values.*

ACTIVITIES:

- *Compute the derivative and compare with Matlab output.*
- *Evaluate the integral and compare with Matlab output.*
- *Interpet the given data and estimate the functional values at a given point.*

UNIT - 1 **L-9, T-3**

MATHEMATICAL PRELIMINARIES: Progressions, partial fractions and binomial theorem.

UNIT - 2 **L-9, T-3**

TRIGONOMETRY AND GEOMETRY: Coordinate system, straight line, trigonometric functions and trigonometric identities.

UNIT - 3 **L-9, T-3**

DIFFERENTIAL CALCULUS : Limits, continuity and differentiability.

UNIT - 4 **L-9, T-3**

INTEGRAL CALCULUS: Concepts of integration - rules, integration by parts, integration by partial fractions and integration by inspection (standard forms).

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS: Bisection method, Newton-Raphson method, finite differences, forward and backward difference tables, interpolation by Lagrange's method, Newton's forward and backward methods, Gauss forward and backward methods.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Introduction to MATLAB environment.

Basic mathematical operations using MATLAB.

1. Solving simple expressions.
2. Trigonometric function values.
3. Limits.
4. Continuity.
5. Symbolic differentiation-1.
6. Symbolic differentiation-2.
7. Symbolic integration-1.
8. Symbolic integration-2.
9. Real roots of functions.
10. Newton-Raphson method.
11. Interpolation.

TEXT BOOKS:

1. C. W. Evans, “Engineering Mathematics, A Programmed Approach”, Stanley Thornes (Special Indian Edition) 2011.
2. P. S. Rao, “A text book of Remedial Mathematics”, 1st edition, Parma Med Press, Hyderabad, 2008.

REFERENCE BOOKS:

1. A. Jeffrey, “Mathematics for Engineers and Scientists”, 6th edition, (Special Indian Edition),CRC Press, 2013.
2. R. Pratap, “Getting started with MATLAB”, Oxford University Publication, 2009.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	45	30	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as lasers, optical fibres, photonics, nano and funcational materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to :

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in non-destructive techniques.
- understand basic concepts of laser and optical fibre which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nanoscience and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*

✓ *Study the wavelengths of light sources and lasers.*

✓ *Estimate the efficiency of a given solar cell.*

✓ *Learn about the type of the optical fibre and their ability to propagate light waves from its numerical aperture.*

✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS : Introduction – production of ultrasonic waves, piezoelectric method, properties of ultrasonic waves, types of ultrasonic waves, determination of velocity of ultrasonic waves in solids and liquids; SONAR - medical applications.

NDT: Introduction- types, visual inspection and liquid penetrate testing; Ultrasonic testing systems; X - ray radiography.

UNIT - 2 **L-9**

LASERS : Characteristics of laser light – spontaneous and stimulated emission of radiation, He-Ne laser, CO_2 laser, semiconductor laser and applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS : Principle of optical fibre – acceptance angle, numerical aperture, types of fibres, dispersion and attenuation in optical fibres, optical fibre communication system and fibre optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS : Introduction- matter waves, Schroedinger's time independent wave equation, physical significance of the wave function, particle in one dimensional potential well and tunneling phenomenon.

FREE ELECTRON THEORY OF METALS : Introduction – classical free electron theory, electrical conductivity of metal, quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature

PARTICLE ACCELERATORS: Introduction- cyclotron, synchrocyclotron, betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, photovoltaic effect, solar cells, efficiency of solar cell and solar thermal energy conversion systems.

PHOTONICS: LED, LCD, photo conducting materials, photo detectors, photonic crystals, non- linear optical behaviour of materials and applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, fabrication of nano materials, ball milling, sol-gel, physical and chemical properties of nano materials and applications.

FUNCTIONAL MATERIALS: Smart materials, shape memory alloys, chromic materials (thermo, photo and electro), metallic glasses, advanced ceramics, composites, fiber reinforced plastics/ metals and biomaterials.

TEXT BOOKS:

1. V. Rajendran, "Engineering Physics", 7th edition, TMH Publications, 2014
2. D. K. Bhattacharya and P. Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M. R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M. N. Avadhanulu and P.G. Kshirsagar, "Engineering Physics", 1st edition, S. Chand and Company Ltd, 1992.
3. S. P. Sukhatme, "Solar Energy", 2nd edition, TMH Publication, 2005.
4. Arumugam, "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimate acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluate thermal conductivity of materials.*
- *Measure temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The teaching efforts in this course will be directed towards making students develop their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to :

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

✓ *Apply different sub skills like top down, bottoms up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **Environmental consciousness**
  (Climate change, green cover, pollution, renewable vs. non renewable energy sources (from energy unit)
- Grammar : Articles, prepositions, sentence types and construction
- Vocabulary : Root, prefixes and suffixes
- Composition : Paragraph writing (descriptive and narrative)
- Laboratory Practice : Introduction to phonetics (Organs of speech- consonants, vowels and diphthongs; Syllable, stress and intonation)

UNIT - 2 **L-9**

- Text : **Emerging technologies**
  (Solar power, cloud computing, nanotechnology, wind energy (to be covered from energy unit)
- Grammar : Time and tense (Present, past and future; Helping verbs; Modals)
- Vocabulary : Synonyms and antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **Travel and tourism**
  (Advantages and disadvantages of travel, tourism, *atithi devo bhava*- Tourism in India)
- Grammar : Subject-Verb agreement and sentence construction
- Vocabulary : Idioms and Phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role plays (Introducing, greeting, enquiring, informing, requesting and inviting)

UNIT - 4 **L-9**

- Text : **Engineering Ethics**
  (Challenger disaster, biotechnology, genetic engineering, protection from natural calamities, how pertinent is the nuclear option? An environment of energy (from energy unit)) Avoiding sexist language (Gender sensitization)
- Grammar : Sentence transformation (Degrees, voice, speech and synthesis)
- Vocabulary : Phrasal verbs
- Composition : Note-making on Nandan Nilekani's "In search of our energy solutions" (from energy unit) Summarizing on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational conversations – Role plays (Emotions, directions, descriptions, agreements, refusals and suggestions).

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Complete graded grammar exercises in Rosetta Stone.*
- *Complete graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watch TED videos and making notes.*
- *Watch TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Prepare brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and group discussion.*

UNIT - 5 **L-9**

- Text : **Media matters:** (History of media, language and media, milestones in media, manipulation by media, thousands march against nuclear power in Tokyo (from energy unit), entertainment media and interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail, short message service (SMS), writing advertisements, reporting; Social Media- blogging, facebook, twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions (topics from energy unit) – Dumping of nuclear wastes, exploration of eco-friendly energy options, lifting of subsidies on petrol, diesel, LPG etc)

TEXT BOOK:

1 "Mindscapes - English for Technologists and Engineers", Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. N. Swamy, "Strengthen Your Writing", 1st edition, Orient Longman, 2003.
2. T. E. Berry, "The Most Common Mistakes in English Usage", 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan Ltd., 2000.
4. V. Sasikumar and P.V. Dhamija, "Spoken English: A Self-Learning Guide to Conversation Practice", 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. M. M. Maison, "Examine your English", 1st edition, Orient Longman, 1999.
6. A. Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes and components associated with computers and internet. Students will get exposure to building blocks of computers, operating systems, application software, networking, internet, world wide web, security, maintenance, information systems and the application development processes.

Course Outcomes:

The student will be able to :

- understand the terms and concepts of computer science and information technology (hardware, software, networking, security, internet/web and technologies).
- use the products and services of computers.
- use internet/web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

- ✓ *Assemble and disassemble the personal computer system.*
- ✓ *Install different desktop operating systems.*
- ✓ *Use the basic text processing, simple data analysis and data presentation tools.*
- ✓ *Configure network parameters.*
- ✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and their peripherals.*
- *Disassemble and assemble of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an ethernet and configure the same.*
- *Prepare an MS word document.*
- *Prepare a spread sheet with various mathematical operations, charts, sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS : Introduction to computer, computers for individuals, importance of computers, parts of computer system, memory devices, input and out devices, types of monitors, types of printers, number systems, bits and bytes, text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS : Types of operating systems, user interfaces, PC operating systems, network operating systems, types of software, programming languages, compiler and interpreter, program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES : Networking basics, uses of network, types of networks, network hardware, introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW : Internet's services, world wide web, browser setups, using search engine, email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY : The need of computer security, basic security concepts, threats of users, online spying tools, threats to data, cybercrime and protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours: 30

1. Demonstrate the personal computer peripherals and get a report on each peripheral.
2. Demonstrate the personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate network interface card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java development kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort and filter using powerpoint tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. P. Norton, “Introduction to Computers”, 7th edition, Tata-McGraw Hill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. E. Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGraw Hill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files and the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile and debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and usage of dynamic memory.
- understand the usage of files and structures.

SKILLS:

✓ *Identify suitable data types for an application.*

✓ *Apply control statements for decision making problems.*

✓ *Use multidimension array for matrix application.*

✓ *Design a program to calculate average of a class.*

✓ *Analyze the difference between static and dynamic memory allocation.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO C PROGRAMMING : Structure of C program- comments, processor statement, function header statement, variable declaration statement and executable statement; C character set - constants, identifiers, operators, punctuations, keywords, modifiers, identifiers, variables, c scopes, basic data types, type qualifiers, storage classes, reading and writing characters and formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS : Operators- assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, size of, dot, arrow and parentheses operators; Expressions precedence of operators and associative rules; Control statements- category of statements, selection, iteration, jump, label, expression and block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS : Function- declaration, prototype, definition, calling by value and call by address, standard library functions and recursive functions; Array- declaration, initialization, reading, writing, accessing and passing as a parameter to functions, 2D-arrays and multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS : Strings- declaration, string library functions, array of strings and command line arguments; Pointers- declaration, initializing pointers, multiple indirection, relationship between arrays and pointers; Scaling up- array of arrays, array of pointers, pointer to a pointer, pointer to an array; pointer to functions and dynamic memory allocation functions.

UNIT - 5 **L-9, T-3**

STRUCTURES AND FILES : Structures - declaration, initialization and accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- choose programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours: 30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's and 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

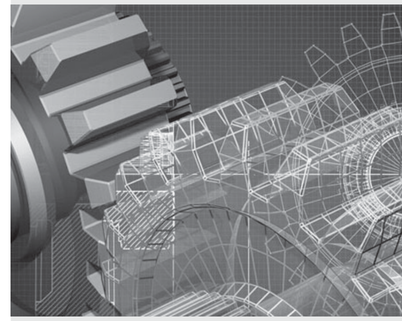
TEXT BOOK:

1. A. Mittal, "Programming in C - A Practical Approach", Pearson Education, India, 2015

REFERENCE BOOKS:

1. R. Thareja, "Introduction to C Programming", 2nd edition, Oxford University Press India, 2015.
2. C. H. Schildt, "The Complete Reference", 4th edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4th edition, Tata McGraw-Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a lighting scheme for specific working environment.*

✓ *Design a composition of hHeating element for a particular application.*

✓ *Troubleshoot issues relating to immersion heater and induction heater.*

✓ *Provide an earthing for domestic outlet.*

✓ *Select, configure and maintain a few engineering appliances such as TV, radio, telephone, mobile phone, wifi router, micro oven, PA system, etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassemble and Assemble of Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design Electric Wiring system for a prototype house.*
- *Design UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of air-conditioner and refrigerator- components, assembly and disassembly, working principle of centrifugal and reciprocating pumps; Types, parts and applications, working principle of screw jack and its components; Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS : General, qualities and classification of bricks; Tests for bricks; Size and weight of bricks; Timber- definition, qualities of good timber, decay of timber and advantages of timber in construction.

CEMENTS : Types and composition of cement, setting of cement, tests for physical properties of cement, and different grades of cement.

AGGREGATES : Classification of aggregates, source, size and shape of aggregates; Tests for aggregates.

STEEL: Types of steel, physical properties and mechanical properties of steel. Simple layout design, paints, tiles, fittings, ventilation, furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS : Overview of power system structure; Conventional and non conventional generations - types of turbines, generators, substations, towers, earthing procedure, protection schemes, single phase and three phase systems. Methods of electrical wiring systems - wiring procedure and calculations; Wiring methods. Uninterruptible power supply (UPS)- components in UPS, its functionality and calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT : Light energy, evolution of light sources, working of incandescent, fluorescent, MV, SV and LED lamps, comparison and applications.

HEAT : Heat energy, modes of heat transfer, resistance and induction heating, comparison and applications.

MOTOR : Electric motors, classification, construction and working principles of motors used in domestic applications, mixer grinder, ceiling and exhaust fan, hair dryer, washing machine, water pump, air coolers, vacuum cleaner, computer cooling motor and electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, radio, remote control, telephone, microwave oven, cell phone, PA system, induction stove, wifi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box.
13. Ceiling Fan and Mixer.
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, “Concrete Technology”, 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition., Charotar Publishing House, Anad, 2009.
3. Govindasamy, A. Ramesh et al, “Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu Textbook Corporation, 2010.
4. Janakaraj, A Sumathi et al, “Electrical engineering - Electrical machines and Appliances Theory”, 1 st edition, Tamilnadu Textbook Corporation, 2011.
5. M. Brain, “How Stuff Works”, 1 st edition, John Wiley and Sons, 2001.
6. P. Kumar, “Basic Mechanical Engineering”, 1 st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip students with functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. Students will strengthen their comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to :

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*

✓ *Read and extract information from different texts & draw inferences by understanding elements like tone and transitional words.*

✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

Functions : Introducing self/others; Expressing needs/feelings/opinions (SWOT Analysis)

Skill Focus:

Reading - Understanding factual information

Writing - Word order and sentence formation

Listening - Decoding for meaning following elements of stress, intonation and accent

Speaking - Articulating syllables clearly, speaking fluently with correct pronunciation

Vocabulary - Discerning to use right word for the given context

Grammar - Spellings, use of nouns, adjectives, verbs, prepositions in the sentence structure

Practice: Objective PET Units 1 - 6

UNIT - 2 **P-6**

Functions : Defining and describing people, places, things and process.

Skill Focus:

Reading - Inferences from sentences and short messages – true/false

Writing - Rewording, sentence transformation and convincing

Listening - Understanding the short messages and conversations

Speaking - Role plays and short conversations

Vocabulary / Grammar – Use of adjectives/adverbs, comparatives and superlatives

Practice : Objective PET Units 7 – 12

UNIT - 3 **P-6**

Functions : Describing spatial and temporal relations; Giving directions/ instructions

Skill Focus :

Reading - Reading between the lines, inferences, true/false

Writing - Developing hints - Writing short messages/paragraphs

Listening - Searching for factual information - Gap filling

Speaking - Snap talks, JAM and elocution

Vocabulary / Grammar - Prepositions, phrasal verbs; PET word list

Practice: Objective PET Units 13 - 18

UNIT - 4 **P-6**

Functions : Narrating, predicting, negotiating and planning

Skill Focus:

Reading - Reading for evaluation and appreciation, comprehension

Writing - Letters – e-mails – 7 C's

Listening - Following long conversations/interviews

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Speaking	-	Discussions, debate and descriptions
Vocabulary / Grammar	-	Modals, conditionals and verb forms (time and tense)
Practice:		Objective PET Units 19 – 24

UNIT - 5 **P-6**

Functions: Requesting, denying, suggesting and persuading

Skill Focus:

Reading	-	Understanding factual information
Writing	-	Short stories and explanatory paragraphs
Listening	-	Inferences from long speeches/conversations
Speaking	-	Announcements and presentations
Vocabulary / Grammar	-	Punctuation and cloze tests

Practice: Objective PET Units 25 – 30

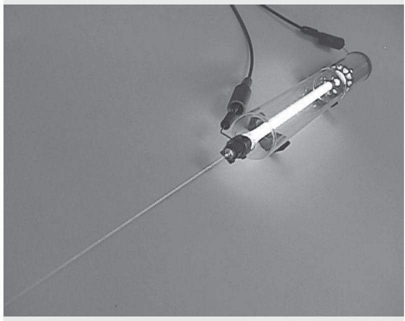
TEXT BOOK:

1. L. Hashemi and B. Thomas, "Objective PET", Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. A. Capel and R. Nixon, "Introduction to PET", Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Description and Objectives:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the following experiments.The students have to perform at least 10 experiments from the list of experiments.

Course Outcomes:

The student will be able to :

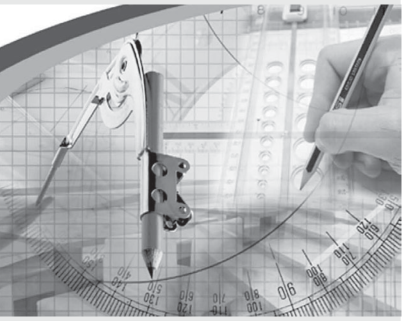
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory, thermal conductivity by conducting experiments of field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of velocity of ultrasonic waves in liquids.
2. Melde's experiment - transverse and longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect.

REFERENCE BOOKS :

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics Laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS106 BASIC MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

This course offers basic concepts on matrices, system of equations, differential equations of first and higher order. Further, numerical methods to solve differential equations are introduced.

The objective of the course is to provide the knowledge on the properties of matrices and solving system of equations using matrices. It is also aimed to offer various methods (analytical as well as numerical) to solve first and second order ordinary differential equations.

Course Outcomes:

The student will be able to :

- understand the basic concepts, properties and operations on matrices.
- determine when a system of equations is consistent or not and solve it whenever possible.
- determine when the matrix has an inverse and find it when it exists.
- identify the method to solve the differential equations.
- find the complete solution of a homogeneous and non homogenerous differential equations with constant coefficients.
- evaluate integrals and solving differential equations using numerical methods.
- compare the solutions of differential equations by numerical methods with exact solution of that equation using MATLAB.

SKILLS:

✓ *Compare the inverse of matrix.*

✓ *Solve given system of linear equations.*

✓ *Solve given differential equations.*

UNIT - 1 **L-9, T-3**

MATRICES: Definition, types of matrices, algebra of matrices, determinant, minor, cofactor, adjoint, and inverse of a matrix; Elementary row operations, inverse by row operations, rank, determination of rank using Echelon form and normal form.

UNIT - 2 **L-9, T-3**

SYSTEM OF EQUATIONS: System of linear equations, consistency of system of equations, solution by Cramer's rule, matrix inversion method, Gauss-Jordan method and Gauss elimination method.

UNIT - 3 **L-9, T-3**

FIRST ORDER ORDINARY DIFFERENTIAL: Introduction, variable separable, linear equations, Bernoulli equation, homogenous equations and non-homogenous equations.

UNIT - 4 **L-9, T-3**

SECOND ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations of second order with constant coefficients with RHS of type e^{ax}, $\sin ax$, $\cos ax$, x^n.

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS - II: Numerical integration by trapezoidal rule and Simpson's rules; Numerical solutions to Differential equations - Euler's method and Runga-Kutte method.

ACTIVITIES:

- *Compute the inverse of matrix and compare with MATLAB output.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Solve given differential equations and compare with MATLAB output.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Matrix algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's rule).
5. System of equations (Matrix inversion method).
6. Solutions of first order ODE.
7. Trapezoidal rule.
8. Simpson's one-third rule.
9. Simpson's three-eight rule.
10. Euler's method.
11. RK Method.

Text BOOKS :

1. H. K. Dass and Er. R. Verma, “Higher Engineering Mathematics”, S. Chand and Co., 3rd edition, 2014.
2. B. S. Grawel, “Engineering Mathematics”, Khanna Publishers, 44th edition, 2014.

Reference BookS :

1. K. S. Rao, “Numerical Methods”, 3rd edition, PHI Publishers, 2007.
2. R. Pratap, “Getting started with MatLab”, Oxford University Publication, 2009.

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to :

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

✓ *Analyse the total hardness of water sample.*

✓ *Understand the basic principles involved in various batteries.*

✓ *Understand the mechanisms of corrosion and various controlling methods.*

✓ *Synthesize various polymers.*

✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY : Introduction, WHO, BIS standards of water; Hardness of water- determination of hardness by EDTA (numerical problems), disadvantages of hard water, scales and sludges, caustic embrittlement, boiler corrosion, priming and foaming; Softening methods - zeolite process, ion exchange process; Desalination of brackish water- reverse osmosis and electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential; Electrochemical series; Nernst equation; Reference electrodes - Calomel and standard hydrogen electrode, ion selective electrode and glass electrode; Determination of pH by pH meter, primary cell and secondary cell (lead-acid storage cell and lithium ion battery); Fuel cell - hydrogen oxygen and methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION : Introduction, dry corrosion, wet corrosion and mechanisms of wet corrosion; Bimetallic corrosion - concentration cell corrosion; Factors influencing the rate of corrosion; Corrosion control methods - cathodic protection, electroplating, electrolessplating and corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction; Types of polymerization - preparation, properties and applications of polyethylene, PVC, teflon, bakelite, urea, formaldehyde and silicones; Rubber – vulcanization; Synthetic rubbers - buna-S, buna-N and neoprene; Introduction to conducting polymers - poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV - Visible Spectroscopy, Beer - Lambert's law, qualitative and quantitative analysis; Block diagram of UV-Visible spectrophotometer; IR Spectroscopy - types of vibrations and block diagram of IR spectrophotometer.

TEXT BOOKS :

1. P.C Jain and M. Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. S. Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and M. Chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and DeMerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. G. Raj and C. Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
5. J.D. Bares, M.Thomas, B. S. Sankar, J.Mendham and R.C Denney, "Vogel's Text book of Qualitative Chemical Analysis", 6th edition, Pearson Publications, 2009.
6. Dr.S. Rattan, "Experiments in Applied Chemistry", S.K. Kataria and Sons Publications, 2008.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an "International language of Engineers". It is the most effective method of communicating technical ideas in 2D and 3D format.

Course Outcomes:

The student will be able to :

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT - 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Introduction to engineering drawing- types of lines, lettering, dimensioning, construction of polygon and conics (ellipse, parabola and hyperbola by general method) and ellipse by oblong method.

UNIT - 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection-planes of projections, projections of points, projection of straight lines; Inclined to one plane and both the planes; Projections of planes; Simple planes; Planes inclined to one reference planes.

UNIT - 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, pyramids, cylinders, cones and solid axis inclined to one plane.

UNIT - 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects; Isometric view of prisms; Pyramids; Cone and cylinder; Simple orthographic views into isometric views through AutoCAD.

UNIT - 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS :

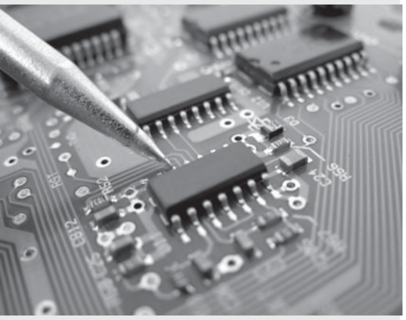
1. N.D.Bhatt, “Engineering Drawing”, 53rd edition, Charotar Publication, 2014.
2. B.Agrawal and C.M.Agrawal, “Engineering Drawing” , 2nd edition, Tata McGraw Hill, 2014.

REFERENCE BOOKS :

1. J. Hole, “Engineering Drawing”, 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, “Engineering drawing”, 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both DC and AC machines. It also deals with the basic electronic components like P-N junction Diode, Zener diode, transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*

✓ *Develop a simple loop generator.*

✓ *Design a voltage regulator using Zener diode.*

✓ *Design a half wave rectifier using PN junction diode.*

✓ *Design a full wave rectifier using PN junction diodes.*

UNIT - 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts; Concepts of network- active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law; Kirchhoff's Laws; Application to simple series, parallel circuits, mesh and nodal analysis of simple resistive circuits (simple numerical problems).

UNIT - 2 **L-9**

FUNDAMENTALS OF AC CIRCUITS: Generation of AC voltage - frequency, average value, RMS value, form factor, peak factor for sinusoidal only; Phasor representation of alternating quantities; Analysis of simple series and parallel AC circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (elementary treatment only).

UNIT - 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of magneto motive force, reluctance, flux and flux density, concept of self Inductance and mutual Inductance, coefficient of coupling (only elementary treatment and simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, constructional features, EMF equation (simple numerical problems).

UNIT - 4 **L-9**

DC MACHINES: Constructional details of a DC machine, DC generator, principle of operation; EMF equation, types of DC generators (simple numerical problems).

DC motor- principle of operation, torque equation, types of DC motors (simple numerical problems)

AC MACHINES: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, torque equation, constructional details of synchronous machine.

UNIT - 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory; Intrinsic and extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics; Half and full wave rectifiers; Zener diode and its characteristics; Voltage regulator; Bi polar junction transistor, operation, types and applications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.

ACTIVITIES:

- *Decode the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of half wave rectifier without filter.
10. Implementation of full wave rectifier without filter.

TEXT BOOKS:

1. V. K. Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D. P. Kothari, “Basic Electrical and Electronics Engineering”, 1st edition, TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman and Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A. K. Thereja and B.L. Thereja, “Electrical Technology”, Vol–II, S. Chand Publications, 2007.
3. U. Bakshi and A. Bakshi, “Basic Electrical Engineering”, 1st edition, Technical Publications, Pune, 2005.

WEB LINKS:

1. http://nptel.ac.in/courses/108108076/
2. https://books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to :

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of total alkalinity of water.
2. Estimation of total hardness of water.
3. Find the percentage of available chlorine in bleaching powder.
4. Estimation of Fe (II) by dichrometry method.
5. Preparation of phenol - formaldehyde resin.
6. Synthesis of urea- formaldehyde resin.
7. Estimation of concentration of acid by pH metry.
8. Determination of strength of acid by conductometry.
9. Measurement of Mn^{+7} by colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-visible spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS :

1. J. Mendham, R. C. Denney, J. D. Bares, M. Thomas and B. S. Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Volume I, Pearson Publications, 2009.
2. S. Rattan, “Experiments in Applied Chemistry”, S. K. Kataria and Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	4	-	4	-

Course Description and Objectives:

Environmental science and technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to :

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*

✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*

✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*

✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*

✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES : Environmental Studies- definition, scope and its importance; Need for public awareness, natural resources, forest resources and deforestation; Water resources - properties and conflicts; Mineral resources - extraction and impacts; Food resources - modern agriculture methods, fertilizer-pesticide problems, water logging and salinity; Energy resources - renewable and non-renewable energy resources, harness technology, solar energy technologies; Land resources - land degradation, soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY : Ecosystem - concept, structure and functions of an ecosystem; Food chains, food webs, ecological pyramids, energy flow, energy regulation and succession; Biogeochemical cycles; Aquatic ecosystems; Biodiversity - introduction, bio-geographical classification, values of biodiversity, biodiversity at global, national and local levels, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India and conservation of biodiversity.

UNIT - 3 **L -6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY : Solid waste management - causes, effects and control measures of municipal and industrial wastes; Pollution - air, water, thermal, soil and noise pollutions; Role of an individual in prevention of pollution; Remote sensing / GIS - introduction, definitions, applications of the remote sensing; Innovative practices-objectives, innovative practices in agriculture, forest-community and bio-villages; Green technology for sustainable development, life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA : Sustainable development, water conservation, cloud seeding, rainwater harvesting methods, watershed management, global warming, acid rain, ozone layer depletion; Environmental legislation; wildlife protection act, water act, forest conservation act, air act, environmental protection act; Environmental impact assssment (EIA) - introduction, definition of EIA and EIS, scope and objectives, importance of EIA in proposed projects/industry/developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION : Food sanitation **-** food and drugs act, food preservations, milk sanitation, tests for milk, pasteurization of the milk; Water, air, soil and food borne diseases; Maintenance of sanitary and hygienic conditions; Role of youth in the development; Promoting activities -youth as initiators and activities; Field work/environmental visit - visit to a local area to document environmental assets river/ forest/grassland/hill/mountain; Study of local environment - common plants, insects, birds; Study of simple ecosystems - pond, river, hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

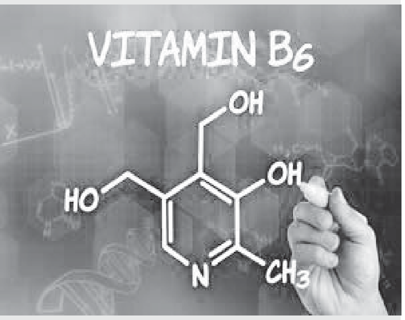
1. A. Kaushik and C. P. Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016.
2. B. Joseph, “Environmental studies”, 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006.
2. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008.
3. K. Mukkanti, “A Text book of Environmental Studies”, S. Chand and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
6. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004.
7. K. Joseph and R. Nagendram, “Essentials of environmental studies”, Pearson Education Pt Ltd, Delhi, 2007. Education Pt Ltd, Delhi, 2007.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*



16FT101 BIOCHEMISTRY AND NUTRITION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	20

WA/RA	SSH/HSH	CS	SA	S	BS
5	45	2	12	2	5

Course Description and Objectives:

This course offers the students knowledge on biological basis of nutrition, metabolic pathways, enzyme activity and mechanisms by which diet can influence health. The objective of this course is to empower the students with methods and techniques for molecular weight estimation of proteins, qualitative analysis of edible fats and oils and make nutrient profiles for balanced diet and health.

Course Outcomes:

The student will be able to:

- describe the major metabolic pathways involved in the metabolism of nutrients in the human body.
- analyze the roles of biomolecules in metabolic reactions and relate metabolism with human nutrition.
- understand the basis of reactivity of biologically relevant molecules and their interactions.

SKILLS:

- ✓ *Separation and molecular weight estimation of proteins*
- ✓ *Quality analysis of edible fats and oils*
- ✓ *Identify and recommend micro and macro nutrient profile for balanced diet and health*
- ✓ *Enzyme activity measurement and determining the mechanism of the reaction.*

UNIT - 1 **L-9**

CARBOHYDRATE METABOLISM: Metabolic pathways for breakdown of carbohydrates, Glycolytic pathway, Pentose phosphate pathway, Citric acid cycle, Electron transport chain, ATP balance, Gluconeogenesis.

UNIT - 2 **L-9**

LIPID METABOLISM: Essential fatty acids, Digestion and absorption of lipids. Lipids: Utilization of fats, Biosynthesis of fatty acids and fats, Clinical disorders associated with fats.

UNIT - 3 **L-9**

PROTEIN METABOLISM: Metabolism of proteins (digestion and absorption), Nitrogen balance and nitrogen pool, Evaluation of quality of protein.

UNIT - 4 **L-9**

ENZYMES: Definition, Function, Classification, Nomenclature &structure,:Co-enzymes and its function; Mechanism of enzyme action, Enzyme kinetics & environmental effects, Enzyme inhibition.

UNIT - 5 **L-9**

VITAMINS AND MINERALS: Occurrence, Physiological functions of vitamins and minerals. Introduction to human nutrition, Nutritive values of foods, Basal metabolic rate, Techniques for assessment of human nutrition, Dietary requirements and deficiency diseases of different nutrients.

ACTIVITIES:

- *Report on food particle disintegration in a prototype stomach model..*
- *Review on starch modification methods and its applications in food industry.*
- *Estimation of RDA values for different micro and macro nutrients.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Preparation of standard acid and alkali solutions.
2. Preparation of standard graph for quantification of biomolecules.
3. Verification Beer- Lambert's law using colorimetry.
4. Estimation of DNA and RNA by Spectrophotometric method.
5. Acid hydrolysis and action of salivary amylase on starch.
6. Enzymatic hydrolysis of sucrose and measurement of optical rotation.
7. Testing Creatinine activity.
8. Separation of proteins by SDS-PAGE.
9. Gelling properties of starch.
10. Specific gravity and Oxidative rancidity of fat and oils.

TEXT BOOKS :

1. M. M. Cox, "Lehninger principles of biochemistry". 4th edition. New York: Worth Publishers, 2000.
2. R. F. Boyer, "Modern Experimental Biochemistry", 3rd edition, Pearson Education, 2009.

REFERENCE BOOKS :

1. L. Stryer, "Biochemistry", 3rd edition. Freeman & Co, New York. 2009.
2. D. Voet, J. G. Voet and C. W. Pratt, "Fundamentals of Biochemistry", 4th edition. Jonh Willey & Sons, 2013.

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	20	-	-

Course Description and Objectives:

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes:

The student will be able to :

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows, etc.

SKILLS:

✓ *Prepare wooden and metal furniture.*

✓ *Electrical wiring and power supply in residences.*

✓ *Make funnels, trays, locker, steel almirahs, etc.*

✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims, etc.*

✓ *CNC machines and various machining operations and processes.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin Smithy and Black Smithy.
4. House Wiring.
5. Foundry and Welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS :

1. S.K. Hazra Choudhury, "Elements of workshop Technology", 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice: Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

II

YEAR

FOOD TECHNOLOGY

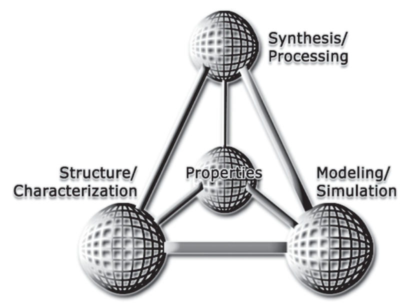
B.Tech.

I SEMESTER	16CH102	-	Materials Science and Technology
	16CS202	-	Data Structures
	16EL102	-	Soft Skill Laboratory
	16FT201	-	Food Chemistry
	16FT202	-	Food Microbiology
	16FT203	-	Thermodynamics and Heat Engines
	16FT204	-	Fundamentals of Fluid Mechanics
II SEMESTER	16EL103	-	Professional Communications Laboratory
	16HS202	-	Probability and Statistics
	16FT205	-	Principles of Food Preservation
	16FT206	-	Fundamentals of Heat and Mass Transfer
	16FT207	-	Unit Operations
		-	Department Elective
		-	Department / Open Elective
		-	Employability and Life Skills Elective

COURSE CONTENTS

I SEM & II SEM

16CH102 MATERIALS SCIENCE AND TECHNOLOGY



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
8	60	-	10	-	-

Course Description and Objectives:

This course will emphasize the structure-property relationships of engineering materials. The objective of this course is to provide knowledge in basic principles of material science and also to study structure of materials at all length scales.

Course Outcomes:

The student will be able to:

- understand crystal structure of various materials and techniques used for structure determination.
- understand the influence of defects on the properties of materials.
- understand the fundamentals of equilibrium phase diagrams.
- gain knowledge on various fabrication techniques used for manufacturing common engineering materials.

SKILLS:

✓ *Identify the type of material: ceramic, polymer, metal or composite.*

✓ *Select materials with suitable properties for a given application.*

✓ *Predict the type of fracture/failure in a material.*

✓ *Read and draw conclusion from binary phase diagrams.*

✓ *Suggest manufacturing methods for metals, ceramics and polymeric materials.*

✓ *Determine basic mechanical properties of materials using universal testing machine.*

ACTIVITIES:

- *Testing the type of failures.*
- *"Gee Whiz": Wonder presentations.*
- *Analysis of load test results.*
- *Study of micro structures of materials.*
- *Segregation of the given materials.*
- *Identification of phases in the given phase diagram.*

UNIT - I **L-9, T-3**

BONDING IN SOLIDS : Inter atomic forces and potential energy, Types of bonds: Primary and secondary, Variation in bonding character and resulting properties.

CRYSTAL STRUCTURE : Classification of crystal systems–SC, BCC, FCC & HCP crystal structures with examples, Atomic packing factor, Coordination number, Determination of miller indices of planes and directions of cubic and hexagonal crystals, Linear and planar densities, Separation between successive planes, Crystal structure determination: Bragg law, Powder method.

UNIT - 2 **L-10, T-3**

CRYSTAL DEFECTS : Point defects, Dislocations: Edge, Screw and mixed, Burgers vectors, Energy of dislocation, Motion of dislocation, Dislocation density. Grain boundary, Stacking faults and twin boundary.

PHASE DIAGRAMS : Gibb's phase rule and terms involved–Reduced phase rule, Tie line and lever rules, Two component systems–invariant reactions–Eutectic system and Iron-Carbon system.

UNIT - 3 **L-9, T-3**

MATERIALS FABRICATION TECHNIQUES : Fabrication of Metals: Forming operations, Casting, Fabrication of Ceramics: Particulate forming processes, Cementation. Forming techniques of Plastics: Compression, Transfer and injection molding, Extrusion, Blow molding.

MECHANICAL PROPERTIES : Stress-Strain relations of various solids–Elastic, Anelastic, Visco-elastic and plastic deformations in solids, Creep and fatigue, Fracture: Brittle and Ductile, Fracture toughness, Ductile to brittle transitions.

UNIT - 4 **L-8, T-3**

ELECTRICAL & SEMICONDUCTING PROPERTIES : Ohm's Law, Electrical conductivity, Electronic and Ionic conduction, Energy band structures in Solids, Classification of solids based on band models, Electron mobility, Electrical resistivity of metals, Intrinsic semiconduction, Extrinsic Semiconduction, The temperature dependence of carrier concentration, Factors that affect carrier mobility.

UNIT - 5 **L-8, T-3**

DIELECTRIC AND MAGNETIC PROPERTIES : Dielectric behavior, Capacitance, Polarization, Frequency Dependence of dielectric constant, Dielectric strength. Types of magnetism, Ferromagnetism-Domain theory-hystersis behavior, Ferrimagnetism, Soft and hard magnets–application of magnetic materials.

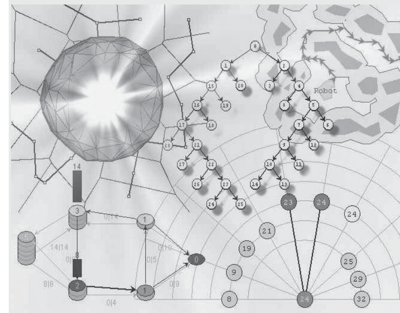
TEXT BOOKS:

1. W. D. Callister, "Materials Science and Engineering: An Introduction," 8th edition, John Wiley & Sons Inc, 2009.
2. V. Raghavan, "Materials Science and Engineering: A First Course", 5th edition, Prentice Hall of India Learing Pvt. Ltd., 2013.

REFERENCE BOOKS:

1. L. H. VanVlack, Elements of Materials Science and Engineering, 6th edition, Addison Wesley, 1989.
2. W. F. Smith and J. Hashemi, "Foundations of Materials Science and Engineering", 4th edition, McGraw-Hill, 2005.
3. N. W. Dowling, "Mechanical Behavior of Materials", 3rd edition, Prentice Hall of India, 2006.
4. J. F. Shackelford, Introduction to Materials Science for Engineers, 6th edition, Prentice Hall of India, 2004.
5. P. Haasen and B. L. Mordike, Physical Metallurgy, 3rd edition, Cambridge University Press, 1996.

16CS202 DATA STRUCTURES



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course will emphasize the structure-property relationships of engineering materials. The objective of this course is to provide knowledge in basic principles of material science and also to study structure of materials at all length scales.

Course Outcomes:

The student will be able to:

- apply advanced C programming techniques such as pointers, dynamic memory allocation, structures to develop solutions for particular problems.
- analyze characteristics of various data structures.
- differentiate between Graphs and Trees.
- understand the importance of sorting and applying it wherever useful.
- understand the usefulness of data structures in solving problems.

SKILLS:

✓ *Identify the required data structures for various applications.*

✓ *Identify the sorting algorithm suitable for a given scenario.*

✓ *Implement array or linked list for a given problem.*

✓ *Analyse Pros & Cons of each of the data structure.*

✓ *Usage of trees and graphs.*

UNIT - 1 **L-9**

SORTING AND SEARCHING: Introduction - Data, Data type, Data structure, Primitive and Non-primitive - Data type, Data structure; Storage structures - Sequential and linked storage representations; Applications of structures, Hashing.

SORTING: Selection sort, Bubble sort, Insertion sort, Quick sort, Merge sort.

SEARCHING: Binary search and linear search.

UNIT - 2 **L-9**

LINKED LISTS: Introduction, Types of linked list - Singly linked list, Doubly linked list, Circular linked List; Operations - Insertion, Deletion, Traverse forward/reverse order; Multi lists, Applications of linked lists.

UNIT - 3 **L- 9**

STACKS AND QUEUES: Stacks - Introduction, Array and linked representations, Implementation and their applications; Queues - Introduction, Array and linked representations, Implementation and their applications, Types - Linear, Circular and doubly ended queues; Applications.

UNIT - 4 **L-9**

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and linked representations; Tree traversals and their Implementation, Expression trees, BST definition and implementation; AVL Trees - Definition and implementation.

UNIT - 5 **L-9**

GRAPHS: Introduction, Properties, Modeling problems as graphs representations - Adjacency matrix, Adjacency list; Traversals - Breath first search and depth first search; Application of graphs.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- understand the importance of structure, abstract data type and their basic usability in different applications through different programminglanguages.
- understand the linked implementation and its uses both in linear and non-linear data structure.
- understand various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
- decide a suitable data structure to solve a real world problem.

LIST OF EXPERIMENTS Total hours-30

1. Selection, Bubble, Insertion, Quick and Merge sorting algorithms.
2. Linear and Binary search algorithms.
3. Single linked list, doubly linked list, and circular linked list.
4. Stack using an array and linked list.
5. Queue using an array and linked list.
6. Tree using an array and linked list.
7. Check if given expression is fully parenthesis or not using stack.

ACTIVITIES:

- *Design and implement a school management system.*
- *Design and implement a social networking site.*
- *Implement a project to find out the most common words in the articles.*
- *Design and implement a library book management system.*
- *Design and implement a cric buzz application.*

8. Tree traversing techniques.
9. BST using an array and linked list.
10. Graph traversal techniques.

TEXT BOOK:

1. ReemaThareja, “Data Structures Using C”, 2nd edition, Oxford University Press, 2014.

REFERENCE BOOKS :

1. F. G. Richard and A. B. Forouzan, “Data Structures: A Pseudocode Approach with C”, 2nd edition, Cengage Learning, 2004.
2. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, 2nd edition, Tata Mc-Graw Hill, 2004.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd edition, Pearson Education, 2006.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to :

- think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.
- identify and introspect on individual strengths and weaknesses.
- improve levels of self-awareness and self-worth for greater efficacy at workplace.

SKILLS:

- ✓ *Communicate and understand the difference between soft skills and hard skills.*
- ✓ *Professionalism and employability skills.*
- ✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*
- ✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*
- ✓ *Prepare resumé and learn how to face interview.*
- ✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

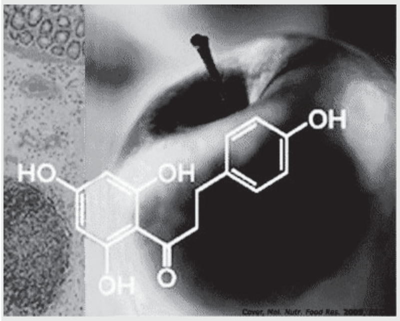
IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan and NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa and Co, 2004.

16FT201 FOOD CHEMISTRY



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	50	-	-	10	5

Course Description and Objectives:

This course deals with the chemical composition and properties of food nutrients and their physical, chemical, nutritional and functional changes during handling, processing, storage and utilization. The objective of this course is to impart knowledge on innate properties of food molecules and their interactions with other food constituents and also to empower the students with analytical techniques for identification and quantification of various biomolecules present in food.

Course Outcomes:

The student will be able to:

- understand the relationship between the chemical composition of food and food quality.
- elucidate why certain ingredients are used in food and major chemical reactions that limit shelf life of foods.
- explicate the rationale for certain food processes.

SKILLS:

✓ *Perform analytical techniques associated with food using basic analytical instrumentation.*

✓ *Critically analyze the chemical information, synthesize the information and validate it.*

✓ *Select appropriate analytical technique when presented with a practical problem.*

ACTIVITIES:

- *Checking efficacy of various solvents for edible oil extraction.*
- *Shelf life prediction of food products.*
- *Estimation of enzymatic reactions using Michaelis-Menten Equation.*

UNIT - 1 **L-9**

WATER AND ITS INFLUENCE : Structure, Water in foods and its properties, Liquid water and Ice, Interactions with food components, Water binding capacity and its determination, Water activity and its role in enhancing shelf life in foods.

UNIT - 2 **L-9**

CARBOHYDRATES: Classification, Physical, Chemical, Nutritional and Functional properties, Browning reactions, Caramelization, Gel formation, starch retro-gradation.

UNIT - 3 **L-9**

PROTEIN: Classification, Physical, chemical, nutritional, and functional properties, major food proteins and their sources, Changes in proteins during processing, Determination of proteins in foods.

UNIT - 4 **L-9**

LIPIDS: Classification, Physical, Chemical, Nutritional and functional properties, Edible oil refining, Technology of edible fats and oils processing: Fat hydrolysis, Interesterification, Hydrogenation, Shortenings and Spreads, Emulsions: properties and types.

UNIT - 5 **L-9**

VITAMINS AND MINERALS: Sources, Functions, Deficiency diseases, Requirements and recommended dietary allowances of vitamins, Changes during processing.

PIGMENTS: Introduction, Chlorophyll, Carotenoids, Flavonoid, Phenols, Betalains, Anthocyanins**.**

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Qualitative test for all carbohydrates - Solubility, Molisch, Anthrone, Iodine test.
2. Qualitative test for Pentoses, reducing sugars, (Bials,Fehlings, Benedicts, Barfoeds test)
3. Qualitative test for Glucose, Fructose, Sucrose (Osazone, Acid hydrolysis, Selewanoffs.)
4. Quantitative test for all Amino acids, aromatic amino acids, Sulphur containing amino acids. (Ninhydrin, Xanthoproteic, Nitro Prusside test).
5. Quantitative tests for peptide bonds and proteins (Biuret test &Folin - Lowry test).
6. Separation of amino acids by Paper chromatography.
7. Separation of lipids by thin layer chromatography.
8. Estimation of Viscosity and refractive index of foods.
9. Determination of free fatty acid content in fats and oils.
10. Estimation of chlorophyll and carotenoids in foods.

TEXTBOOKS:

1. H. D. Belitz, W. Grosch and P. Schieberle, “Food Chemistry”, 4th edition, Springer, 2009.
2. O. R. Fennema, S. Damodaran and K. L. Parkin “Fennema’s Food Chemistry”, 4th edition, CRC press, 2007.

REFERENCE BOOKS:

1. M. Swaminathan, “Essentials of Food and Nutrition”, 1st edition, Ganesh & Co, 1974.
2. L. H. Meyer, “Food Chemistry”, 3rd edition, Reinhold Pub. Corp, 1960.
3. S. Ranganna, “Handbook of Analysis and Quality Control for Fruit and Vegetable Product”, 2nd edition, Tata McGraw-Hill Education, 1986.

16FT202 FOOD MICROBIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
15	45	-	-	5	5

Course Description and Objectives:

This course deals with basics of food microbiology, preservation and spoilage of various food products. The objective of this course is to enable students to apply identification and enumeration techniques of microbes found in food products.

Course Outcomes:

The student will be able to:

- understand the characteristics, morphology and classification of food borne microorganisms.
- understand microbiology of food products.
- know about pathogens responsible for food spoilage.
- understand the principles involved in food preservation techniques.

SKILLS:

✓ *Prepare and sterilize media.*

✓ *Identify types of microorganisms present in food products.*

✓ *Prepare pure cultures of microbes.*

✓ *Isolate microorganisms from the food sample.*

ACTIVITIES:

- *Prepare flow charts for production of food products using different microorganisms.*

UNIT - 1 **L-9**

INTRODUCTION TO MICROBIOLOGY: Classification of microorganisms, Importance of microorganisms in food industry, Moulds: General characteristic, Classification and Identification. Yeasts and Yeast like fungi: General characteristics, Classification, Identification, Yeasts of industrial importance. Bacteria: Morphological, Cultural and Physiological characteristics, Examples of bacteria important in food bacteriology.

UNIT - 2 **L-9**

FOOD SPOILAGE: Microbial spoilage of foods, Cause of spoilage, Classification of foods by ease of spoilage, Factors affecting kinds and numbers of microorganisms in food, Factors affecting growth and survival of microorganisms in foods: Intrinsic factors and Extrinsic factors, Chemical changes caused by microorganisms: breakdown of proteins, carbohydrates, fats and other constituents during spoilage, Contamination of Food, Sources of contamination.

UNIT - 3 **L-9**

FOOD PRESESRVATION: Principles of preservation, Methods of food preservation: High temperature, Low temperature, Drying, Radiation, Chemical preservatives, Bio-preservatives, Hurdle technology, Active packaging, Novel processing technologies.

UNIT - 4 **L-9**

MICROBIOLOGY OF MILK AND MILK PRODUCTS: Microbiology of milk and milk products, Contamination, Preservation, Pasteurization, Freezing and Drying, Changes caused by microbes during milk and milk product spoilage: Gas production, Proteolysis, Ropiness, Changes in milk fat, Alkali production, Flavour changes and Colour changes.

MICROBIOLOGY OF FRUITS AND VEGETABLES: Contamination, Preservation of vegetables, Asepsis, Chilling, Freezing, Drying, Preservatives, CA storage, MA storage, Spoilage of fruits and vegetables.

MICROBIOLOGY OF CEREAL AND CEREAL PRODUCTS: Contamination, Preservation, Spoilage of flours and Bread.

UNIT - 5 **L-9**

MICROBIOLOGY OF MEAT AND MEAT PRODUCTS: Contamination, Preservation, Spoilage of meat and meat products, Changes during storage, Changes not caused by microorganisms, Changes caused by microorganism. Microbiology of canned foods: Causes of spoilage, Appearance of the unopened container, Types of biological spoilage of canned foods: Flat sour spoilage, TA spoilage, Sulphide spoilage. Types of spoilage of canned foods by Bacteria, Yeasts, Moulds. Spoilage of canned meat.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Introduction to different types of equipment used in food Microbiology Lab.
2. Preparation and sterilization of media.
3. Gram staining and microscopic examination of bacteria.
4. Techniques of pure culture (Pour plate and streak plate).
5. Isolation and Identification of molds from foods.
6. Microbial examination of milk.
7. To perform MBRT for milk.

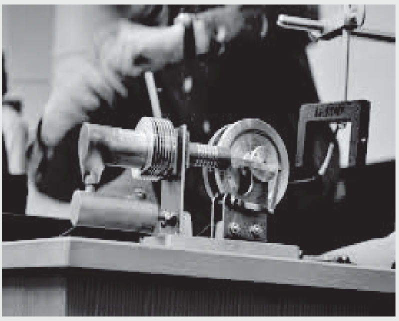
8. Microbial examination of fruits and vegetable products – Isolation, Identification
9. Microbial examination of Fermented food – Isolation, Identification
10. Determination of effect of various preservatives on the suppression of microbial growth.

TEXT BOOKS:

1. W. C. Frazier and D. C. Westhoff, "Food Microbiology", 4^{th} edition, Tata McGraw Hills Publishing Company Limited, 2004.
2. J. M. Jay, "Modern Food Microbiology", 4^{th} edition, Springer, 2000.

REFERENCE BOOKS:

1. J. Garbutt, "Essentials of Food Microbiology", 2^{nd} edition, Taylor and Francis, 1997.
2. M. J. Pelczar, E. C. S. Chan and N. R. Krieg, "Microbiology", 5^{th} edition, Tata McGraw-Hill Education Pvt. Ltd, 1998.
3. S. J. Forsythe, "Microbiology of Safe Food", 2^{nd} edition, Blackwell Publishing Limited, 2010.



16FT203 THERMODYNAMICS AND HEAT ENGINES

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	5	-	5	5

Course Description and Objectives:

This course deals with laws of thermodynamics, refrigeration, liquefaction and steam generation processes. The objective of this course is to make students understand the theory and applications of classical thermodynamics, and thermodynamic properties, equations of state and the methods used to describe and predict phase equilibrium.

Course Outcomes:

The student will be able to:

- understand fundamentals of thermodynamic properties.
- derive and discuss the laws of thermodynamics.
- develop profound knowledge on refrigeration cycles.
- gain knowledge on different types of steam generators.

SKILLS:

✓ *Select suitable refrigerant for specific process.*

✓ *Estimate the thermal and volumetric properties of real fluids.*

✓ *Suggest industry specific boiler and usage.*

UNIT - 1 **L-9, T-3**

BASIC CONCEPTS: The scope of thermodynamics, Dimensions and units, Measures of amount or size, Force, Temperature, Pressure, Work, Energy, Heat, Zeroth law.

UNIT - 2 **L-9, T-3**

FIRST LAW OF THERMODYNAMICS: Joule's experiment, Internal energy, Statement of first law, Energy balance for closed system, Thermodynamic state and state functions, Equilibrium, phase rule, Reversible processes, Constant-v and Constant-p processes, Enthalpy, Heat capacity.

UNIT - 3 **L-9, T-3**

THE SECOND LAW OF THERMODYNAMICS: Statements of the second law, Heat engines, Thermodynamic temperature scales, Entropy, Mathematical statement of the Second law, Third law of thermodynamics.

UNIT - 4 **L-9, T-3**

REFRIGERATION AND LIQUEFACTION: The Carnot refrigerator, The vapor compression cycle, The choice of refrigerant, Absorption refrigeration, Liquefaction processes.

UNIT - 5 **L-9, T-3**

STEAM GENERATORS: Classification of boilers, Comparison of fire tube and water tube boilers, Function of mountings and accessories, Constructional and operational details of Cochran, Babcock and Wilcox boiler.

TEXT BOOKS

1. J. M. Smith, H. C. Vanness and M. M. Abbot, "Introduction to Chemical Engineering Thermodynamics", 6th edition, Tata McGraw Hill, 2005.
2. R. K. Rajput, "Thermal Engineering", 8th edition, Laxmi Publications, 2010.
3. Y. V. C. Rao, "Chemical Engineering Thermodynamics", 1st edition, Universities Press, 2004.

REFERENCE BOOKS

1. P. K. Nag, "Engineering Thermodynamics", 5th edition, McGraw-Hill Education India Private Limited, 2013.

ACTIVITIES:

- *Report on properties and environmental performance of some commonly used refrigerants in food industry.*
- *Report on Indian Boiler's Act and Indian Boiler Regulation.*

16FT204 FUNDAMENTALS OF FLUID MECHANICS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	5	5	5

Course Description and Objectives:

This course deals with fundamentals of fluid statics, dynamics, compressible and incompressible fluids, fluidization, transportation and metering of fluids. The objective of this course is to train students on the basic concepts of fluid flow and its application to chemical process industries.

Course Outcomes:

The student will be able to:

- understand basic principles of fluid mechanics.
- analyze fluid flow problems with the application of the momentum and energy equations.
- analyze pipe flows as well as fluid machinery.

SKILLS:

✓ *Analyze fluid flow situations for type of flow.*

✓ *Prescribe conditions for maintaining a given type of flow.*

✓ *Determine the velocity and pressure drop of fluid flowing through pipes.*

✓ *Select a meter for measuring flow rate and velocity of a flowing fluid.*

✓ *Select the pump for a given engineering application.*

UNIT - 1 **L-9**

INTRODUCTION TO FLUIDS: Definitions, Properties, Units and dimensions, Measurement of fluid pressure, Absolute and gauge pressure: Pressure head of the liquid, Pressure on vertical rectangle surfaces, Compressible and Non compressible fluids, Surface tension, Capillarity, Pressure measuring devices: Piezometer, Simple manometers, Inclined manometers, Differential manometers, Problems.

UNIT - 2 **L-9**

KINEMATICS OF FLUID FLOW : Introduction, Classification of flows: Steady, Uniform, Non uniform, Laminar and turbulent, Continuity of fluid flow, Boundary layer, Fully developed flow Bernoulli's theorem, Problems on Bernoulli's theorem,Venturimeter, Pitot tube, Orifice meter, Rotameter, Problems on Venturimeter ,Orifice meter.

UNIT - 3 **L-9**

FLOW THROUGH SIMPLE PIPES: Loss of head in pipes, Darcy's formula, Chezy's formula for loss of Head in pipes, Minor losses of energy, Hagen Poiseuille equation Drag, Drag Coefficients, Terminal velocity, Fluidization introduction, Types of fluidization Applications of fluidization, Problems on fluidization.

UNIT - 4 **L-9**

FLOW THROUGH ORIFICES: Types of orifices, Jet of water, Hydraulic coefficients, Experimental Method for Hydraulic Coefficients, Discharge through a rectangular orifice, Discharge over a Triangular Notch, Stepped Notch, Dimensional analysis and similitude, Buckingham's pi theorem, Hydraulic similitude.

UNIT - 5 **L-9**

DESIGN OF PIPES AND PUMPS: Pipes, Fittings, Valves, Pumps, Developed head & power requirement in pumps, Suction lift, Cavitation, Classification of pumps, Reciprocating pump, Centrifugal pumps, Pressure variation, Work efficiency, Types of chambers: Selection and sizing, Compressors, Fans and Blowers.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Identification of laminar and turbulent flows.
2. Verification of Bernoulli's Equation.
3. Measurement of flowing fluid using Venturimeter.
4. Measurement of flowing fluid using Orifice meter.
5. Determination of friction loss in fluid flow through pipes.
6. Determination of friction loss in fluid flow through fittings.
7. Determination of pressure drop in packed bed.
8. Determination of pressure drop in fluidized bed.
9. Determination of characteristics of centrifugal pump.
10. Determination of characteristics of reciprocating pump.

ACTIVITIES:

- *Calibration of rotameter.*
- *Calibration of manometer.*
- *Fabrication of Venturi meter.*
- *Fabrication of Orifice meter.*

TEXTBOOKS

1. P. N. Modi and S. M. Seth, “Hydraulics and Fluid Mechanics”, 14th edition, Standard Publishers Distributors, 2002.

REFERENCE BOOKS

1. R. K. Bansal, “A Text Book of Fluid Mechanics and Hydraulic Machinery”,1st edition, Laxmi Publications (P)Ltd,2002.
2. R. J. Grade, “Fluid Mechanics Through Problems”, 1st edition, Wiley Eastern Ltd, 1992.
3. A. M. Micheal and S. D. Khepar, “Water Well and Pump Engineering”, 2nd edition, Tata McGraw Hill, 2005.
4. J. Lal, “Hydraulic Machines”, 6th edition, Metropolitan Book house, 2001.
5. A. M. Michael, “Irrigation Theory and Practice”, 2nd edition, Vikas Publishing House, 2008.

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

The student will be able to :

- clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- stand out both in the professional setting as well as for further pursuits in the academic world.
- succeed confidently in all four critical components of communication - LSRW (listening, speaking, reading and writing).

SKILLS:

✓ *Grammar rules in writing sentences, paragraphs and paraphrasing.*

✓ *Compose business emails, memos, letters, reports and proposals.*

✓ *Comprehend business articles and documents.*

✓ *Use of expressions in professional context and acquire presentation skills like one minute talk and pair discussion.*

✓ *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT - 1 **LEARNING - 3 HRS + PRACTICE - 3HRS = 06 HRS**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage) **Elements of Technical Writing**- Sentence structure, reducing verbosity, arranging ideas logically, building coherence, paragraph level and document level, topic sentence, cohesive devices, transitional words, paraphrasing and précis-writing.

Mechanics of Writing- Stylistic elements, the rapporteur, the purpose, the reader's viewpoint (audience), elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, weak links in business correspondence, ethical concerns in business writing, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication.

UNIT - 2 **LEARNING - 3 HRS + PRACTICE - 3HRS = 06 HRS**

BUSINESS CORRESPONDENCE: E-mail- nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and minutes of the meeting, notice, circular and memo.

Letter Writing - Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiring, claim letter, letter of apology etc]; Introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts of a report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusions, recommendations, citations, references and appendices).

UNIT - 3 **LEARNING - 3 HRS + PRACTICE - 3HRS = 06 HRS**

SPEAKING: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), features of a good power point presentation (making the PPT), delivering the presentation effectively, telephone etiquettes, delivering seminar/proposal/ report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations.

UNIT - 4 **LEARNING - 3 HRS + PRACTICE - 3HRS = 06 HRS**

READING: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **LEARNING - 3 HRS + PRACTICE - 3HRS = 06 HRS**

LISTENING: Specific information in business context, listening to telephonic conversations/messages and understanding the correct intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion and enable active listening.

TEXT BOOKS: BEC

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

ONLINE REFERENCES:

1. http://www.cambridgeenglish.org/exams/business-certificates/business vantage/ preparation/
2. https://www.youtube.com/watch?v=qxFtn9pGaTI.

ACTIVITIES:

- *Basic grammar practice, framing paragraphs on topics allocated.*
- *Paraphrasing an article or a video in your own words. Finding topic sentences in newspaper articles.*
- *Finding out new words from a professional viewpoint. Understanding the meaning and its usage.*
- *Perusing samples of well prepared proposals and reports.*
- *Draft different proposals/reports on topics assigned.*
- *Watching videos/ listening to audios of business presentations.*
- *Classroom activities of team and individual presentations.*
- *Using PPTs, mock exercises for BEC speaking.*
- *Presenting (speaking) the written components completed in Unit 1.*
- *Hand-outs; matching the statements with texts.*
- *Finding missing appropriate sentence in the text from multiple choice, multiple choices.*
- *Using right vocabulary as per the given context and editing a paragraph.*

16HS202 PROBABILITY AND STATISTICS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	35	-	10	2	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation and regression and their applications, probability, theoritical distributions and testing of hypothesis.

The objective of this course is to enable the student to understand and apply statitical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L-9**

STATISTICS : Basic definitions, Frequencies, Graphical representation, Histogram, Ogive curves, Measures of central tendency, Arithmetic mean, Median, Mode, Mean deviation, Standard deviation, Symmetry and skewness, Karl Pearson's coefficient of skewness.

UNIT - 2 **L-9**

CURVE FITTING, CORRELATION & REGRESSION : Least squares method, Curve fitting (straight line and parabola only). Covariance, Correlation, Types, Pearson's coefficient of correlation, Rank correlation, Spearman's rank correlation. Regression, Regression lines.

UNIT - 3 **L-8**

PROBABILITY : Introduction, Definition (classical and axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L-8**

DISTRIBUTIONS: Random variables, Discrete and continuous variables, Introduction to distributions.

BINOMIAL DISTRIBUTION : Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION : Definition, Mean and standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION : Definition, Normal curve, Mean and standard deviation, Median, Mode, Normal distribution applications.

UNIT - 5 **L-12**

SAMPLING METHODS : Population and sampling, Parameters and statistics, Types of sampling. Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion, T-distribution for small sample, difference between means of small sample, Chi square test for goodness of fit, Chi square test for test of independence.

TEXTBOOKS:

1. Miller and Freund, "Probability and Statistics for Engineers", 8^{th} edition, Pearson Publishers, 2013.

2. H. K. Dass & Er. Rajanish Verma, "Higher Engineering Mathematics", 3^{rd} revised edition, S. Chand and Company, 2014.

REFERENCE BOOK:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Company, New Delhi, 2005.

16FT205 PRINCIPLES OF FOOD PRESERVATION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	40	-	-	5	5

Course Description and Objectives:

This course deals with the basic principles involved in food preservation methods. The objective of this course is to provide students with the knowledge of basic food preservation principles and processing methods to control food spoilage and deterioration.

Course Outcomes:

The student will be able to:

- understand fundamental principles of food spoilage.
- gain knowledge about different preservation techniques.
- understand the impact of various preservatives on safety and quality parameters of food products.

SKILLS:

✓ *Identify appropriate processing and preservation method for a given food.*

✓ *Identify and suggest suitable food additive for a given food product.*

✓ *Troubleshoot problems related to food safety during food processing.*

ACTIVITIES:

- *Prepare a table with different foods and their preservation methods.*
- *Report on permissible limits for various food additives as per regulatory standards.*

UNIT - 1 **L-9**

INTRODUCTION: Scope of food processing, Historical developments, Principles of food preservation, Preservation by physical methods and chemical methods.

UNIT - 2 **L-9**

FOOD PRESERVATION BY LOW TEMPERATURE: Processing, Preservation by low temperature, Refrigeration, Freezing, Freezingcurve, Changes occurring during freezing, Types of freezing, Thawing and its effects.

UNIT - 3 **L-9**

FOOD PRESERVATION BY HIGH TEMPERATURE: Sterilization, Pasteurization, Blanching, and UHT processing, Canning: different unit operations involved, Canning-equipment, Types of canning containers.

UNIT - 4 **L-9**

FOOD PRESERVATION BY NON-THERMAL METHODS: Processing, Preservation by: Irradiation, Dielectric heating, High pressure processing, Pulsed electric field, Hurdle technology, Ohmic heating.

UNIT - 5 **L-9**

FOOD PRESERVATION BY FOOD ADDITIVES: Definition, Types, Functions, Permissible limits and Safety aspects.

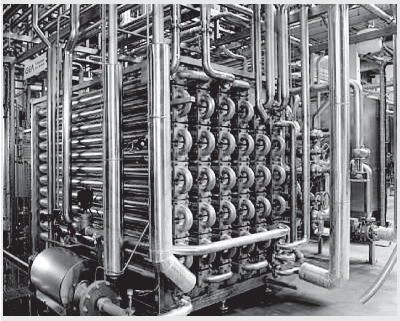
TEXT BOOKS:

1. J. P. Fellows, “Food Processing Technology, Principles and Practices”, 2nd Edition, Wood Head Publishing, 1999.
2. N. N. Potter and J.H. Hotchkiss, “Food Science”, 5th Edition, Springer, 1998.

REFERENCES:

1. B. Lal, G. B. Siddappa and G. N. Tandon, “Preservation of Fruits and Vegetables”, 2nd edition, ICAR Publication, 1967.
2. S. Ranganna, “Handbook of Analysis and Quantity Control for Fruit and Vegetable Products”, 2nd edition, CFTRI, 1986.
3. N. Shakuntala and M. Shadaksharaswamy, “Foods, Facts and Principles”, 3rd edition, New Age Publishers, 2008.

16FT206 FUNDAMENTALS OF HEAT AND MASS TRANSFER



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	25	45	-	5	5	5

Course Description and Objectives:

This course deals on imparting fundamental understanding on the phenomena of heat and mass transfer. The objective of this course is to train students on principles of heat and mass transfer, methodologies for determining the rate of heat and mass transfer and perform heat exchanger design calculations.

Course Outcomes:

The student will be able to:

- understand the basic laws of heat and mass transfer.
- account for the consequence of heat transfer in thermal analyses of engineering systems.
- analyze problems involving steady state heat conduction in simple geometries.
- obtain numerical solutions for conduction and radiation heat transfer problems.
- understand the fundamentals of convective heat transfer process.
- know about the basic mechanism behind boiling and condensation processes.
- analyze heat exchanger performance by using the method of log mean temperaturedifference.
- calculate radiation heat transfer between black body surfaces.
- understand the basic principles of mass transfer.

SKILLS :

- ✓ *Estimate the rate of heat flow through a wall, cylinder or sphere.*
- ✓ *Insulation thickness estimation.*
- ✓ *Determine heat transfer coefficients.*
- ✓ *Estimate double pipe heat exchanger length required for specified conditions*
- ✓ *Perform basic calculations required for heat exchanger design.*
- ✓ *Select the correct type of heat exchanger required for a specific process.*
- ✓ *Determine the emissivity of a body.*

ACTIVITIES:

- *Mix the heat*
- *Feel the heat*
- *Effect of radiation on test tube filled with water.*
- *Window Insulation*
- *Connecting shell and tube heat exchanger setup.*
- *Feel the fragrance*
- *Calculate critical thickness*
- *Design of double pipe heat exchanger*
- *Design of shell and tube heat exchanger*
- *Design of evaporator for fruit juce concentrate*

UNIT - 1 **L-9**

HEAT TRANSFER AND ITS APPLICATIONS: Nature of heat flow, Conduction, Convection, radiation, Heat transfer by conduction: Fourier's Law, One dimensional heat flow through slab/cylinder/sphere derivation, Concept of electrical analogy, Thermal resistance, Heat flow through composite wall/cylinder and sphere, Thermal contact resistance, Composite wall/ sphere/cylinder connected in series and parallel.

UNIT - 2 **L-9**

CONVECTION: Concept of overall heat transfer coefficient, Critical thickness of insulation, Heat transfer through extended surfaces, Application of fins, General fin equation, Effectiveness and efficiency of fins. Dimensional analysis, Rayleigh's and Buckingham pi theorem, Dimensionless number, Heat transfer by convection, Concept of thermal boundary layers, Heat transfer by forced convection in laminar and turbulent flow, Natural convection principle, Important correlations in forced and natural convection.

UNIT - 3 **L-9**

HEAT EXCHANGER: Applications of correlation to determine heat transfer coefficients in free and natural convection, Heat exchange equipment, Counter currents and parallel currents flows, Energy balances, Rate of heat transfer, LMTD, Individual heat transfer coefficient, Overall heat transfer coefficient, Fouling factors, Shell and tube and plate heat exchangers, Heat exchanger design, Application of different types of exchangers in dairy and food industry.

UNIT - 4 **L-9**

BOILING AND CONDENSATION: Boiling heat transfer, Types of boiling, Pool boiling of liquid, Critical heat flux concept, Pool boiling of saturated liquids, Film boiling, Condensation heat transfer: Drop wise and film type condensation, Radiation: Heat radiation, Emissivity, Absorptivity, Transmissivity, Radiation through black and grey surfaces, Determination of shape factors, Combined heat transfer by conduction, Convection and radiation.

UNIT - 5 **L-9**

MASS TRANSFER: Introduction, Fick's law of diffusion, Steady state diffusion of gases and liquids through solids, Equimolar counter diffusion, Isothermal evaporation of water into air, Mass transfer coefficient, Qualitative discussion on various mass transfer operations: Drying, Humidification, Distillation, Liquid extraction, Leaching and Adsorption.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Determination of heat transfer coefficient by natural convection.
2. Determination of overall resistance in composite wall.
3. Emissivity measurement.
4. Determination of thermal conductivity of metal rod.
5. Determination of heat transfer coefficients of double pipe heat exchanger.
6. Determination of critical heat flux points of Nichrome Wire.
7. Shell and Tube heat exchanger.
8. Liquid-liquid diffusivity experiment.

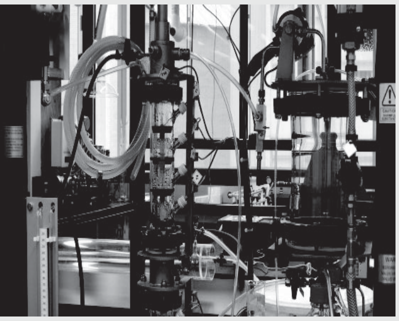
9. Surface evaporation experiment.
10. Gas-diffusivity measurement experiment.

TEXT BOOK:

1. R. K .Rajput, “Heat and mass transfer”, S. Chand and Co. Ltd, 2008.

REFERENCE BOOKS:

1. Y. A. Cenger and A. Ghajar, “Heat and Mass Transfer: Fundamentals and Applications”, 5th edition, McGraw Hill India, 2014.
2. A. S. Lavine, F. P. Incropera, D. P. DeWitt and T. L. Bergman, “Fundamentals of Heat and Mass Transfer”, 7th edition, Wiley India, 2011.
3. R. E. Treybal, “Mass Transfer Operations”, 3rd edition, McGraw-Hill Book Company, 1980.



16FT207 UNIT OPERATIONS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
25	45	-	5	5	5

Course Description and Objectives:

This course deals with the principles and practices of unit operations involved in process industries. The objective of this course is to impart knowledge to students on engineering concepts of unit operations and processes.

Course Outcomes:

The student will be able to:

- understand the basic methods of characterization of particles and bulk solids.
- know basic principles of various unit operations.
- identify the range of equipments used to perform each major unit operation.
- gain knowledge on different drying techniques and their effect on food quality.

SKILLS:

- ✓ *Perform cumulative and differential particle size analysis.*
- ✓ *Identify the suitable mixer required for mixing cohesive and non cohesive solids.*
- ✓ *Recognize the required specifications of the size reduction equipment for a given feed.*
- ✓ *Identify the filtration equipment required for a specific application.*
- ✓ *Compare the efficiency of separation, size reduction, mixing and drying equipments.*

UNIT - 1 **L-9**

PROPERTIES AND CHARACTERIZATION OF SOLIDS: Properties, Handling and Characterization of particulate solids, Properties of particulate masses, Storage and mixing of solids, Mixers for cohesive and non-cohesive solids, Transportation of solid particulate mass, Belt, Screw, Apron conveyers, Bucket elevators, Pneumatic conveying.

UNIT - 2 **L-9**

PRINCIPLE OF COMMINUTION: Laws of Size reduction - Rittingers Law, Kicks law, Bondscrushing law, Work index, Problems, Classification of size reduction equipment : Crushers, Grinders, Ultra fine grinders, Cutting machines, Problems.

Industrial Screening: Different types of screening equipment in industries, Screen efficiency.

UNIT - 3 **L-9**

FILTRATION: Classification of filters based on nature of filtration and external force, Principles of cake filtration, Specific cake resistance, Filter-medium resistance, Types of membranes, Permeate flux, Concentration polarization, Micro filtration.

SEPARATION TECHNIQUES: Separations based on motion of particles through fluids, Gravity settling, Centrifugal settling, Sink and Float method, Flotation, Flotation agents.

UNIT - 4 **L-9**

AGITATION AND MIXING OF LIQUIDS: Agitation equipment, Impellers, Propellers, Paddles, Turbines, Power consumption in agitated vessels.

Crystallization: Crystal geometry, Principles of crystallization, Nucleation, Types of nucleation.

UNIT - 5 **L-9**

DRYING: Psychrometry, Humidification and dehumidification operations, Drying theory: thin layer drying, Deep bed drying, and types of dryers.

Leaching: Leaching principles, Leaching process with examples.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Determination of particle size using screen Analysis.
2. Finding the effectiveness of a screen.
3. Verification of size reduction laws using Jaw Crusher.
4. Verification of size reduction laws using Ball Mill.
5. Verification of size reduction laws using Roll Crusher.
6. Determination of compressibility coefficient using sedimentation process.
7. Determination of filter Medium resistance and cake resistance using plate and frame filter press.
8. Determination of percent recovery of coal from coal-sand mixture using Froth Flotation cell.
9. Determine the efficiency of cyclone separator.
10. Drying characteristics of food material.

ACTIVITIES:

- *Comparing the working of different types of crushers*
- *Finding the optimum time of sieving*
- *Comparing the working of leaf filter and plate and frame filter press.*

TEXTBOOKS:

1. R. L. Earle, “Unit Operations in Food Processing”, 2nd edition, PergamonPress, 2003.
2. W. L. Mc Cabe, J. C.Smith and P. Harriot, “Unit Operations of Chemical Engineering”,7th edition, McGraw-Hill. Inc, 2005.

REFERENCE BOOKS:

1. J. M. Coulson and J. F. Richardson, “Chemical Engineering” 1st to 5th volume, The Pergamon Press,1999.
2. K. M. Sahay and K. K. Singh, “Unit operation of Agricultural Processing”, 2nd edition, Vikas Publishing House Pvt. Ltd, 2004.
3. C. J. Geankoplis, “Transport Processand Unit Operations”,4th edition, Prentice-Hall of India, 2004.

VIGNAN'S UNIVERSITY

III Year - B.Tech

SYLLABUS

I SEM & II SEM

III Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
4	0	-	4	4

FT301 LEGUME AND OIL SEED TECHNOLOGY

Course Description & Objectives:

This course will impart knowledge to the students on Legume and Oil Seed Processing.

By the end of the course students will be able to develop good expertise on the technical aspects of dhal milling, oil milling and various legumes and oil seeds based product preparations.

Course Outcomes:

By the end of the course, the students will be able to

1. *Know about different pulses processing aspects and preparation of products with pulses*
2. *Learn about different oil seeds, oil milling by expellers, solvent extraction of oils, refining of oils and utilization of oil seed meals for different food uses.*

UNIT I - Pulse Classification and Processing

Present status and future prospects of legumes - Current trends in area, production and yield – TechnologyMission on Oil seeds and Pulses (TMOP). Morphological description of pulses. Classification and typesoflegumes - Chemical composition and nutritional Value. Anti-nutritional factors in pulses and their chemistry - Methods of removal of anti-nutritionalfactors. Processing of legumes - Milling, Soaking, Germination, Fermentation, Roasting and Parching, Extrusion, Parboiling and Agglomeration. Physical and chemical changesduring the processing of legumes

UNITII - Milling of Pulses

Dehulling of pulses - Advantages - Methods of dehulling - Traditional and modern methods of dehulling. Dehulling pretreatments - wet treatment, soaking, chemical treatment, dry treatment, oil treatment and heattreatment. Seed characteristics that affect dehulling - Nature of seed coat and physical characteristics of grains.Storage of pulses - Insect control measures in pulses. Milling of pulses - Wet milling and dry milling- Commercial milling of pulses by traditional methods. Dry milling of Tur, Black gram, Bengal gram, Wet milling of Tur - Modern CFTRI method of pulse milling

UNIT III - Pulse's Value Added Product

Dhal milling equipment and effect on quality - Principal products. Fermented products of legumes - Idli, Dosa,Soya curd(Tofu), Textured Vegetable Protein (TVP), Soya sauce, Tempeh, Natto and Miso. Cooking quality ofdhal - Factors affecting cooking quality of dhal and Legumes – Processed legume products - Puffed chick peaand Peas, Canned dry pea. Quick cooking dhal and instant dhal - Uses of pulses - Role of pulses in cookery –Medicinal value of pulses. Present status and future prospects of oil seeds - Annual oil crops, Perennial oil seedplants and Minor oil seeds - Chemical composition and characteristics of oil seeds and oils. Anti-nutritionalfactors in oil seeds -

UNIT IV- Post-Harvest Technology of Oil Seeds

Post-Harvest Technology of oil seeds - Handling- Drying and Storage - Grading – Pretreatments - Cleaning -Dehulling - Size reduction - Flaking - Heat treatment. Oil extraction - Rendering - Traditional methods - Ghani -Power ghanis - Hydraulic Press- Expellers - Principle and structural design of expeller. Solvent extraction process - Principle - Pretreatment - Breaking - Cracking - Flaking - Extraction principles - Factors affecting theextraction process - Desolventisation. Processing of oil seeds - Production and refining of cotton seed oil -Mechanical expression of cotton seed oil - Refining of crude cotton seed oil. Solvent extraction of soya bean oil- Sunflower oil - Palm oil - Coconut oil. Utilization of rice bran - Stabilization of rice bran - Dry heat treatment - Wet heat treatment. Extraction of rice bran oil - Solvent extraction - batch and continuous methods

UNIT V- Refining of Oils

Refining of oils - Degumming - Neutralization - Bleaching - Filtration – Deodorization - Winterization -Principles and process controls. Refining of crude bran oil into edible oil - Uses of bran and bran oil. Hydrogenation - Products based on hydrogenated fats -Margarine - Shortenings – Salad oils - Vanaspati – Saladdressings - Rancidity in fats and oils - Types of rancidity - Tests for rancidity. New technologies in oil seed processing. Utilization of oil seed meals for different food uses . High protein products - Protein concentrates - Protein isolates

TEXT BOOKS:

1. Chakraverty A. *Post Harvest Technology of Cereals, Pulses and Oil seeds*. Oxford and IBHPublishing Co. Ltd., Calcutta,2005.
2. Chakraverty A, Majumdar A.S, VijayaRaghavan G.S and Ramaswamy H.S. *Hand Book of PostHarvest Technology*. Marcel Dekker Inc., New York. Basel,1999.

REFERENCES:

1. Achhayya K.T. *Oil seeds and Oil Milling in India*. Oxford and IBH Publishing Co., New Delhi, 1999
2. Barid and Hamson. *Hand Book of Solvent Extraction*.
3. Chakraverty A, Majumdar A.S, VijayaRaghavan G.S and Ramaswamy H.S. *Hand Book of PostHarvest Technology*. Marcel Dekker Inc., New York. Basel.
4. Guriqbal Singh, Harbhajan Singh Sekhon and Jaspinder Singh Kolar. *Pulses*. Agrotech
5. Publishing Academy, Udaipur.
6. Jaswanth Singh and Shukla B.D. *Post Harvest Technology of Oil Seeds*. Central Institute ofAgricultural Engineering, Bhopal.

III Year B.Tech. Food Tech. I-Semester	**L**	**T**	**P**	**To**	**C**
	4	0	-	4	4

FT303 CEREAL PROCESSING

Course Description & Objectives:

This course will impart knowledge to the students on cereal and millet processing.

By the end of the course, the students will be able to understand traditional and improved methods of cereal processing and to develop good expertise on the technical aspects of preparation of cereal and millet based products.

Course Outcomes:

By the end of the course, the students will be able to

1. *Know about different cereals and millets and their processing aspects*
2. *Acquaint with knowledge on utilization of by-products from cereals, preparation of ready to eat breakfast cereals and instant cereal foods*

UNIT I - Cereal and Millets

Present status and future prospects of cereals and millets - Current trends in area, production and yield. Structure ofcereals - Wheat, Corn, Rice, Barley, Oat, Rye and Sorghum. Composition and nutritive value of cereals. Physico - chemical properties of cereals, major and minor millets - Bulk density, true density, Porosity, Sphericity,Roundness, 1000 grain weight, Coefficient of friction and Angle of repose. Thermal properties - Specific heat -Thermal Conductivity - Thermal diffusivity. Theory of grain drying - Thin layer drying - Moisture content -Moisture measurement -Direct and indirect methods

UNIT II - Rice Processing

Equilibrium moisture content (EMC) - Determination of EMC - EMC models - Hysteresis - Bound, unbound andfree moisture. Drying curves - Constant rate period and falling rate period - Deep bed drying - Problems on moisturecontent. Methods of grain drying - Conduction, Convection, Radiation, Dielectric, Chemical and Sack drying. Graindryers - Unheated and heated air dryers - Batch and continuous type - Flat bed type - PHTC type - Columnar type -LSU type - Baffle type - Rotary type. Paddy and its handling - Cleaning - Drying - Cracking of paddy during dryingand its prevention - Methods of paddy drying - Sun drying and mechanical drying. Rice milling - Traditional ricemilling machinery - Engelberg huller, Huller mill, Battery of hullers, Sheller cum huller mill, Sheller mill, Shellercum cone polisher mill. Modern rice milling process - Cleaning, Dehuskinga, Husk separation, Paddyseparation,Polishing and Grading operations and their related equipment. Advantages and disadvantages of millingmachineries - Factors that affect rice out turn during milling. By-products of rice milling - Rice bran, rice hulls,broken grains, rice pollards. Parboiling of paddy and its principle - Physico - chemical changes during parboiling –Steps in parboiling - soaking, steaming and drying

UNIT III - Methods of Rice Processing

Effect of parboiling on milling, nutritional and cooking quality of rice. Advantages and disadvantages of parboiling.Methods of parboiling of paddy - Traditional methods- Atapa, Balam, Josh, Sela and Siddhaprocesses. Parboiling -single boiling and double boiling methods - Improved methods - CFTRI method- Schule process - Crystal riceprocess. Rice conversion process - Jadavpur University method - Malek process - Rice Growers Association ofCalifornia process - Avorio process. Fernandes process - IRRI process - True continuous parboiling process –RPECmethod. Sodium chromate method - Brine solution method - Kisan continuous parboiling method –Pressureparboiling method.

UNIT IV- Rice Value Added Products

Ageing of rice - Enrichment of rice. Rice fortification - Methods of rice fortification. Processed products from rice -Rice flour - Parched rice - Puffed rice - Flaked rice – Ricestarch - Instant rice - Canned rice. Wheat - Types of wheat -Wheat quality and grading. Wheat flour milling -Components of a wheat mill.

UNIT V- Milling Of Corn

Corn dry milling and wet milling - Products of corn milling. Milling of Barley, Oats and Rye. Milling of Sorghum, Bajra, Ragi - Their food uses. Malting of cereals - Uses of malt. Breakfast cereal foods – Flaked breakfast cereals, puffed breakfast cereals, shredded and granular breakfast cereals and cereals puffed by extrusion

TEXT BOOKS:

1. Chakraverty A. *Post-Harvest Technology of Cereals, Pulses and Oil seeds*. Oxford and IBHPublishing Co. Ltd., Calcutta.
2. Chakraverty A, Majumdar A.S, VijayaRaghavan G.S and Ramaswamy H.S. *Hand Book of Post-Harvest Technology*. Marcel Dekker Inc., New York. Basel.

REFERENCE BOOKS:

1. Araullo E.V, Padua D.B.D and Graham. *Rice- Post Harvest Technology*. IDRC, Canada.
2. Kent N.L and Evers D. *Technology of Cereals*. Woodhead Publishing Co. Ltd., Cambridge,England. Scott. *Flour milling process*.
3. ShakuntalaManay N and ShadaksharaswamyM. *Foods - Facts and Principles*. New AgeInternational (P) Ltd Publishers, New Delhi.
4. Srilakshmi B. *Food Science*. 2nd Edn.. New Age International (P) Ltd Publishers, New Delhi.
5. Subbulakshmi G and Shobha A. Udipi. *Food Processing and Preservation*. New Age International(P) Ltd Publishers, New Delhi.

III Year B.Tech. Food Tech. I-Semester

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4	0	-	4	4

FT305 FRUIT AND VEGETABLE PROCESSING

Course Description & Objectives:

This course will train the students in the field of Fruit and Vegetable Processing. This courses will enable the students to learn different preservation techniques to curb post-harvest losses in the field of agriculture.

Course Outcome:

By the end of the course, the students will be able to

Learn processing of fruits & vegetables - different preservation techniques to improve the shelf life of seasonal fruits

UNIT I- Introductionto Fruit and Vegetable Processing

Production and processing scenario of Fruits and vegetables in India and world-scope of fruit and vegetable processing industry in India - present status, constraints and prospective. Overview of Principles ofpreservation - Drying /dehydration - process - types – pretreatments required - factors affecting rate of dehydration -Reconstitution - coefficient of rehydration. Freezing - process - types of freezing-changes during cold storage - thawing;Canning of fruits and vegetables - process - unit operations Concentration - types of concentration - changes duringconcentration. Chemical preservation - different types of chemicals used in processing of fruits and vegetables -Preservation by Sulphur dioxide and Sodium benzoate-safe limits of usage . Hurdle concept - Intermediate moisturefoods. Irradiation - process - principle and application in fruit and vegetable Industry - safe dosesof usage

UNIT II- Value added products from fruits and vegetables and their processing

Processing Technology of Jam - What is Jam? - Ingredients and their role in quality of Jam - Processing of Jam(flowcharts) - Tests for end point determination-Problems in Jam making. Pectin - properties -theories - Olsen's theory, Spencer's theory, Hinton's theory, Fibril theory. Jelly and Marmalades - Jelly –Differencebetween Jam and Jelly - Processing of Jelly – End point determination - Failure of Jellies to set- Cloudy or foggy Jellies -Formation of crystals - Syneresis. Marmalades - What is a marmalade? - Types - Jam marmalade - Jelly marmalade –Problems in marmalade making. Fruit preserves and candied fruits - What are fruit preserves? - Preparation of fruitpreserves - problems in making; candied fruits - Preparation of candied fruits; Glazed fruit - preparation. Glazed fruit -preparation, Crystallized fruit - preparation-problems in preparation of preserves and candied fruit. Chutneys -Preparation of chutney; Pickles - Types of Pickling-Pickling with salt – Dry salting - Brining. Pickling with Vinegar andfermentation - Sauerkraut - Role of lactic acid bacteria in pickling;

UNIT III- Fruit Beverage

Pickling with oil - pickling with mixture of salt, oil and spices - Problems/ spoilage in Pickles. Sauces and Ketchups -What are sauces? - Difference between sauce and a ketchup - classification of sauces-thick and thin sauces- processing ofTomato sauce/ketchup -Preparation of soya sauce(thin sauce) - problems in making of sauces**.** Processing Technology ofFruit Beverage - Unit operations involved in preparation of fruitbeverage. Equipment used in the preparation of beverages - pulping - Screw type juice extractors -Burring machines-rollers-Taglith press by CFTRI. Basket press - Rack and cloth press-Hydraulic press - Deaerators -Seitz filters – Flash pasteurizers**.** Types of Beverages - Processing technology of Beverages - Flow charts of Juice – examples- RTS – Nectar.

UNIT IV-Fruit Beverage: Standard and Specification

Processing of Beverages like Cordial, Squash, and Crush - FPO Specification –Processing method - Ingredients Flow Charts. Processing of Syrups - natural and synthetic- rose syrup -almond syrup- fruit syrup. Fruit juice concentrate - Fruit juice powder - Lemon Barley water - Carbonated beverages. Processing technology ofFruit Cheese - Processing of fruit cheese - guava cheese - Processing of Fruit leather - mango leather. Fruit toffee - preparation of banana toffee - Processing of Fruit Butter. Processing technology of vegetable wafers - potato wafers - preparation - types of peeling- discolorations - slicing - Drying - Frying - Salting - packing. Vegetable Papads - Processing of Papads - preparation -equipment used for preparation -Packing

UNIT V- Fruit Fermentation

Processing of Soups - preparation of tomato soup-packing/canning - preparation of souppowders - technology and equipment required. Fermented products from fruits and vegetables - Vinegar – typesofvinegar - methods of vinegar production - Quick method - Orleans slow process - Generator process – problems invinegar production. Fermented fruit beverages - Wine - types of wines - equipment required - preparation – problems.Sparkling clear wines - Champagne and Cider; Fortified wines - Sherry, vermouths; orange wine, Perry, Tokay, Port.

Cashew wine/ Brandy (Feni), Neera, Toddy, Arrack and different distilled spirits – their source and alcohol percentages

TEXTBOOKS:

1. Giridharlal, Siddappa and Tandon. Preservation of fruits and vegetables.ICAR, New Delhi, 2005.
2. Sudhir Gupta (Compiled). Fruits and Vegetables Processing Hand Book.EIRI, Delhi, 2005.
3. Srivastava.P.R. and Sanjeev Kumar. Fruit and vegetable preservation - 3rd Edition. International, 2009.

III Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
4	0	-	4	4

FT307 BAKERY AND CONFECTIONERY PRODUCTS

Course Description & Objectives

This course will train the students in Bakery & Confectionery sector of food processing.

By the end of the course, the students will have knowledge about different raw materials used and their role and different equipment, processing of different Products and their packaging & Quality maintenance.

Course Outcomes:

By the end of the course, the students will have

1. Knowledge in the areas of Bakery and Confectionary product processing

UNIT I- Introduction to bakery and confectionary

History of Bakery and Confectionery - Present Trends - Prospects - Nutrition facts of Bakery& Confectionery goods. Raw materials used in Bakery - Flour - Types of flour - Flour characteristics - Water -Sources - Functions - Usage of Water; Salt - Role of Salt. Yeast, Yeast Production - Enzymes - their functions indough. Sugar and Milk - Properties and Role of milk and Sugar in Bakery. Leavening agents - What are leaveningagents? - Different Leavening agents - their functionsin Baking Industry. Spices used in baking and their functions; flavoring - Nuts and fruits - their function in breadmaking.

UNITII- Unit operation in bakery and Setting up bakery industry

Food colors; Setting materials - types - their function in baking; Cocoa and Chocolate. Bakery unit operationsincluding mixing - fermentation - Proofing - baking. Formula construction and computation of yeast raised products; types of breads, bread faults and remedies. Biscuits - Ingredients - Types of biscuits - Processing of biscuits - faults&Remedies. Cream crackers, soda crackers, wafer biscuits & matzos, puff biscuits. Hard sweet, Semi Sweet andGaribaldi fruit sandwich biscuit. Short dough biscuits, Wafers. Cakes - types - Ingredients - Processing of cakes -Problems - Remedies. Pizza and pastries - their ingredients and Processing. Setting up of a Bakery Unit – Bakeryequipment required - types - Selection – Maintenance- Bakery norms and Standards. Types of confectionery - Basic technical considerations of confectionery - TSS, pH,Acidityand ERH.

UNIT III- Bakery Raw Materials

Raw materials - types of sugar, granulated, caster, liquid brown sugars, molasses, microcrystalline sugars - their role in confectionery. Alternative bulk sweeteners - Glucose, fructose, lactose, sugar alcohol,sorbitol, xylitol,Isomalt, poly dextrose - their role in confectionery. Enzymes - used in syrup production - used in gelling –enzymesused in whipping. Agar-agar, Alginates, carrageenan, Gelatin, Acacia gum - Gum Arabic, Pectin, tragacanth,Xanthan gum, Egg albumen and Gelatin as a whipping agent. Milk protein, soya protein, oils, fats related productsand their role in confectionery. Food colors&flavors.

UNIT IV- Chocolate Processing

Chocolate processing - Different steps involved in chocolate processing - Ingredients, mixing refining. General technical aspects of Industrial sugar confectionery, composition effects, and changes, of state. Boiled sweets -

classification - Ingredients used in the preparation - Caramel, toffee andfudge - Processing. Processing of liquorice paste, cream paste and aerated confectionery products - Ingredients- theirfunction - Ingredients and Processing

UNIT V- Confectionery products and Quality Standards

Tablets, Lozenges, Sugar panning tablets, granulated confectionery, medicated confectionery - Ingredients andProcessing. Chewing gums, fondants, Marzipan - Ingredients & Processing. Crystallized confectionery - Processing -Ingredients and their functions. Quality and standards/ Regulations to be followed in the Bakery Industry andpackaging requirements. Quality and standards/regulations to be followed in the confectionery Industry andpackaging requirements

TEXT BOOKS

1. US wheat Associates .Baker’s Handbook on Practical Baking
2. John Kingslee .A Professional Text to Bakery and Confectionery. New Age International, NewDelhi. EBJackson. Sugar Confectionery Manufacture. Aspen Publications

III Year B.Tech. Food Tech. I-Semester

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4	0	-	4	4

FT309 REFRIGERATION ENGINEERING AND COLD CHAIN
(ELECTIVE - I)

Course Description & Objectives:

This course will impart basic knowledge of refrigeration process and equipment. By the end of the course students will be able to understand the refrigeration processtheir application in processing and increasing shelf life of food, also to make students aware of cold chain design and storage.

Course Outcomes:

By the end of the course students will be able understand

1. *Refrigeration and air-conditioning, types, properties and working of refrigerants.*

2. *Vapour compression cycle and different types of evaporators.*
3. *Different types of evaporators and their advantages and disadvantages.*
4. *Processing of fruits and vegetables, meat products etc. by freezing and quality changes during freezing.*

UNIT I- Refrigeration and air conditioning

Definition of refrigeration and air conditioning - Necessity of refrigeration and air conditioning - Factors affecting comfort air conditioning. Definition of Refrigerant - History of refrigerants - Classification of Refrigerants – Primary Refrigerants - Secondary Refrigerants - Halo carbon refrigerants. Azeotrope refrigerants - Inorganic refrigerants - Ammonia - Air - Cabon dioxide – Sulphur dioxide - Water. Hydro carbon refrigerants - Designation system for refrigerants. Desirable properties of an ideal refrigerant - Selection of a refrigerant. Thermodynamic properties of refrigerants.

UNITII- Refrigerators& Refrigerants

Chemical requirements of refrigerants - Physical properties of refrigerants. Secondary refrigerants -Brines. Types of Refrigerators - Air Refrigerator - Vapour refrigerator - Advantages and Disadvantages of Vapour compression refrigeration system over air refrigeration system. Mechanism of a simple Vapour compression refrigeration systems. Evaporators - Capacity of an evaporator - Factors affecting heat transfer capacity of an evaporator - Types of evaporators. Bare tube coil evaporator - Finned evaporator - Plate evaporator - Shell and tube evaporator.

UNIT III- Evaporator

Shell and coil evaporator - Tube in tube evaporator - Flooded evaporator - Dry expansion evaporator. Natural convection evaporator - Forced convection evaporator - Frosting evaporators – Non Frosting evaporators - Defrosting evaporators. Compressors - Classification - Suction pressure, Discharge pressure, Compression ratio, Suction volume, Stroke volume, Clearance factor, Compressor capacity, Volumetric efficiency. Reciprocating compressors - Parts of a reciprocating compressor - Cycle of a reciprocating compressor. Rotary compressor - Centrifugal compressor - Advantages and disadvantages of a centrifugal compressor.

UNITIV- Condensers

Condensers - Working of a condenser - Factors affecting the condenser capacity – Heat rejection factor. Classification of condensers - Air cooled condensers - Water cooled condensers - Tube in tube condenser - Shell and coil condenser. Fouling factor - Differences between air cooled and water cooled condensers – Evaporative condenser. Expansion Devices - Types of expansion devices - Capillary tube. Hand operated expansion valve - Low side float valve - High side float valve. Ice manufacture - principles of ice production. Applications of refrigeration in different food products.

UNIT V- Freezing

Food Freezing - Freezing systems - Indirect contact systems Plate Freezers - air blast Freezers - Freezers for liquids foods. Direct contact systems - Air blast - Immersion. Frozen food properties - Density – Thermal conductivity - Enthalpy - Apparent specific heat- Apparent thermal diffusivity. Freezing time – Factors influencing freezing time - Freezing rate - Thawing time. Quality changes in foods during frozen storage.

TEXTBOOKS:

1. Adithan, M. and Laroiya, S. C. 1991. Practical Refrigeration and Air Conditioning. Wiley EsternLtd., New Delhi
2. Arora, C. P. 1993. Refrigeration and Air Conditioning. Tata MC Graw Hill Publishing Co.Ltd.,NewDelhi.

III Year B.Tech. Food Tech. I-Semester	L	T	P	To	C
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FT311 ENGINEERING PROPERTIES OF FOOD MATERIALS
(ELECTIVE - I)

Course Description & Objectives:

This course will impart knowledge about the various properties of food and their handling and storage

By the end of the course students will be able to understand physical, chemical and mechanical properties of food and their handling and storage.

Course Outcomes:

By the completion of the course students will be able to understand

1. Engineering properties of food and biomaterials.

2. Structure and chemical composition of foods, Physical properties.
3. Water activity, food stability sorption and desorption isotherm of food materials.
4. Newtonian and non-Newtonian fluid.
5. Thermal properties and Electrical and magnetic properties of food.
6. Aero- and hydrodynamic characteristics, application of frictional properties in grain handling, processing and conveying.

UNIT I- Introduction to engineering properties of food

Introduction to engineering properties of food and biomaterials, Structure and chemical composition of foods, Physical properties (size, shape, surface area, volume, density, sphericity, porosity, specific gravity, color), Properties of powdery materials.

UNIT II-Moisture and water activity

Moisture in food and biological materials. Water activity, food stability sorption and desorption isotherm of food materials.

UNIT III- Mechanical properties of food

Mechanical properties (strain and stress), viscosity, elasticity, visco-elasticity, Newtonian and non-Newtonian fluid, time dependent fluids, creep and relaxation phenomena, texture profile.

UNIT IV- Thermal properties of food

Thermal properties (specific heat capacity, thermal conductivity, and thermal diffusivity), Convective heat transfer coefficient, Cooling and phase change. Electrical and magnetic properties.

UNIT V-Friction and grain handling

Friction of solids and flow of granular solids, angle of repose, coefficient of friction, Aero- and hydrodynamic characteristics, application of frictional properties in grain handling, processing and conveying.

TEXTBOOKS:

1. Rao MA and Rizvi SSH. (Eds.) Engineering Properties of Foods. Marcel Dekker
2. Steffe, J.F. Rheological methods in Food Process Engineering. 2nd ed East Lansing, MI: Freeman Press

REFERANCES:

1. Lewis, M.J. Physical Properties of Foods and Food Processing Systems Cambridge, UK: Woodhead.
2. Mohesenin NN. Physical Properties of Plant and Animal Materials. Gordon & Breach Science Publ.
3. SerpilSahin and ServetGulumSumnu. Physical Properties of Foods. CRC.
4. Figura and teixeira. Food Physics: Physical properties, Measurement and applications.Springer.

III Year B.Tech. Food Tech. I-Semester	L	T	P	To	C
	4	0	-	4	4

FT313 NOVEL FOOD PROCESSING TECHNIQUES
(ELECTIVE - I)

Course Description & Objectives:

This course will impart knowledge about the advanced technologies in food processing.

By the end of the course students will be able to understand the advanced technology in food processing and their importance in food safety and quality and shelf life stability.

Course Outcomes:

By the end of the course students will be able to understand

1. High Pressure Processing, equipment and application in food
2. Pulsed electric fields processing, equipment and application in food
3. Osmotic dehydration and application in food
4. Ultrasound processing and application in food
5. Microwave heating, Radio-frequency processing: dielectric heating, radio-frequency heating; Ohmic heating, Freeze drying, freeze concentration, UV radiation

UNIT I- High Pressure Processing and Hurdle Technology

High Pressure Processing: Principles of high pressure processing, Effects of high pressure on food quality: Pressure effects on microorganisms, texture and nutrients of food. Hurdle Technology Concept; effect on preservation of food.

UNIT II-Pulsed electric fields processing of food

Pulsed electric fields processing: PEF treatment systems, main processing parameters. Mechanisms of action: mechanisms of microbial inactivation.

UNIT III- Osmotic dehydration and Membrane separation

Osmotic dehydration: mechanism of osmotic dehydration, application of osmotic dehydration.

Membrane separation: Principle, different types of Membrane processing, Application in Food industry

UNIT IV- Ultrasound processing of food

Ultrasound processing: fundamentals of ultrasound, ultrasound as a food preservation and processing aid, effects of ultrasound on food properties.

UNIT V- Thermal processing of food

Alternate thermal processing: Microwave heating, Radio-frequency processing: dielectric heating, radio-frequency heating; Ohmic heating, Freeze drying, freeze concentration, UV radiation

TEXTBOOKS:

1. P J Fellows (2009). Food Processing Technology: Principles and Practice. Third edition. Wood Head Publishing in Food Science, Technology and Nutrition.
2. Howard Q. Zhang,, Gustavo V. Barbosa-Cánovas, V. M. BalaBalasubramaniam, C. Patrick Dunne, Daniel F. Farkas, James T. C. Yuan (2011). Nonthermal Processing Technologies for Food. Wiley-Blackwell.

REFERANCES:

1. Ortega-Rivas, Enrique (2012). Non-thermal Food Engineering Operations. Springer.
2. N S Isaacs (1998). High pressure food science, bioscience and chemistry. Wood Head Publishing limted.
3. H L M Lelieveld, S Notermans, and S W H De Haan (2007).Food preservation by pulsed electric fields: From research to application. Wood Head Publishing limted.

III Year B.Tech. Food Tech. I-Semester

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FT315 CEREAL PROCESSING LAB

Course Description & Objectives:

This course will impart knowledge to the students on cereal and millet processing.

By the end of the course, the students will be able to understand traditional and improved methods of cereal processing and to develop good expertise on the technical aspects of preparation of cereal and millet based products.

Course Outcomes:

By the end of the practical exercises, the students will be able to

1. Develop skills on cereal processing aspects.
2. Determine the physical properties of cereals and millets.
3. Learn about preparation of ready to eat cereal products.

LIST OF EXPERIMENTS

1. Study of morphological characteristics of cereals
2. Determination of physical properties of cereals
3. Determination of colour of cereals
4. Determination of moisture content of cereals
5. Experiment on parboiling of paddy
6. Cooking quality studies of rice
7. Experiments on rice shelling and polishing
8. Processing of pop corn
9. Processing of puffed rice
10. Processing of flacked rice
11. Processing of cereal and millet malts
12. Visit to a commercial cereal processing unit.

III Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
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FT317 FRUIT AND VEGETABLE PROCESSING LAB

Course Description & Objectives:

This course will train the students in the field of Fruit and Vegetable Processing. This courses will enable the students to learn different preservation techniques to curb post-harvest losses in the field of agriculture.

Course Outcomes:

By the end of the course, the students will know the

1. processing of fruit & Vegetable products like Jams, Jellies, Squashes

LIST OF EXPERIMENTS

1 Preparation of Jams.
2. Preparation of Jelly and Marmalade.
3. Preparation of Preserves, Candies and Crystallized Fruits.
4. Preparation of Chutneys.
5. Preparation of Sauces, Ketchups.
6. Preparation of Fruit Squashes, Fruit Juices and RTS.
7. Preparation of Fruit nectar or Cordial or Crush.
8. Preparation of Wine and Vinegar.
9. Preparation of Carbonated Beverages.
10. Preparation of Fruit cheese and Toffee.
11. Preparation of Wafers and Papads.
12. Dehydration of Fruits and Vegetables.
13. Visit to Fruit and Vegetable Processing Industry.

III Year B.Tech. Food Tech. I-Semester	**L**	**T**	**P**	**To**	**C**
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FT319 BAKERY AND CONFECTIONERY PRODUCTS LAB

Course Description & Objectives

This course will train the students in Bakery & Confectionery sector of food processing.

By the end of the course, the students will have knowledge about different raw materials used and their role and different equipment, processing of different Products and their packaging & Quality maintenance.

Course Outcomes:

By the end of the lab, the students will

1. Gain skills in the areas of bakery and confectionery products - raw materials required, equipment required and quality of the baked products
2. Various test conducted for determining the quality of the flour.
3. Preparation of cookies, cake and other bakery products

LIST OF EXPERIMENTS

1. Study of different equipment used in Bakery and Confectionery
2. Estimation of Gluten
3. Determination of alcoholic acidity
4. Determination of falling number/amylase
5. Determination of Pelshenke value
6. Determination of sedimentation value
7. Preparation of bread by straight dough methods
8. Preparation of buns by sponge
9. Preparation of yeast dough products
10. Preparation of soda crackers
11. Preparation of Cakes and Cake decorations, cookies
12. Preparation of confectionery, candy, hard boiled candy, cotton candy
13. Preparation of chocolates
14. Visit to bakery and confectionery unit

III Year B.Tech. Food Tech. II - Semester

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MS310 MANAGERIAL ECONOMICS

Course Description & Objectives:

This course provides students with the knowledge, tools and techniques to make effective economic decisions under conditions of risk and uncertainly.

Course Outcomes:

Students will be able to:

1. *Apply the economic way of thinking to individual decisions and business decisions*
2. *Understand how prices get determined in markets, how market participants benefit in the form of consumer surplus and producer surplus, and what are the consequences of government intervention*
3. *Understand the roles of managers in firms*
4. *Understand the internal and external decisions to be made by managers*
5. *Design competition strategies, including pricing, product differentiation, research & development, and marketing, according to the natures of products and the structures of the markets*
6. *Analyse real-world business problems with a systematic theoretical framework.*

UNIT I - Nature & Scope of Managerial Economics

Basic tools and techniques of Business Economics, Macro Economic Environment and Managerial decisions.

UNIT II – Demand Analysis

Demand Analysis: Types of Demand, Demand determination Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT III – Theory of Production

Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors,Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT IV – Cost Analysis

Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis.

UNIT V - Features and types of different competitive situations

Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

TEXT BOOKS:

1. Gupta: Managerial Economics, 1/e TMH, 2005
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010

REFERENCE BOOKS:

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004

III Year B.Tech. Food Tech. II - Semester

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FT302 FOOD PACKAGING

Course Description & Objectives:

This course will impart knowledge about the need for Optimum Packaging of foods. By the end of the course students will have understanding of different packaging materials, and machinery used to protect food products and increase their shelf life.

Course Outcomes:

By the end of the course, the students will be able to know

1. *About different types of paper based packaging material*
2. *About different types of plastic based package material*
3. *About metal and glass based packaging material*
4. *About advanced packaging techniques and packaging* machinery.

UNIT I- Introduction to packaging

Introduction to the subject, packaging situations in world and in India - Packing is pervasiveand essential - Historical development of packing - ‘a package must protect what it sellsand sell what it protects’. Need of Packaging food - Logistics - Merchandising Outlets - Handling -Transportation - Packaging machinery - Technology upgradation - Public Distribution - Cost effectivepackaging.. Packaging requirements - Levels of Packaging - Packaging functions - Attractiveness -Protection - Convenience - Printability - Differentiability. Machinability - Environmental Impact - Low costcontainment - Communication – Resealing features - Non toxicity - Aroma retention. Hazards acting onPackage during transportation - Moisture impact - Light impact – Common insect pests - Changes in foodquality - Biological changes in food quality. Storage - Factors influencing - Shelf Life of fruits andvegetables - Atmospheric packaging - Respiratory Metabolism

UNIT II- Advanced packaging technology and Packaging laws and Regulations

Controlled Atmospheric Packaging Technology (CAP) - Modified Atmospheric PackagingTechnology (MAP) - Advantages of CAP and MAP - Effect of gases on MAP foods - N2, O2,CO2. Labeling Laws - Packaging laws and Regulations - SWMA Rules - PFA Rules - FPO Rule- MFPO Rules - Agmark Rules - Class ‘A’ commodities - Class ‘B’ commodities – MisbrandedLabeling rules for infant foods. National Standards on Packaging code for foodstuffs and Perishables -Classification of food stuffs according to the code - Decreasing order of their perishability - Milk and milkproducts. Fruits and vegetables - Meat, fish and poultry - Bakery rich foods - Protein rich foods -Edible starch and starch products - Oils and Fats - Food grains and food grain products - Sugar and Honey. Stimulant foods - Alcoholic drinks and carbonated beverages - Food Additives andSpicesand Condiments. Packaging materials - Classification of Packages - Paper as packaging material– Paper manufacture - Pulp - Mechanical pulp - Chemical pulping - Alkaline processes – Sodaprocess - Sulfate process - Sulfite process - Semi chemical pulping – Digestion

UNIT III- Manufacturing of Glass and Paper

Bleaching - Beating and Refining - Paper making - Converting - Calendaring – Strengthadditives - Sizing agents. Types of paper - Kraft paper - Bleached paper - Grease proof paper – Glassin paper -getable parchment Waxed paper. Paper Boards - Paper board grades - Folding Cartons – Kindsof carton boxes – BeverageCartons - Molded Pulp containers - Printing and varnishing - Die cutting andcreasing -Gluing and sealing. Glass as Package material - Composition of Glass - Basic parts of Glass container -Closures Parts of Closures - Types of Closures - Properties of glass - Internal pressureresistance - Vertical load Strength. Resistance to impact - Resistance to Scratches and Abrasions -Glass manufacture -Press and Blow (P&B) - Narrow Neck Press and Blow (NNPB) - Shape of glass Container.Improvements in glass manufacturing - Hot and Cold end treatment of surface – Inspectionof Glass - Advantages and Disadvantages. Metal as Packaging material - Introduction - Materials used inCan Manufacture – PropertiesManufacture of Tin Plate - Pig Iron - Steelmaking - Tin plating - Basic types of Metal Plate- Tin free steel (TFS)

UNIT IV- Manufacturing of aluminum cans and Plastics

Manufacture of ECCS- Aluminum Cans - Manufacture of Aluminum cans - Container -Advantages and Disadvantages. Making Processes - End Manufacture - Three Piece Can Manufacture -Welded Side seams Soldered Side seams - Double Seaming - Two Piece Can Manufacture. DWI Cans - DRD Cans - Protective and Decorative (Lacquers/ Enamels) - Aluminum foilsand Containers - Tubes - Retort Pouch - Corrosion of Metals. Plastic Consumption and use inWorldandin India - Plastic as packaging material .Classification of Plastics. Properties of Each Plastics - Uses andChemistry of Polyethylene (LDPE, HDPE, LLDPE, ULDPE). Polypropylene - Polystyrene -Polycarbonate - PVC - PVDC - EVOH - EVA - PVA - PET - Cellulose Acetate - Cellophane - Nylon -Plastic recycling . Laminations - Need of Laminations - Types of Laminations - Advantages andDisadvantages of each type - Coating on paper and films - Types of coatings - Need of Coatings –Methods of Coatings

UNIT V- Aseptic Packaging for food products

Aseptic Packaging - Need for Aseptic Packaging - Materials used in Aseptic PackagingProcess of Aseptic Packaging. Comparison of Conventional and Aseptic Packaging Aseptic PackagingSystem - Advantages. Machineries used in Food Packaging. Packaging of Specific Foods likeBread, Biscuits, Coffee, Milk Powder, and Egg Powder -Carbonated Beverages - Snack Foods.

Mechanical andFunctionalTests on Packaging, on Packaging boxes and on Packaging Materials - Thickness – BasicweightGrammage. Water Absorption - Burst Strength - Tear Strength - Puncture- Resistance TensileStrength- Grease Resistance - Gas Transmission Rate (GTR) -Water Vapour Transmission Rate(WVTR)

TEXTBOOKS

1. EIRI Board of Consultants and Engineers, New Delhi, *Modern Packaging Technology.*
2. *Robertson* , Taylor and Francis*, Food Packaging* : *Principles and Practice.*

REFERENCES

1. NeelamKhetarpaul and DarshanPunia, *Food Packaging.*
2. Richard Coles, *Food Packaging Technology*.
3. NIIR *Food Packaging Technology Hand Book.*
4. *Robertson,* Taylor and Francis*, Food Packaging:Principles and Practice*.

III Year B.Tech. Food Tech. II - Semester

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FT304 FOOD SAFETY AND MICROBIAL STANDARDS

Course Description & Objectives:

This course will impart the knowledge to students about Food safety and microbial standards.

By the end of the course students will be able to understand various Food safety and microbial standards and toxins both natural and synthetic used in food processing and Sanitation principles.

Course Outcomes:

By the end of the course, the students will be able to

1. *Understand about toxins from bacteria and fungi.*
2. *Know about different food additives, anti-nutrients, anti-vitamins used in food processing.*
3. *Understand about heavy metal contamination in foods.*
4. *Understand about food safety and microbial standardization.*

UNIT I-Food Spoilage

History of Food spoilage, Food poisoning, Food legislation and Food preservation. Dietarytoxins - Food poisoning, Intoxication, Infection, Classification of toxins. Food borne bacterial toxins - *Clostridium botulinum, Clostridium perfringens, Staphylococcus*- Types of food involved - toxicity and symptoms - Chemical properties – Environmental conditions Food borne bacterial toxins - *Salmonella, Vibrio, Escherichia coli*, five groups of *E.coli, Bacillus cereus.* Types of food involved - toxicity and symptoms - Chemical properties -Environmental conditions. Food borne bacterial toxins - *Listeria, Shigella, Yersinia, Campylobacter, Aeromonas,Brucella,*. Types of food involved - toxicity and symptoms - Chemical properties- Environmental condition. Mycotoxins - Types of mycotoxins - Aflatoxins, Patulin, Penicillic acid, Ochratoxin, citrinin, Alternaria toxin - Types of food involved - toxicity and symptoms - Chemical properties -Environmental conditions. Mycotoxins - Sterigmatocystin, Fuminosins, Sambutoxin, Zeralenone, Ergotism,Cyclopiazonic acid, Rubratoxin, Roquefortine - Types of food involved - toxicity and symptoms-Chemical properties - Environmental conditions.

UNIT II- Introduction to Mycotoxin and metal toxin

Mushroom toxins, Different species of poisonous mushrooms, Poisoning or disorders due to poisonous mushrooms. Control of mycotoxins in food and feed. Algal toxins - Paralytic shell fish poisoning, Ciguatera poisoning, , cyanobacterial toxins, Scombro toxic Fish poisoning, - Types of food involved - toxicity and symptoms - Chemical properties - Environmental conditions. Food borne animal parasites - Protozoans - Giardiasis, Amebiasis, Food borne animal parasites-Flat worms - Taeniasis, Round worms (Trichinosis, Anisakiasis) –Types of food involved - toxicity and symptoms - Chemical properties - Environmental conditions. Food borne viruses - Polio, Hepatitis A and Noroviruses, rota viruses, Prion Diseases - Types of food involved - toxicity and symptoms - Chemical properties –Environmental conditions. Metals as toxins - Heavy metals - Arsenic - Occurrence - detection in foods – Toxicological effects - limits - Cadmium - Occurrence - detection in foods - Toxicological effects – limits - Mercury - Occurrence - detection in foods - Toxicological effects - limits. Lead, Tin, Zinc, Aluminium, Chromium, Cobalt, Antimony - Occurrence - detection in foods - Toxicological effects – limits.

UNIT III- Pesticide and Antinutrients in food

Pesticides - Chlorinated pesticides and non-chlorinatepesticides - Decontamination of food commodities of their insecticide residues. Movement of Residues in the environment. Pesticides - Mechanisms of Toxicity-Residues in Food, Acceptable daily intakes, Maximum residue limits. Antinutrients - Toxic phenolic substances, Flavonoids, tannins, - Toxicity and symptoms – Chemical properties - Type of foods involved - Prevention. Antinutrients - Saffrole, Cyanogenic glycosides, Glucosinolates, favism, Lathyrism, Canavanine, Goitrogens, Caffeic acid &chlorogenic acid, Glycoalkaloids, Saponins. Anti-nutritive factors -Type Aantinutritives - antiproteins- Protease inhibitors - Lectins - Type B antinutritives - antiminerals - Phytic acid - Oxalic acid - Glucosinolates – Diteryfiber- Gossypol - Type C antinutritives - anti vitamins - Ascorbic acid oxidase – Antithiamine factors - Antipyridoxine factors. Anti-microbial agents - common anti-microbial food agents - Benzoic acid - Benzoates -Sorbic acid - Sorbates - Short chain organic acids - acetic acid - lactic acid – propionic acid - citric acid - parabens - sulfite - nitrite. Anti-microbial agents - Natural antimicrobial substances present in foods (Indirect antimicrobials) - Antioxidants, Flavouring agents, spices and essential Oils, phosphates, Medium chain fatty acids and esters, acetic and lactic acid. Anti-microbial agents - Antibiotics (, natamycin, tetracyclins, Subtilin, Nisin,), Antifungal agents for fruits, Ethylene and propylene Oxides

UNIT IV - Food safety and HACCP

Antimicrobial agents - Miscellaneous chemical preservatives - Chitosans, Dimethyl bicarbonate, Ethanol, Glucose oxidase, Polyamino acids. Bacteriophages as biocontrol agents, hurdle concept. Sanitation - GMPs - Personal hygiene - Sanitizers - Sanitation principles – Sanitizing methods - Sanitation agents - Chlorocompounds- Idocompounds - Bromcompounds – Acid and alkali compounds. Sanitation - Ozone, hydrogen peroxide, Acidified sodium chlorite- Factors influencing efficacy of sanitizers. Food safety- Indicators of food microbial Quality andsafety - Coliforms, Enterococci, Bifidobacteria, Coliphages/Enteroviruses, predictive Microbiology/ Microbial modeling. Risk assessment and management during food preparation - HACCP – prerequisite programmes, definitions, HACCP principles, Flow diagrams, Application of HACCP principles, Limitations of HACCP. Risk assessment and management during food preparation - Food safety Objective (FSO), Microbiological criteria, definitions, sampling plans. Microbiological criteria for various food products

UNIT V - Food laws & Standards

Food laws & Standards - FAO, Codex Alimentarius, ISO, Indian food laws and standards, Prevention of Food adulteration (PFA)act, Fruit Products Order(FPO), Meat product order (MPO), Cold storage order (CSO),BIS, Agmark.Non permitted food additives - Allura red AC, Aspartame, amaranth, Benzoic acid, brilliant black, Butylated Hydroxy - anisole, Calcium benzoate, Calcium sulphit. Non permitted food additives-Monosodium glutamate (MSG) Ponceau 4R, Cochineal Red A, Potassium benzoates, Potassium nitrate, Propyl p-hydroxybenozoate, propyl paraben, and paraben. Non permitted food additives - Saccharin & its Na, K and Ca salts, Sodium metabisulphite, Sodium sulphite, Stannous chloride (tin), Sulphur dioxide, Sunset Yellow FCF, Orange Yellow S, tartrazine.

TEXTBOOKS:

1. James M.Jay, Martin J. Loessner and David A. Golden; *Modern Food Microbiology, 1999.*
2. John de Vries*Food Safety and Toxicity* CRC Press, 2000

REFERENCES:

1. Wisconsin- Madison 1995, *Food Safety*, Food Research Institute University.
2. N.G Marriott (1985), *Principles of Food Sanitation,* AVI Pub. Co. USA.
3. PS Diamond and R.F Denmen*Laboratory techniques in chemistry and biochemistry*, 2004.

III Year B.Tech. Food Tech. II - Semester

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FT306 PROCESSING OF MILK & MILK PRODUCTS

Course Description & Objectives:

This course will impart knowledge about the various technologies for milk processing. By the end of the course students will be able to understand various technologies for milk processing, processing equipment, Quality standards for dairy products and handling and storage of milk and milk products.

Course Outcomes:

1. *Understand and describe the inherent compositional variability of milk composition, both within and among species.*
2. *Describe the physico-chemical and functional properties of milk constituents (proteins, lipids, carbohydrates, minerals.*
3. *Understand and describe the structural constituents of milk (casein micelle, milkfat globule)*
4. *Understand the processing of various milk products*

UNIT I- Introduction to milk

Milk - Definition - Indian Standards - Composition - Milk Constituents - Food and Nutritive value of milk. Physico-chemical properties of milk constituents - Physico-chemical properties of milk. Colostrum and its nutritive value - Milk and Public health - Safe guarding the milk supply- Clean milk production - Buying and collection of milk - Cooling and transportation of milk. Effect of heat on milk. Manufacture, Packaging and Storage of Pasteurized milk- Receiving - Preheating - Filtration/ Clarification - Cooling - Storage of raw milk. Standardization - definition and procedure. Pasteurization - Definition - Objectives - Formulation of standards - Methods of Pasteurization- Batch method and HTST method.

UNIT II- Pasteurization of milk and milk products

Vacuum Pasteurization - Standardization - Ultra High Temperature Pasteurization - Uperization - Homogenization - Bottling and storage - Flavour defects in milk, their causes and prevention. Ultra filtration and Reverse Osmosis. Cream - Definition - Classification - Composition - Food and

Nutritive value – Physicochemical properties. Cream production - Gravity and Centrifugal methods. Factors affecting fat percentage of cream - Yield of cream - Collection of cream - Neutralization of cream. Pasteurization of cream - Manufacture of different types of cream - Defects in cream, their causes and prevention. Butter - Definition - Classification - Composition - Method of manufacture, packaging and storage - Butter Over run. Theories of churning - Continuous butter making - Defects in butter, their causes and prevention

UNIT III- Types of milk and milk products and their preparation

Butter oil - Definition - Composition - Nutritive value - Methods of manufacture, Cooling, Packaging, Storage and Distribution - Defects in butter oil, their causes and prevention. Special milks - Sterilized milk-Definition - Method of manufacture - Homogenized milk- Definition - Factors influencing homogenization-Method of manufacture - Homogenizer- Soft curd milk - Definition - Characteristics - Methods of preparation of soft curd milk. Flavoured milks - Definition - Types - Methods of manufacture of chocolate/fruit flavoured milks/drinks – Vitaminized/Irradiated milk - Frozen concentrated milk .Fermented milk - Merits - Types - Starter propagation - Natural butter milk – Cultured butter milk - Acidophilus milk - Bulgarian butter milk - Kumiss - Kefir. Yoghurt - Method of preparation - Flavoured yoghurt preparation - Standardized milk -Reconstituted milk - Recombined milk - Toned milk - Double toned milk - Humanized milk- Miscellaneous milks.. Cheese - Definition - Classification - Composition - Nutritive value - Manufacture of cheddar cheese - Curing of cheese

UNIT IV- Processing of indigenous milk products

Cottage cheese - Method of manufacture - Different varieties of cheese - Defects in cheese, their causes and prevention. Ice cream - Definition - Classification - Composition - Nutritive value - Role of constituents in ice cream - Method of manufacture, packaging, hardening and storage. Over run in ice cream - Defects in ice cream, their causes and prevention. Manufacture of indigenous milk products - Ghee, Khoa, Chhana - Method of manufacture, packaging and storage - Nutritive value. Paneer, Dahi and Shrikhand - Method of manufacture, packaging and storage.

UNIT V- Dairy industry and by-products

Methods of preparation of Kheer, Rabri, Kulfi and Lassi. Indian milk confectionery - Manufacturing, packaging and storage of Khoa based sweetsKalakhand and Gulabjamun. Manufacturing, packaging and storage of Chhana based sweets Sandesh and Rasogulla.. By-products of dairy industry - Classification - Principle and method of utilization. Casein (industrial) - method of manufacture - Defects - Uses - Casein (edible) - method ofpreparation – Uses.

TEXTBOOKS:

1. Sukumar De. Outlines of Dairy Technology. Oxford University Press, New Delhi.
2. Warner J.N. Principles of Dairy Processing. Wiley Eastern Ltd., New Delhi

REFERENCES

1. Bangarappa K.S and Acharya K.L. Indian Dairy Products. Asia Publishing House, Bombay.
2 .EIRI Board of Consultants, Engineers. Milk Processing and Dairy Products Industries. EIRI India Research Institute, New Delhi.
3. Kessler H.G. Food Engineering and Dairy Technology. Published by Verlag A Kessler, Post Box No 1721, D-8050 Fraising (F R Germany)
4. Nelson J.A and Trout. Judging of Dairy Products. The Olsen Publishing Co., Milwaukee Wisconsin,USA
5. Srilakshmi B. Food Science. 2nd Edn. New Age International (P) Ltd Publishers, New Delhi.
6. Swaminathan M. Food Science, Chemistry and Experimental Foods. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

III Year B.Tech. Food Tech. I I-Semester

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FT308 PROCESSING OF MEAT AND POULTRY PRODUCTS
(ELECTIVE - II)

Course Description & Objectives:

This course will impart knowledge about the various technologies for meat and poultry processing.

By the end of the course students will be able to understand various meat processing technology and equipment, Quality standards for meat and poultry products and handling and storage of meat and poultry products

Course Outcomes:

By the end of the course students will be able to understand

1. *Sources and development of meat and poultry industries in India and importancein national economy.*
2. *Methods of slaughter - Stunning techniques - mechanical, electrical, chemical methods; Ritual/religious methods of slaughter - Jewish, Halal, Jhatka and Spanish methods.*
3. *Principles of various meat preservation techniques.*
4. *Safety standards in meat industry - Meat food product order - HACCP-ISO-9000 standards. Meat plant sanitation and hygiene.*
5. *Composition, spoilage, preservation and maintenance of eggs of eggs.*

UNIT I-Introduction to meat and poultry

Introduction: Sources and development of meat and poultry industries in India and importanceof meat and meat industries in national economy. Structure of meat muscle-microscopic view - Myofibrils - Actin - Myosin - Contraction. Chemical composition of meat muscle - muscle proteins - fats - carbohydrates - connective tissue-nutritive value of meat. Pre-slaughter care-requirements - different modes of transport of meat animal. Ante-mortem examination of meat animal; principles and judgements. Slaughtering of meat: Scientific methods of slaughter - Stunning techniques -

mechanical,electrical, chemical methods; Ritual/religious methods of slaughter - Jewish, Halal, Jhatka and Spanish methods. Dressing and cutting of carcass in sheep, pig and buffalo.

UNIT II-Post mortem changes in meat

Post mortem examination of carcass and principles of judgement. Grading of meat and packaging of meat Postmortem changes in meat - Rigormortis - Biochemical changes associated with Rigormortis which lead to the conversion of muscle to meat - Factors - Ph decline, resolution of rigor-autolytic proteolytic enzymes - microbial invasion and loss of structural integrity. Meat quality parameters - Meat color - Water holding capacity - Marbling - Quantum of connective tissue - firmness and storage conditions. Palatability characters of meat and factors affecting meat quality. Methods of tenderization - aging, enzymes and curing - factors affecting tenderness

UNIT III-Principles of various meat preservation techniques

Spoilage of meat - Sources of contamination, growth of microorganisms – Deteriorative changes in meat - Identification of spoilage. Principles of various meat preservation techniques - Chilling - Freezing- Curing – Smoking - Thermal processing - canning - Dehydration - Irradiation and Hurdle concept. Processing technology of meat products - Basic processing - Comminution – Mechanical deboning - Emulsification - Meat emulsion - methods of stabilization of meat emulsion meat extension - preblending - Hot processing - Cooking Techniques. Cured meats - Process of curing, methods of curing - commercial processing of ham and Bacon - Sausage processing - Production of Intermediate moisture and shelf stable meat products.

UNIT IV-Safety and quality standards in meat and poultry industry

Restructured meat products - tumbling - massaging - chunking - forming - tearing and forming. Value added meat products like luncheon meats - meat patties - meat loaves - meat balls and meat nuggets Safety standards in meat industry - Meat food product order - HACCP-ISO-9000 standards. Meat plant sanitation and hygiene. Structure of egg - different parts of an egg. Composition of egg - Proteins of Egg white, Yolk proteins and lipids and nutritive value of egg. Egg quality characteristics - Internal Quality - Haugh's unit - Terms indicating defective quality and Egg grading Ante mortem and post mortem examination of poultry birds - principles of judgement.

UNIT V-Spoilage and Preservation of eggs

Preslaughter care, handling, Transport and dressing of a poultry bird Cuts of poultry bird and Indian Standards of a dressed chicken. Microbial spoilage of eggs - types of spoilage in eggs - indications – organismscausing spoilage. Preservation and maintenance of eggs - Preservation of shell eggs - Egg cleaning – Oil Treatment - Cold storage - Thermo stabilization - Immersion in liquids. Preservation of Albumin and yolk-powder production. Preservation of poultry meat - Chilling, Freezing, Curing, Smoking, Dehydration, Canning and Radiation. Processing of value added products - Chicken barbecue, chicken sausage, meat balls and Pickling

TEXT BOOKS:

1. Sharma, B.D. Meat and Meat Products Technology (Including Poultry Products Technology),Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi, 2000.
2. NIIR Board of Consultants .Preservation of Meat and Poultry. Asia Pacific Business Press Inc,Delhi, 2004.

REFERENCES:

1. Lawrie R.A. Meat Science, Paragoan Press, Oxford and New York, 1999.
2. Sharma, B.D. Modern Abattoir Practices and Animal By-Products Technology. Jaypee BrothersMedical Publishers Pvt. Ltd, New Delhi.
3. Meat Processing and Meat Products Hand Book. EIRI, Delhi, 2002.
4. William J. Stadel. Egg Science. CBS Publishers, New Delhi, 2001.

III Year B.Tech. Food Tech. I I-Semester

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FT310 FOOD INDUSTRY BY-PRODUCTS
(ELECTIVE - II)

***Course Description & Objectives**:*

This course will impart knowledge about waste minimization, utilizing and developing various techniques to get best out waste from various food industry. By the end of the course students will be able understand the various types of by-products of food industry and their minimization, effective and efficient management of waste

Course Outcomes:

By the completion of the course students will be able to understand.

1. *Various types of by products and waste generated by the food industry.*
2. *By-product utilization of Legume seeds and oil seed industry.*
3. *By-products of dairy industry, Classification, Principle and method of utilization.*
4. *By- products of vegetable and fruit processing Industry, pectin extraction from apple pomace - tartaric acid extraction - oxalic acid. Fruit pits-kernel oil production, Citrus oil production, wine and beer production.*
5. *By-products of meat, poultry and egg processing Industry.*

UNIT I-Introduction to food waste

Introduction to Industrial by - products and waste - Potentials and prospects of developing by-products Industry in India. Agricultural wastes and agro based industries - Types of By-products in agro – based industries - commercial compounds obtained from by-products. By-products of Cereals - by-products of cereals processing - Rice and corn milling byproducts, Husk Utilization

UNIT II- By-product utilization of Legume, oil seed, and dairy

By-product utilization of Legume seeds. By-products of oilseed Industry - Oil seed cake utilization. By-products of dairy industry, Classification, Principle and method of utilization – Whey utilization - demineralization of whey - Lactose preparation, Casein preparation – Utilization of Ghee residue - protein hydrolysates

UNIT III- By- products of vegetable and fruit processing Industry

By- products of vegetable and fruit processing Industry - various wastes obtained in different fruit processing industries - pectin extraction from apple pomace - tartaric acid extraction - oxalic acid. Fruit pits- kernel oil production, Citrus oil production, Value added products from culled fruit, peels and rinds. By-products of fruit and vegetable fermentation - wine and vinegar

UNIT IV- By-products of meat, poultry and egg processing Industry

By-products of meat, poultry and egg processing Industry - Abattoir By-products. By-products of meat, poultry and egg processing Industry - Abattoir By-products. By-products of fish processing units. By-products of spices and plantation crops

UNIT V- By-products of fermentation, sugar and bakery industry

By-products of Alcoholic Fermentation Industries. By-products of Sugar Industry. By-products of BakeryIndustry

TEXTBOOKS:

1. Sharma, B.D. Modern Abattoir Practices and Animal by Products, 1996.
2. Ervan. Food from Wastes, nternational Publishers, Delhi, 1998.

REFERENCES

1. A Chakraverty, Post-Harvest Technology of Cereals, Pulses and Oil Seeds. Oxford and IBH Publishing Co. Ltd., Calcutta, 1997
2. Giridharlal, Siddappa and GL Tandon, ICAR. Preservation of fruits and vegetables, New Delhi, 2002.
3. Sudheer Gupta (Compiled), EIRI Fruits & Vegetables Processing Hand Book, Delhi, 2001
4. R.P. Srivastava, Sanjeev Kumar, Fruit and vegetable preservation-3rd Edition, International Publishers, Delhi.
5. Sukumar De, Outlines of Dairy Technology. Oxford University Press. New Delhi.

III Year B.Tech. Food Tech. I I-Semester

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FT312 NEUTRACEUTICAL & FUNCTIONAL FOODS
(ELECTIVE - II)

Course Description & Objectives:

This course will give basic knowledge of nutraceuticals and functional foods. By the end of the course students will be able to understand nutraceuticals and functional food and their role in combating various diseases like cardiovascular diseases, cancer, and various techniques to manufacture nutraceutical.

Course Outcomes:

1. *By the completion of the course students will be able to understand.*
2. *Nutraceuticals and functional foods, regulatory issues for nutraceuticals including CODEX.*
3. *Concept of angiogenesis and the role of nutraceuticals/functional foods; Nutraceuticals for cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, joint pain.*
4. *Manufacturing aspects of selected nutraceuticals such as lycopene, isoflavonoids, prebiotics and probiotics, glucosamine, phytosterol.*
5. *Clinical testing of nutraceuticals and health foods; interactions of prescription drugs and nutraceuticals; adverse effects and toxicity of nutraceuticals.*

UNIT I-Introduction to nutraceuticals

Introduction to nutraceuticals: definitions, synonymous terms, basis of claims for a compound as a nutraceutical, regulatory issues for nutraceuticals including CODEX.

UNIT II-Application of Nutraceuticals

Concept of angiogenesis and the role of nutraceuticals/functional foods; Nutraceuticals for cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, joint pain.

UNIT III -Nutraceuticals and Immunity

Immune enhancement, age-related macular degeneration, endurance performance and mood disorders –compounds and their mechanisms of action, dosage levels, contraindications if any etc.

UNIT IV-Manufacturing of nutraceuticals

Manufacturing aspects of selected nutraceuticals such as lycopene, isoflavonoids, prebiotics and probiotics, glucosamine, phytosterols etc.; formulation of functional foods containing nutraceuticals – stability and analytical issues, labelling issues.

UNIT V-Clinical testing of nutraceuticals

Clinical testing of nutraceuticals and health foods; interactions of prescription drugs and nutraceuticals; adverse effects and toxicity of nutraceuticals; nutrigenomics – an introduction and its relation to nutraceuticals.

TEXT BOOKS:

1. Robert EC. 2006. Handbook of Nutraceuticals and Functional Foods. 2nd Ed. Wildman
2. Shi J. (Ed) 2006. Functional Food Ingredients and Nutraceuticals: Processing technologies.. CRC.
3. Gibson GR & William CM. 2000. Functional Foods - Concept to Product.

REFERENCES:

1. Brigelius-Flohé, J &JoostHG. 2006. Nutritional Genomics: Impact on Health and Disease. Wiley VCH.
2. Cupp J & Tracy TS. 2003. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press.
3. Goldberg I. 1994. Functional Foods: Designer Foods, Pharma Foods.
4. Losso JN. 2007. Angi-angiogenic Functional and Medicinal Foods. CRC Press.
5. Manson P.2001. Dietary Supplements. 2nd Ed. Pharmaceutical Press.
6. Campbell JE & Summers JL. 2004. Dietary Supplement Labeling Compliance.
7. Neeser JR & German BJ. 2004. Bioprocesses and Biotechnology for Nutraceuticals. Chapman & Hall.

III Year B.Tech. Food Tech. II-Semester

L	T	P	To	C
-	-	3	3	2

FT314 FOOD SAFETY & MICROBIAL STANDARDS LAB

***Course Outcomes**:*

By the end of the practical exercises, the students will be able to

1. *Know about isolation of toxins from different food materials*
2. *Know about detection of heavy metals from plant and animal source*
3. *Know about risk assessment and management determination*

LIST OF EXPERIMENTS

1. Estimation of bacterial toxins from food sample - I.
2. Estimation of bacterial toxins from food sample - II.
3. Estimation of bacterial toxins from food sample - III.
4. Estimation of fungal toxins from food sample - I.
5. Estimation of fungal toxins from food sample - II.
6. Estimation of fungal toxins from food sample - III.
7. Detection of heavy metal from plant source.
8. Detection of heavy metal from animal source.
9. Risk assessment.
10. Management determination.
11. Study of National microbial quality standards.
12. Study of International microbial quality standards.
13. Visit to export oriented food industry.

III Year B.Tech. Food Tech. II-Semester

L	T	P	To	C
-	-	3	3	2

FT316 PROCESSING OF MILK & MILK PRODUCTS LAB

Course Description & Objectives:

This course will impart knowledge about the various technologies for milk processing. By the end of the course students will be able to understand various technologies for milk processing, processing equipment, Quality standards for dairy products and handling and storage of milk and milk products.

Course Outcomes:

After the completion of this course students will able to understand

1. *Sampling of milk*
2. *Various quality tests for milk.*
3. *Preparation of milk products like dahi, butter, ghee etc.*

LIST OF EXPERIMENTS:

1. Sampling and analysis of milk-COB, Titratable acidity, alcohol test, fat.
2. Study of physico- chemical properties, specific gravity and composition of milk.
3. Determination of adulterants and preservatives in milk.
4. Separation and standardization of milk.
5. Heat processing of milk- Pasteurization.
6. Preparation of butter.
7. Preparation of ghee.
8. Preparation of Dahi and Shrikhand.
9. Preparation of Lassi.
10. Preparation of Khoa.
11. Preparation of Khoa and Khoa based sweets.
12. Preparation of Chhana and Paneer.
13. Preparation of Chhana based sweets.
14. Visit to Dairy plant.

VIGNAN'S UNIVERSITY

IV Year - B.Tech

SYLLABUS

I SEM & II SEM

IV Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
4	0	-	4	4

FT401 PROCESSING OF SPICES & PLANTATION CROPS

Course Description & Objectives*:*

This course will impart knowledge about various types of spices and condiments.

By the end of the course students will be able to understand about various types of spices and condiments and their plantation, harvesting, post-harvest technology and treatments, processing, packaging, storage and their marketing.

Course Outcomes:

By the completion of the course students will be able understand

1. *Production and processing scenario of spices and plantation crops and its scope*
2. *Value addition of spices and spice products with different processing methods*
3. *Standards and specifications of spices, packaging of spices and spice products, market value of spices in India*
4. *Marketing of spices, adulteration, specifications for marketed products, packaging and different grades.*
5. *Harvesting post-harvest technology and treatments, processing and extraction, adulteration, specifications for marketed products, packaging.*

UNIT I-Introduction to spices

Introduction and History of Spices and condiments, production and processing scenario of spices and plantation crops and its scope. Value addition of spices and spice products with different processing methods. Definition of major spices, classification of spices, post-harvest technology, processed products and their marketing in trade. Different technologies involved in the preparation of spice powders, spice oils, oleoresins and micro encapsulated products. Standards and specifications of spices, packaging of spices and spice products, market value of spices in India. Herbs and leafy vegetables used as spices and condiments. Definition of plantation crops, Commercial value of plantation crops that are grown in India. Garlic- introduction, harvesting, post-harvest technology, processing methods, processed products and its grades.

UNIT II- Post- harvest technology of Turmeric, Onion, Pepper, Dil seed
Turmeric, Onion, Pepper, Dil seed, - Introduction, harvesting, post-harvest technology and treatments, processing into marketed products, adulteration, specifications for marketed products, packaging and different grades.

UNIT III- Post-harvest technology of Coffee, Clove and Coriander, and Chilli
Coffee, Clove and Coriander, and Chilli - Introduction, harvesting, post-harvest technology and treatments, processing into marketed products, adulteration, specifications for marketed products, packaging and different grades. Tea - Introduction, harvesting, post-harvest technology and treatments, processing into marketed products, adulteration, specifications for marketed products, Types of tea packaging and different grades

UNIT IV-Post-harvest technology of Cumin, Saffron, Oil palm, Cashew nut:
Cumin, Saffron, Oil palm, Cashew nut: Introduction, harvesting, post-harvest technology and treatments, processing into marketed products, adulteration, specifications for marketed products, packaging and different grades. –

UNIT V-Post-harvest technology of Vanilla and Annatto, Coconut, Asafoetida
Vanilla and Annatto, , Coconut, Asafoetida- Introduction, harvesting, post-harvest technology and treatments, processing and extraction, adulteration, specifications for marketed products, packaging and different grades. Chemistry of different spice flavors including coffee, tea, vanilla, and. Ginger: Introduction, harvesting, post-harvest technology and treatments, processing into marketed products, adulteration, specifications for marketed products, packaging and different grades.

TEXT BOOKS:

1. Shanmugavelu K.G. *Spices and Plantation Crops*. Oxford & IBH Publishing Co. New Delhi, 1998.
2. Gupta S. *Hand Book of Spices and Packaging with Formulae*.Engineers India Research Institute, New Delhi, 2000.

REFERENCES:

1. Purseglave J.W., Brown E.G., Green C.L., and Robins. *Spices* Vol.1 and Vol.II SRJ Academic Press. New Delhi.
2. Thampan P.K. *Hand Book of Coconut Palm.* IBA Publishing Company, New Delhi

IV Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
4	0	-	4	4

FT403 TECHNIQUES IN FOOD ANALYSIS

Course Description & Objectives:

This course will impart knowledge to the students on the Techniques in food analysis.

By the end of the course students will be able to understand various techniques in food analysis and analytical techniques used in Quality control laboratory.

Course Outcomes:

By the end of the course, the students will be able to

1. *Understand the concepts of Techniques in food analysis.*
2. *Understand proximate analysis of foods.*
3. *Understand Biochemical methods and approaches used in Food analysis.*

UNIT I- Introduction to the chemical analysis of food

Introduction to the chemical analysis of food - Definitions of food analysis, Quality control, Official methods of analysis. Association of Official Analytical Chemists, American Association of Cereal Chemists, American Oil Chemists Society Rules and Regulations of Food Analysis. Nutritional Labelling , Food Inspection and Grading, food safety - Safety rules in the chemistry - Safety rules - What to do in case of an accident - Broken Glass - Small chemical spill - Large chemical spill - Chemical splash in your face - Large splash of dangerous chemical on your clothing and or body, small confined fire, small open fire, large fire, your clothing on fire

UNIT II- Spectrophotometer

First Aid -Thermal burns, chemical burns, minor bleeding, toxic fumes, fainting and shock, chemical splashes. Sampling and Sampling Techniques - Introduction - Definitions of Population, Laboratory Sample, sample, precision, accuracy, sensitivity, Reproducibility - of Analysis – Official Samples, Raw Materials. Basic principles of spectrophotometer and colorimeter and its application. Analysis of Carbohydrates - Introduction - Importance of Carbohydrate Analysis – Methods of Analysis – Sample preparation - Extraction of Monosaccharides, Oligo saccharides.

UNIT III-Quantitative analysis of carbohydrate

Chemical methods for carbohydrates - Gravimetric methods - Titrimetric methods - Colorimetric methods - phenol sulphuric acid - Enzymatic methods. Physical methods - Polarimetric method, Refractive index measurements, Density, Infrared radiation, Immuno assays. Analysis of starch and crude fibre.

UNIT IV-Chromatography

Protein concentration by Kjeldhal method, Enhanced Dumas method, using U.V.Visible spectroscopy. Direct measurement at 280 nm, Biuret method, Lowry method, Dye binding method, Turbido metric method. Protein and characterisation - Basic principles of chromatography - types of chromatography and its applications. Analysis of lipids - Introduction - Importance of analysis of lipids - Determination of total lipid concentration - solvent extraction.

UNIT V-Extraction of lipids

Extraction of lipids - solvent, non-solvent extraction methods, instrumentation methods. Determination of lipid composition - Separation and analysis by chromatography – lipids fractions of TLC - Fatty acid methyl esters by GC - Chemical techniques - acid value, instrumental techniques of analysing lipid oxidation in foods - Chromatography, peroxide value - Characteristics of physico chemical properties. Analysis of minerals - Introduction - Importance of mineral analysis - Dry ashing – Wet ashing - Low plasma ashing, Adsorption Spectroscopy.

TEXTBOOKS:

1. ManoRanjanKalia First Edition 2002, *Food Analysis and Quality Control*. Kalyani Publishers, NewDelhi, Hyderabad
2. S.S. Nilson, *Food Analysis*, Aspen Publishers, Gaithery Berg, Mary Land, 2002.

REFERENCES:

1. AOAC methods For Food Analysis, 2001.
2. Y. Pomeranz and C.E. Meloan, *Food Analysis,* Theory and practice, *A.V.I Publishing* Company, INC West Port, Connecticut, U.S.A.,
3. Jayaraman, J. 1980. *Laboratory Manual in Biochemistry*. Wiley Eastern Publishers, New Delhi.
4. Plummer, D.T. 1979. *An introduction to Practical Biochemistry*. Tata Mc Graw-Hill Publishing Co., New Delhi.

IV Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
4	0	-	4	4

FT405 FOOD ADDITIVES

Course Description & Objectives:

This course will impart knowledge about various food additives used in food industry.

By the end of the course students will be able to understand different types of food additive and their importance in food processing.

Course Outcomes:

By the end of the course, the students will be able to

1. *learn different aspects of Food Additives - Permitted & Non-permitted Additives, their safety aspects & regulations along with recommended intakes.*
2. *learn Identification, determination to both qualitative & quantitative procedures for estimation of different Food Additives in food.*

UNIT I-Introduction to additives

Introduction: What are Food Additives? - Role of Food Additives in Food Processing - functions – Classification - Intentional & Unintentional Food Additives. Toxicology and Safety Evaluation of Food Additives – Beneficial effects of Food Additives / Toxic Effects - Food Additives generally recognized as safe (GRAS) – Tolerance levels& Toxic levels in Foods - LD 50 Values of Food additives. Naturally occurring Food Additives - Classification - Role in Food Processing – Health Implications.

UNIT II- Preservatives: Color and antioxidant

Food colors - What are food colors - Natural Food Colors - Synthetic food colors - types - their chemical nature- their impact on health.. Preservatives - What are preservatives - natural preservation- chemical preservatives –their chemical action on foods and human system?

Anti-oxidants & chelating agents - what are anti-oxidants - their role in foods - types of antioxidants - natural & synthetic - examples - what are chelating agents – their mode of action in foods

UNIT III-Surface active agents role in food

Surface active agents - What are surface active agents - their mode of action in foods - examples. Stabilizers &thickeners - examples - their role in food processing. Bleaching & maturing agents: what is bleaching -Examples of bleaching agents - what is maturing - examples of maturing agents - their role in food processing.

UNIT IV-Starch modifiers

Starch modifiers: what are starch modifiers - chemical nature - their role in food processing. Buffers - Acids &Alkalis - examples - types - their role in food processing. Sweeteners - what are artificial sweeteners & nonnutritive sweeteners - special dietary supplements & their health implication - role in food processing.

UNIT V-Flavoring agents used in food

Flavoring agents - natural flavors & synthetic flavors - examples & their chemical nature - role of flavoring agents in food processing. Anti-caking agents - their role in food processing. Humectants - definition on their role in food processing.. Clarifying agents - definition examples - their role in food processing.

TEXTBOOKS:

1. Srivastava, R.P. Fruit & Vegetable Preservation – Principles and Practices. International Book Distributing Co. CIBDC, New Delhi
2. Mahindru, S.N. Food Additives – Characteristics, Detection and Estimation .Tata McGraw Hill Publishing, India.

REFERENCES

1. Belitz. Food Chemistry. 3rd Revised Edition. Springer International.
2. Deshpande, S.S. Hand book of Food Toxicology. Marcel and Dekker CRC Publishers.
3. ShakuntalaManay and ShadaksharSwamy. Food Facts and Principles. New Age International Publishers, New Delhi.

IV Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
4	0	-	4	4

FT407 FOOD PROCESSING EQUIPMENT

Course Description & Objectives:

This course will impart knowledge about various food processing equipment and their design& considerations.

By the end of the course students will be able to understand about processing equipment and their working principle.

Course Outcomes:

By thecompletion of the course students will be able to understand the

1. *Design consideration of food processing equipment and factors affecting them like stress, thickness and material of construction.*
2. *Pumps and pipelines and their application in food industry.*
3. *Design of dryer, heat exchanger and evaporators.*
4. *Design of high pressure processing, pulse electric field processing, ultrasound and pulse UV light.*
5. *Operating and performance parameters in mechanical, thermal and mass transfer operations carried out in food processing.*

UNIT I-Equipment design

Design considerations of agricultural and food Processing Equipment: factor of safety, theories of failure, allowable stresses, minimum thickness after forming; Materials of Construction.

UNIT II-Pumps and pipelines

Introduction to pumps and pipelines. Process plant piping, hygienic considerations and ease of cleaning for insulated as well as un-insulated pipes Introduction to boilers.

UNIT III-Design of dryers

Design of dryers: Introduction, types of driers, design consideration of dryers. Design of heat Exchangers, evaporators.

Unit IV-Design of HPP, PEF, UV equipment

Design of high pressure processing, pulse electric field processing, ultrasound and pulse UV light

UNIT V-Unit operation in food processing

Identification of design, operating and performance parameters in mechanical, thermal and mass transfer operations carried out in food processing such as; particulate size reduction, homogenization, centrifugation, packaging, mixing, conveying, extrusion, storage, heating, cooling, freezing, puffing, frying, distillation, extraction, concentration and drying. Developing mathematical relationship between the independent and dependent variables affecting the food processing operations by using physical and chemical principles governing the processes. Factorial, fractional factorial and rotatable central composite experimental design. Developing empirical equations using experimental data. Developing predictive model using Neural network. Optimization of processing parameters using Genetic algorithms. Application of Fuzzy logic to sensory evaluation and ranking of foods

TEXT BOOKS:

1. Richey CB. (Ed.). 1961. Agricultural Engineers' Hand Book. McGraw Hill.
2. Romeo T Toledo. 1997. Fundamentals of Food Process Engineering. CBS. Slade FH. 1967.

REFERENCES BOOKS:

1. Ahmed T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal.
2. Chakraverty A & De DS. 1981. Post-harvest Technology of Cereals, Pulses and Oilseeds. Oxford & IBH.
3. Gary Krutz, Lester Thompson & Paul Clear. 1984. Design of Agricultural Machinery. John Wiley & Sons.
4. Hall CW & Davis DC. 1979. Processing Equipment for Agricultural Products. AVI Publ.

IV Year B.Tech. Food Tech. I -Semester	**L**	**T**	**P**	**To**	**C**
	4	**0**	**-**	**4**	**4**

FT 409 FOOD PLANT LAYOUT, MANAGEMENT AND UTILITIES
(ELECTIVE - III)

Course Description & Objectives:

This course will impart knowledge about plant design, plant layout planning, linear programming in plant design and maintenance of food plant**.**

By the end of the course students will be able to understand plant design and safety parameter related to plant design

Course Outcomes:

By the completion of the course students will be able to understand

1. Basics of plant design, feasibility study of plant design.
2. Plant layout considerations involved in planning an efficient layout. Types of layouts.
3. Linear Programming in plant design.
4. Materials of construction of Equipment.
5. Safety Color Code, Roof Inspection, Care of Concrete floors. ColorCoding:Color – Code System - Specific Hazards Color codes for buried pipes and cablesColor Scheme for pipes.

UNIT I-Introduction to plant design

Introduction: Plant design concepts - situations giving rise to plant design problems - general design considerations - differences in design of food processing and non-food processing plants. Feasibility study: Steps involved including planning of the study - collection of information - information flow diagrams – market analysis, technical analysis and preparation of feasibility report. Plant location: Factors affecting plant location, their interaction with plant location, theory models for evaluation of alternate locations. Plant size: Economic plant size - factors affecting the plant size - raw materials availability, market demand, competition in the market - return on investments. Procedures for estimation of economic plant size - break even analysis and optimization techniques - estimation of volume of production for each product - in case of more than one product that will maximize profits. Process scheduling

UNIT II-Plant layout and consideration

Plant layout: considerations involved in planning an efficient layout. Types of layouts. Equipment symbols - flow sheet symbols - electrical symbols - graphic symbols for piping systems including pipe fitting and valves. Standards for space requirements - distances between critical plant areas and for setting different plant facilities. Development of the pilot layout: Size and structure of the pilot plant, minimum and maximum size, types and applications, pilot plant design. Engineering Economy : Definitions : Time value of money, inflation, Interest, Interest rate, compound interest, rate of return, payment, receipt , cash flow, present value, Equivalence, sunk costs, opportunity costs, Asset, Life of an asset, depreciation, book value of an asset, salvage value, retirement, replacement, defender and challenger. Methods of economic evaluation of engineering alternatives

1. Undiscounted cash flow methods -payback period method
2. Discounted cash flow methods

a) Net present value method

b) Equivalent annual method

c) Rate of return method

3. Cost- benefit analysis, Social costs, social benefits

UNIT III- Introduction to linear programming

Linear Programming: Introduction, Salient features of linear programming (Terminology), Formulation of linear programming model, Advantages, limitations and applications of linear programming, solution of linear programming problems. Linear Programming: Introduction, Salient features of linear programming (Terminology), Formulation of linear programming model, Advantages, limitations and applications of linear programming, solution of linear programming problems. Queuing theory: Introduction, Elements of queuing system, 1) Input source, 2) Queue and 3) Service mechanism. Queuing theory: Introduction, Elements of queuing system, 1) Input source, 2) Queue and 3) Service mechanism. Common problems in plant layout:Service system layout problem, Manufacturing layout problem, Warehouse layout problem, Non-traditional Layout problem.

UNIT IV- Equipment and material handling

Selection of equipment: Process equipment - material handling equipment – service equipment- valves and fittings - instruments and controls-considerations involved in equipment selection. Estimation of Services and Utilities:Utilities: Fuel oil cost, Natural gas cost, electricity cost, steam cost, cooling water cost, Refrigeration cost, waste treatment cost. Estimation of Services such as Cafeteria, locker rooms, water closets, sinks, parking lots, exercise area. Office Layout. Line Balancing and Line balancing techniques. Materials of construction of Building / structure and Equipment: Building and Structure: Foundations, supporting structure, walls, Floors, Slope of Floors, Doors, piping, Electrical, Ventilation, Hand - Cleaning - Stations.

UNIT V-Materials of construction of Equipment

Materials of construction of Equipment: Characteristics of suitable construction material: Stainless steel, Aluminium, Nickel and Monel, Plastic Materials. Materials of construction of Equipment: Characteristics of suitable construction material: Stainless steel, Aluminium, Nickel and Monel, Plastic Materials. Maintenance of Food Plant Building: Safety Colour Code, Roof Inspection, Care of Concrete floors ColourCoding:Colour – Code System - Specific Hazards Colour codes for buried pipes and cablesColour Scheme for pipes. Illumination and ventilation. Cleaning & sanitization Painting and colour coding and Fly and insect control.

TEXTBOOKS:

1. M Moor, Mac Millan, *Plant Layout & Design. Lames*, New York, 2002.
2. *Food plant engineering systems* by Theunis C. Robberts, CRC Press, Washington, 2008

REFERENCES:

1. H.S. Hall & Y.S. Rosen, *Milk Plant Layout*. FAO Pubs, Rome, 2003.
2. F.W. Farrall, *Dairy & Food Engineering*. John Willy & Sons, New York.
3. *Food Plant Design* by Antonio López. Gómez, 2004.
4. *Food plant engineering systems* by Theunis C. Robberts, CRC Press, Washington, 1998.

IV Year B.Tech. Food Tech. I -Semester

L	T	P	To	C
4	0	-	4	4

FT411 PROCESSING OF FISH AND MARINE PRODUCTS
(ELECTIVE - III)

Course Description & Objectives:

This course will impart knowledge about fisheries.

By the end of the course students will be able to understand the resources, types, handling, processing techniques, packaging, transportation and spoilage and various quality and safety standards for fish and fish products

Course Outcomes:

By the completion of the course students will be able to understand the

1. *Types, composition, and nutritive value, spoilage and factors affecting the spoilage of fish.*
2. *On-board handling and various methods of preservation like smoking, drying, canning, salting etc. of fish.*
3. *Fermentation and fermented fish products, freezing and equipment, novel methods of fish processing like Low dose irradiation& high pressure, MAP; Vaccum packaging.*
5. *Hurdle technology, Types of value added fish Products - Fish finger - Surimi - Fish burger - Fish protein concentrates, – flakes, Types of packaging used for fish..*

UNIT I-Introduction to fisheries

Fisheries resources - Global and Indian Scenario - Types of fishes and other marine products. Biochemical composition of fish - prawn and marine fishes - Proximate composition. Nutritive value of Fish flesh – prawn and marine foods. Types of fish - Anatomy - Deboning process of fish. Post-mortem changes in fish and quality assessment - types of fish spoilage – enzymatic - chemical & microbial. Spoilage indices of fish – Factors affecting spoilage of fish.

UNIT II- Drying and canning of fish

On-board handling - Need for hygienic handling - Handling fish onboard - washing – sorting Eviscerationremoval of gills - bleeding icing - bulking -

shelving and boxing.. Drying, Dehydration - principles of drying - Types of drying and types of dryers. Effect of drying on the quality of fish - Spoilage of fish during drying - Advantages - disadvantages. Smoking - Preservative action of smoke - composition of smoke - physical and chemical characteristics of smoking agents - Preparation of fish for smoking and smoking process. Types of
Marinades in fish processing. Salting - Dry Salting process - Wet salting process. Canning of Fish – Canning process - Equipment required - filling - Exhausting - Sealing - Can washing -Thermal processing/sterilization - Advantages

UNIT III-Fermentation and Freezing of fish

Fermentation - Fermented fish products - liquid fermented fish products (Sauces) – Factors affecting quality of fish sauce. Fermented fish - method of processing - Lactic acid fermented products. Traditional methods – Low temperature storage - Freezing of fish - prawn - process of Freezing - principles of refrigeration – factors affecting - freezing time of fish - Quick freezing. Slow freezing methods - equipment required-types - direct and indirect systems – Changes associated with freezing and cold storage of fish. Chemical treatments used in fish processing industry. Novel Methods - Low dose irradiation& high pressure treatment - Principle - application in fish and prawn processing industry. MAP; Vaccum packaging; Gas Packaging - Principle - application in fish and Prawn processing industry

UNIT IV-Value added Fish products

Oxygen Absorbents-Carbon dioxide generators - Ethanol vapour - Principle - Application in fish and prawn processing industry. Hurdle barrier concept - principle and application in fish processing industry. Value added Fish products - What is Value addition? - Types of value added fish Products - Minced fish - Fish finger - Surimi - Fish burger - Fish protein concentrates, cutlets – balls -noodles - flakes. Processing of Fish oils - Chitosans - fish meal - Isinglass - pearl Essen. Fish Packing - Types of packaging used for fish. Fish Packing - Types of packaging used for prawn and other sea foods

UNIT V-Quality Assurance and Standard

Sea food Quality Assurance - Quality management. HACCP - implementation of HACCP in fish and marine processing. Quality control and standards for fish, prawn and other sea foods. EU hygienic regulations in fish and marine industry. ISO 9000 and ISO 14000 certification for standards in fisheries. New kinds of quality and safety problems emerging in sea foods processing and Preservation

TEXTBOOKS:

1. Charles. L. Cutting .*Processing and Preservation of Fish*. Agro Bios, 1998
2. *Code of Practices of Canned Fishery products*. FAO (United Nations), Rome, 2002.

REFERENCES:

1. Ronal J. Roberts .*Fish Technology, 2003.*
2. George Borstorm .*Fish as Food – Vol.I,II III and IV.* Academic Press, Newyork, 2000.
3. *Code of Practices of Canned Fishery products*. FAO (UnitedNations), Rome, 2009
4. Chicjester .*Microbial safety of Fishery products*. Academic Press, Newyork, 2010.

IV Year B.Tech. Food Tech. I -Semester	L	T	P	To	C
	4	0	-	4	4

FT413 FOOD QUALITY & CERTIFICATION
(ELECTIVE - III)

Course Description & Objectives:

This course will impart knowledge about National and international food quality standard& certification systemdealing with food products

After the completion of the course students will be able to understand quality, quality control, tools of quality control and various national and international quality standards dealing with food quality and safety.

CourseOutcomes:

By the completion of the course students will be able to understand

1. *Food quality and quality attributes, quality control and its function, quality assessment of fruits & vegetable and cereals and legume.*

2. *Quality Assessment of Food materials like Dairy Products / Milk and Milk Products, Meat, Poultry, Egg and Processed food Products, Different methods of Quantitative descriptive analysis.*
3. *Determination of Sensory thresholds and taste Interactions, Objective/ Instrumental analysis of Quality Control, Food laws and Standards (BIS). Consumer Studies.*
4. *Novel Foods & aspects of Labelling.*
5. *International food regulations and certifications. The concept and process of implementation of HACCP in an industry, ISO9000 series, Food Adulteration and Food Safety.*

UNIT I-Food Quality

Food Quality - its need and its role in Food Industry. Food Quality and Quality Attributes - Classification of Quality Attributes and their role in food Quality. Objectives, Importance and Functions of Quality Control. Methods of quality concepts of Dough Rheology. Quality Assessment of Food materials - Fruits and Vegetables. Quality Assessment of Food materials - Cereals and legumes.

UNIT II-Quality assessment of food products

Quality Assessment of Food materials - Dairy Products / Milk and Milk Products. Quality Assessment of Food materials - Meat, Poultry, Egg and Processed food Products. Statistical Quality Control of Foods. Sensory Evaluation of Food Quality - Introduction - Panel Screening - Selection of Panel Members. Requirements for conducting Sensory Evaluation and serving procedures. Methods of Sensory Evaluation and Evaluation cards - Difference/ discrimination procedures. Methods of Sensory Evaluation and Evaluation cards - Ranking and Rating procedures. Different methods of Quantitative descriptive analysis

UNIT III- Food laws and Standards and consumer study

Determination of Sensory thresholds and taste Interactions. Objective/ Instrumental analysis of Quality Control. Food laws and Standards (BIS). Consumer Studies - Types of Consumer studies - Preference Studies and Acceptance Studies. Consumer Studies - Types of Consumer studies - Preference Studies - Objectives of Consumer Preference Studies - factors affecting consumer acceptance. Information obtained from Consumer Study

- Factors Influencing results from Consumer surveys. Methods of Approach - Development of the questionnaire - Types of Questionnaire andother methods of data collection

UNIT IV- Food grade, legislation and standards

Comparison of Laboratory Panels with Consumer panels. Limitations of Consumer Survey. Fundamentals of Food regulations - pertaining to Additives and Contaminants. Food regulations pertaining to aspects of Hygiene - Novel Foods & aspects of Labelling. Different existing Food legislations-norms in implementation. Food grade and standards

UNIT V- International & Indian food regulations and certifications

International food regulations and certifications. Indian food regulations and Certifications. Concept of Codex Alimentarius. The concept and process of implementation of HACCP in an industry. USFDA - the cause of its existence - its role in safe guarding food quality - ISO9000 series- Significance. Food Adulteration and Food Safety.

TEXT BOOKS:

1. Ranganna.S .*Handbook of Analysis and Quality Control – Fruits and Vegetable Products*. Tata Mc Graw Hill, New Delhi, 2001
2. Imteaz Ali. *Food Quality Assurance – Principles and Practices* .CHIPS, Texas, 2006.

REFERENCES BOOKS:

1. Multon. J.L. *Quality Control for Food and Agricultural Products* .CHIPS, Texas, 2007
2. Amerine, Pangborn. M.A. and Roseiur.*Principles of Sensory Evaluation of Food*., 2004
3. Birk, G.G. Berman and Parker.K.J.*Sensory Properties of Food*.Applied Science, London, 2006
4. Pattee.*Evaluation of Food quality of fruits and vegetables*. AVI publishers, Westport, 2003
5. IS standards on *Sensory Evaluation, 2002*

IV Year B.Tech. Food Tech. I -Semester

L	T	P	To	C
4	0	-	4	4

FT415 FOOD BIOTECHNOLOGY
(ELECTIVE - IV)

Course Description** & **Objectives:

This course will impart the knowledge to students about Prospectus of Biotechnology in food sector.

By the end of the course students will be able to understand biotechnology and Application of Biotechnology in food industry and Agriculture

CourseOutcome:

By the end of the course, the students will be able to

1. *Get knowledge about basics and fundamentals of Molecular biology.*
2. *Know about rDNA Technology and their applications in different areas.*
3. *Know about cell and tissue culturing techniques.*
4. *Know about application of biotechnology in particular to food industries.*

UNIT I - Prospectus of Biotechnology

Prospectus of Biotechnology-new development in the science of gene manipulation – a rash of new companies -to commercialize the new technology - Human genome sequencing project - potential for human therapy -Fundamentals of molecular biology - DNA as genetic material – Hersheyand chase experiment - RNA as genetic material - Viruses and bacteriophages Transcription - Translation. Chemistry and biology of DNA - Structural elements of nucleic acids - sugar –Anionic group - Nitrogenous bases - Purines - pyrimidine’s - Nucleosides - Nucleotides – Phosphoric acid.Primary conformation of DNA - Secondary conformation of DNA - Watson and Crick model -Types of DNAA, B, Z - - Types of RNA

UNIT II- DNA synthesis

Requirements for DNA synthesis - Substrate - Primer - proteins - DNA polymerase - I, II, III - Helicase -Topoisomerase - primase - ligase - ssb proteins - Mechanism of replication - Initiation - elongation -termination. Genetic recombination - Gene transfer mechanism - Conjugation - Process - F plasmid - Hfr factor- Transformation - Competence - Gram positive transformation - Gram negative transformation. Micro injection

Transduction - Generalized transduction - Co-transduction - Abortive transduction - Specialized transduction.Industrial fermentation process

UNIT III- Fermentation and Enzyme

Types of fermentations - Batch fermentation - Feed batch fermentation - Sub batch fermentation – Continuousfermentation - Multiple fermentations - Multistage fermentations. Regulation of gene expression - Induction repression- LAC operon- The operon model - promoter - operator- Structural genes - Lac Z gene - Lac Y gene -Lac A gene - regulation of lac operon - negative regulation - positive regulation.

Different enzymes used - Helicases - premases – topoisomerases - RNA polymerase I, II, - Holoenzyme – sigmafactor - DNA Gyrase - DNA polymerase - I, II, III. Restriction enzymes - restriction endonucleases -RecombinantDNA technology.

UNIT IV-Cell and Tissue culture

Cell and Tissue culture- Animal cell culture- primary cell lines - secondary cell lines - Minimal essentialmedium - Amino acid assay medium - plant cell culture- Plasticity - Totipotency - MS medium –micro propagation- callus formation - Organ development – tissue transformation - uses of tissue culture. Expression of foreigngenes - Transformation - calcium chloride mediated – calcium phosphate mediated - microinjection – liposomemediated gene transfer - electroporation. Selection of cells containing cloned genes - selection based onantibiotic resistance - complementation of nutritional defects - assay of biological activity – immunochemicalmethod - colony hybridization - Expression of target gene in the host cell - Shot gun method- DNA libraries -

UNIT V- Application of Biotechnology in Agriculture

Application of Biotechnology in Agriculture - Improvement of nutritionalquality - post harvest technology - Changing plants at their genetic level - To develop nitrogen fixation -Productionof disease resistant plants. Bio gas plant - Anaerobic digestion - Methane formation – Methanogenicfermentations - Methane oxidation - Hydrocarbon degradation - Anaerobic digester designs - positive andnegative features of anaerobic process

TEXT BOOKS:

1. Sandy Primrose, Richard Twyman, Bob Old, *Principles of Gene Manipulation* sixth Edition T.ABrown, *Gene Cloning., 2000.*
2. Agrawal / Parihar, *Industrial Microbiology - Fundamentals and Applications, 2002.*

REFERENCE BOOK:

1. B.D Singh, *Text Book of Biotechnology, 1998.*

IV Year B.Tech. Food Tech. I -Semester

L	T	P	To	C
4	0	-	4	4

FT417 FOOD STORAGE AND TRANSPORT ENGINEERING
(ELECTIVE - IV)

Course Description & Objectives:

This course will impart knowledge about handling equipment and storage methods used in food industry.

By the end of the course students will be able to understand material handling equipment, principle and practices of storage

Course Outcomes:

After completion of this course students will be able to understand

1. *About material handling system, equipment and storage design*
2. *Design of screw, bucket, belt, oscillation & vibrating conveyor.*
3. *Refrigerated transportation of food materials*
4. *Principles and practices of storage*
5. *Conventional& modern storage structures for fruits, vegetables, meat and marine products*
6. *Layout and Design of storage structures, economics of storage structures*

Unit I-Material handling

Overview of material handling system and devices in food processing plants.

Unit II-Conveyor design

Design of screw, bucket, belt, oscillation & vibrating conveyor.

Unit III-Transportation and storage of food

Refrigerated transportation of food materials. Principles and practices of storage: Physicochemical changes in stored products during storage, air tight, non-air tight, underground conventional storage structures for fruits, vegetables, meat and marine products

Unit IV-Modern storage structure

Modern storage structures for fruits, vegetables, meat and marine products; Aerated, refrigerated and controlled atmospheric storage;

Unit V-Layout and Design

Layout and Design of storage structures, economics of storage structures.

TEXT BOOKS:

1. Henderson S & Perry SM. 1976. Agricultural Process Engineering. 5th Ed. AVI Publ. Multon JL. (Ed). 1989.
2. Preservation and Storage of Grains, Seeds and their By-products. CBS. Ripp BE. 1984. Controlled Atmosphere and Fumigation in Grain Storage. Elsevier.

REFERANCES BOOKS:

1. FAO. 1984. Design and Operation of Cold Stores in Developing Countries. FAO. Hall CW. 1970. Handling and Storage of Food Grains in Tropical and Sub-tropical Areas. FAO Publ. Oxford & IBH.
2. McFarlane Ian. 1983. Automatic Control of Food Manufacturing Processes. Applied Science Publ.
3. Shefelt RL & Prussi SE. 1992. Post Harvest Handling – A System Approach.
4. Academic Press. Shejbal J. (Ed). 1980. Controlled Atmosphere Storage of Grains. Elsevier

IV Year B.Tech. Food Tech. I -Semester

L	T	P	To	C
4	0	-	4	4

FT419 FOOD LAWS & REGULATIONS
(ELECTIVE - IV)

Course Description & Objectives:

This course will impart knowledge about various food laws and regulation for all kinds of food products

After completion of this course students will be able to understand establishment and importance of various food laws and regulation.

Course Outcomes:

After completion of this course students will be able to understand

1. *The need for food/standards and their enforcement and various types of laws.*
2. *Establishment of Food Safety and Standards Authority of India (FSSAI) and its composition.*
3. *Milk and Milk Product Order, 1992 (MMPO)*
4. *Optional food standards. Their scope, Need.*
5. *Codex standards for Fruits and Vegetables Codex standardsfor Meat and Poultry products Recommended International Code of hygiene for various food products.*

UNIT I-Introduction to food standard

Introduction - What is the need for food/standards and their enforcement,various types of laws-Mandatory/Regulatory and Voluntary/Optional - Introduction to various food laws (Mandatory) - Food Safetyand Standards Act, 2006 (FSSA), Edible Oils Packaging (Regulation) Order, 1998, Environment (Protection)Act, 1986, Fruit Products Order, 1955 (FPO), Meat Food Products Order, 1973 (MFPO), Milk and Milk ProductOrder, 1992(MMPO), Solvent Extracted Oil, De-oiled Meal and Edible Flour (Control) Order, 1967, Standardsof Weights and Measures Act, 1976, Essential Commodities Act, 1955, Export (Quality Control andInspection) Act, 1963, The Insecticides Act, 1968, Vegetables Oil Products(Control) Order, 1998, Prevention ofFood Adulteration Act & Rules (PFA Act), 1954Introduction to various food laws (Voluntary) –AgmarkStandards (AGMARK), CodexAlimentarius Standards, BIS

Standards and Specifications, Consumer Protection Act, 1986. Food Safety andStandards Act, 2006 (FSSA) - Need, Scope and Definitions (Chapter I ofFSSA, 2006).

UNIT II- Establishment of FSSAI

Establishment of Food Safety and Standards Authority of India (FSSAI) (II Food Safety Officer (FSO)/Food Inspector (Called so by PFA Act) - Powers, Duties and functions of FSO. Prevention of Food AdulterationAct & Rules (PFA Act), 1954. Definition. Object of the act. Central committee for food standards. Powers of the food Inspectors. Procedures to be followed by theFood Inspectors. Report of public analyst. (PFA Act 1954 and Part IV of PFA Rules, 1955) Sealing, fasteningand dispatch of samples.

UNIT III- Power of court and various Acts

Powers of Court (Section 14 to 25 of PFA Act, 1954). Consumer Protection Act, 1986 and Consumer ProtectionRules, 1987. - Need, Scope, Functions and Enforcement. Environment (Protection) Act, 1986. - Need, Scope,Functions and Enforcement. The Insecticides Act, 1968. - Need, Scope, Functions and Enforcement. The Export(Quality Control and Inspection) Act, 1963. - Need, Scope, Functions and Enforcement. Fruit Products Order,1955 (F8PO). - Need, Scope, Functions and Enforcement.

UNIT IV-Need and significance of food laws and regulation

Milk and Milk Product Order, 1992 (MMPO). - Need, Scope, Functions & Enforcement. The Plants, Fruits andSeeds (Regulation of Imports in India) Order, 1989. - Need, Scope,Functions and Enforcement. Edible Oils Packaging (Regulation) Order, 1998. - Need, Scope, Functions &Enforcement. Meat Food Products Order, 1973 (MFPO). - Need, Scope, Functions & Enforcement. Standards ofWeights and Measures Act, 1976. - Need, Scope, Functions & Enforcement. The Essential Commodities Act,1955. - Need, Scope, Functions & Enforcement

UNIT V-Optional food standards.

Optional food standards. Their scope, Need - Procedure to obtain that standard (ISO 9001, 14000 etc.).AGMARK. Bureau of Indian Standards (BIS). Codex Alimentarius. Scope of Codex Alimentarius and CodexStandards. Codex standards for Cereals & Pulses. Codex standards for Fruits and Vegetables

Codex standardsfor Meat and Poultry products Recommended International Code of hygiene for various food products

TEXT BOOKS:

1. Patricia and ACurtis *An operational Text Book, Guide to Food Laws* and *Regulations*.
2. Ranganna S. *Hand book of Analysis and Quality Control for Fruit and Vegetable Products.*

REFERANCES:

1. Srilakshmi B. *Food Science.*
2. Avanthi Sharma *A text book of Food Science and Technology*.
3. Sumati R Mudambi, Shalini M Rao and Rajagopal M.V. - *Food Science*.

IV Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
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FT421 PROCESSING OF SPICES & PLANTAION CROPS LAB

***Course Description & Objectives**:*

This course will impart knowledge about various types of spices and condiments.

By the end of the course students will be able to understand about various types of spices and condiments and their plantation, harvesting, post-harvest technology and treatments, processing, packaging, storage and their marketing.

Course Outcomes:

By the end of the practical exercises, the students will be able to understand

1. *Identification of flavoring compounds of spices*
2. *Extraction of oil from various spices*

LIST OF EXPERIMENTS

1. Identification and characterization of flavoring compounds of spices
2. Extraction of oil from clove and pepper

3. Extraction of oil from cardamom and chili
4. Extraction of oleoresins- turmeric or ginger
5. Extraction of oleoresins- pepper or clove
6. Piperine estimation in pepper oleoresin
7. Steam distillation of spices
8. Determination of curcumin content in turmeric
9. Chemical analysis of spices- Moisture, valuable oil, specific gravity, refractive index andacid value
10. Study of standard specifications of spices
11. Preparation of different spice powders
12. Packaging study of spices
13. Visit to cashew processing industry
14. Visit to spice processing industry

IV Year B.Tech. Food Tech. I-Semester	L	T	P	To	C
	-	-	3	3	2

FT423 TECHNIQUES IN FOOD ANALYSIS LAB

Course Description & Objectives:

This course will impart knowledge to the students on the Techniques in food analysis.

By the end of the course students will be able to understand various techniques in food analysis and analytical techniques used in Quality control laboratory.

Course Outcomes:

By the end of the practical exercises, the students will be able to

1. Adapt suitable method for food analysis.
2. Apply the knowledge of Techniques in Food Analysis.
3. Differentiate between Qualitative identification and Quantitative estimations.
4. Understand the separation of biomolecules using various biochemical techniques.

LIST OF EXPERIMENTS

1. Introduction to Food Analysis Techniques
2. Sampling techniques and methods of sample preparation
3. Calorimetry and spectrophotometry
4. Determination of pH of Food samples (milk, flours, jams)
5. Determination of Titratable acidity
6. Determination of Moisture and Total solids
7. Estimation of carbohydrates by Phenol Sulphuric Acid method
8. Estimation of Fructose by Roes method
9. Estimation of starch
10. Analysis of crude fibre
11. Estimation of free Fatty acids in plant oils
12. Estimation of free Fatty acids in animal oils
13. Estimation of Cholesterol
14. Test for adulterants in Sugar, Jaggery, Honey, Milk, Ghee, plantation crops (Tea, coffee), Turmeric, spices(Cardamom, cloves, pepper)

IV Year B.Tech. Food Tech. I-Semester

L	T	P	To	C
-	-	3	3	2

FT425 FOOD PROCESSING EQUIPMENT LAB

Course Description & Objectives:

This course will impart knowledge about various food processing equipment and their design& considerations.

By the end of the course students will be able to understand about processing equipment and their working principle.

Course Outcomes:

By the end of the practical exercises, the students will be able to understand

1. *Equilibrium sorption isotherms, gas transmission rate, Material balances, pressure drop across filter.*
2. *CIP.*

LIST OF EXPERIMENTS

1. Lab demonstration on state of water.
2. Demonstration of equilibrium sorption isotherms.
3. Determination of gas transmission rate.
4. Determination of water vapor permeability of packages.
5. Evaluation of properties of films to determine their suitability as containers for foods.
6. Shelf life calculations for food products.
7. Material balances over screen and screen effectiveness.
8. Determination of pressure drop across filter using Hermons-Bredee equation.
9. Determination of area of filter medium in a continuous filtering centrifugal.
10. Overall material balance for two component system in a continuous distillation plant.
11. Study of freezers.
12. Study of CIP treatment for fruits and vegetable processing plant.
13. Study of CIP treatment for Dairy - processing plant.

IV Year B.Tech. Food Tech. II -Semester

L	T	P	To	C
4	0	-	4	4

FT402 INSTRUMENTATION & PROCESS CONTROL (ELECTIVE - V)

Course Description & Objective:

To impart knowledge to the students on instrumentation and process controls used in food industry.

Course Outcomes:

By the end of the course the students will be able to

1. *Understand the different instruments used in different operations of food industries*
2. *Know about working principles of different instruments used in different operations*

UNIT I - Elements of Instruments

Introduction - measurements - methods of measurements - primary measurements –secondarymeasurements - tertiary measurement - instruments and measurement systems- mechanical instruments - electrical instruments - electronic instruments.Functional elements of measurement systems - basic functional elements – auxiliary elements - transducer elements - examples of transducer elements. Characteristics of transducer elements - signal conditioning elements – amplification .Standards of measurements - international standards - primary standards – secondary standards - working standards - calibration - classification of calibration

UNIT II - Static and Dynamic Characteristics

Performance characteristics - static and dynamic performance characteristics – accuracy – precession- resolution - threshold - static sensitivity - deflection factor . Primary sensing elements – mechanical devices as primary detectors - springs, bimetallic strips - mechanical spring devices - cantilever - helical spring - spiral spring - torsion bar - proving ring - pressure sensitive primary devices Temperature and temperature scales - classification of temperature measuring devices - glass thermometers - bimetallic pressure gauge thermometers - thermocouples. Electrical resistance thermometers - desirable properties of liquids used in glass thermometers.

UNIT III - Thermocouples

Law of intermediate temperatures - law of intermediate metals - thermo electric sensors - thermocouples classification - base metal thermocouples - rare metal thermocouples. Properties of thermocouples - calibration of thermocouples - comparison method – fixed point. Tutorials on temperature. Pressure - gauge pressure, absolute pressure, differential pressure, vacuum - units of pressure - pressure scales - conversion of units . Measurement of pressure - mechanical pressure instruments - manometers - U tube manometer - inclined tube manometer - well type manometer .Elastic type pressure gauges - classification of elastic type gauges - bourdon tube – metallic diaphragm - capsule – bellows . Differential gauges - metallic diaphragm pressure gauge – capsule pressure gauges Tutorials on pressure. Measurement of flow - classification of flow meters - flow of incompressible fluids in pipes- Reynolds number - discharge coefficient - flow coefficient.

UNIT IV - Flow Metering

Flow of compressible fluids in pipes - orifice flow meter - types of orifice plates – materials for orifices. Venturi tubes - venturi construction - types of venturi tubes. Secondary/rate meters - variable head meters - variable area meters - types of weirs. Pitot static tube - its advantages - its limitations – flow meters. Anemometers - principle - types of hot wire anemometer - constant current type – constant temperature type - comparison between constant current and constant temperature type. Mechanical anemometers types - working principle - vane anemometer - three cup anemometer – impeller anemometer. Liquid level measurement - various methods of level measurement by industry – level measurement using gauge glass technique

UNIT V - Pressure Measurement

Gauge glass technique construction and working - its advantage and disadvantages. Float type level indication - float level switch - rope method. Float operated spring loaded switch - magnetic float device. Tutorials on level. Hydrostatic pressure measurement in open tanks - hydrostatic pressure measurement in closed tank - hydrostatic level gauge applications. Data transmission elements - classification - land line type transmission elements – radio frequency type transmission elements. Electrical type data transmission elements - pneumatic type transmission element. Position type data transmission elements - radio frequency transmission system

TEXT BOOK:

1. B.C. Nakra and K.K.Chaudhary, *Instrumentation Measurement and Analysis*.TataMcGrawHill,New Delhi.

REFERENCES BOOKS:

1. Sahney and Sahney, *A Course in Mechanical Measurement & Instrumentation*. DhanpatRaiandSons, New Delhi.
2. K. Krishnaswamy and S. Vijayachitra, *Industrial Instrumentation*. New Age International (P)Limited, New Delhi.

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	4	0	-	4	4

FT404 INDUSTRIAL MICROBIOLOGY
(ELECTIVE - V)

Course Description & Objectives:

To impart the knowledge to students about Fermentation technology and its application in Food industry and industrially important Microorganisms and their application in food industry.

Course Outcomes:

By the end of the course, the students will be able to

1. *Know about Industrial fermentation techniques.*
2. *Know about different Industrially important micro organisms.*
3. *Know about different growth regulators (Hormones).*
4. *Know about different products produced by Industrial fermentation process.*

UNIT I - History of Industrial Microbiology

Microbes as friend's - Normal flora - History of Industrial Microbiology, Microbes influencing our lives -Primarymetabolites& secondary metabolites produced by the microorganisms.. Screening ofMicroorganisms - Primary screening - Isolation of desired and interested microorganisms – Secondaryscreening - yield potential of microbes - both qualitative and quantitative approach. Strain Improvement -Preservation of Microorganisms - Organizations involved in microbiological work . Fermentation media -Characteristics of an ideal production medium, Raw materials as media, Precursors and Inducers,Repressors, Antifoams . Industrial sterilization - Principles of Sterilization - Sterilization of equipment, Sterilization of Production media and sterilization of air. Types of fermentors - Stirred tank fermentors -Packed bed fermentors - Fluidized bed fermentors - Bubble column fermentor - Air lift fermentor -Cylindrical fermentors – Flocculated cell culture fermentor - Multi phase bioreactors - Trickling bedbioreactors - Tubular fermentor- Mechanically agitated stirred tank reactors, Deep jet fermentor, CycloneColumnFermentor, Novel See saw Bioreactor, Stirred tank fermentor (CSTF).

UNIT II - Components of a Fermentor

Fermentor - Components of a Fermentor, Parts of Fermentors, Peripheral parts andaccessories, Alternative Vessel Designs, Additional accessories and Peripherals, Feedpumps, Exit gas analysis, Common measurements and Control systems (Speed Control,Temperature control, Control of Gas Supply, Control of pH, Control of Oxygen). Types of fermentations -Solid Substrate Fermentation-Submerged Fermentation – Factors affecting Submerged culture – Batchfermentation - Fed batch fermentation - Sub batch fermentation - Continuous fermentation – Multiplefermentations - Multistage fermentations.. Industrially important secondarymetabolites - Production ofOrganic acids - Citric acid, Lactic acid, Itaconic acid, Acetic acid, Gluconic acid, Kojic acid, Gallic acid -Production - Microorganisms & Metabolisms - Fermentation conditions - Inoculum preparation – Carbonand nitrogen source - Trace elements - pH and temperature - Aeration and Agitation. Yieldand Recovery. Uses of organic acids. Production of Antibiotics - Screening of antibiotic producers - â -lactam antibiotics - Penicillin- Amino glycoside antibiotics - Tetracyclines, Chloramphenicol, Griseofulvin, Macrolideantibiotics, Rifamycins. Streptomycin - Chemical nature and biosynthesis – Commercialproduction - Inoculum - Media - Fermentation process - Temperature - Aeration - pH -Biomass production - Recovery and purification - uses of antibiotic.. Probiotics – Importance – role infermented dairy foods - Yoghurt - *Lactobacillus acidophilus- Bifidobacterium- Lactobacillus delbrueckii-Lactobacillus bulgaricus-* Standard number of Probiotics to be used - Probiotic cheese –*Lactobacillussalivarius- Bifido bacterium* bifidum - Kefir - combination of Lactic acid bacteria and yeasts- therapeutic and medicinal value - enhances digestion.. Bacteriocins - Nisin - Production - metabolism – Fermentationconditions - Inoculum

UNIT III - Morphology

preparation - carbon and nitrogen source - Trace elements - pH and temperature requirement - Recovery and purification. Biocolours - carotenoids - lycopene - Angkak- production - using fungi -*Monascuspurpureus*- History and traditional uses - Morphology - Fermentation conditions - Pigment of*M.purpureus*- Health benefits -Toxicology - Safe consumption . Plant growth regulators and Hormones -Role in metabolic activity of plants – Microorganismsinvolved in the production of Auxins, Gibberellins, Cytokinins, purification.Role of Ethyleneandabscissic acid in plant metabolic activity.Production of Microbial enzymes - Solid state fermentation -Fermentors - Medium Advantages and disadvantages - Submerged fermentation - Steps of enzymeproduction -Factors affecting submerged culture. Production of Amylases, proteases, Pectinases,Cellulases . Extraction of enzymes - physical disruption method - Chemical treatment method -Purification of enzyme - removal of nucleic acids and cell debris - preliminary purification - Final purification - Applications. Downstream processing - Steps involved in the purification of biological -Capture intermediate - Polishing - Cell disruption methods - Chemical methods - Mechanical methods –Sonication - Freeze - thawing - Concussion device - Liquid shear - Colloid mill - French press .Centrifugation - Flocculation and coagulation - Filtration - Product concentration- Extraction- Chromatography - Size exclusion - Ion exchange - Affinity - Hydrophobic interaction -Immobilized metal ion affinity chromatography - HPLC - Gas chromatography –Supercriticalfluid chromatography - Electrophoresis - Mass spectrometry . Microbial polysaccharides – Bacterialpolysaccharides - Localization and description - Xanthan - Pullan - Curdlan - Exopolysaccharidesfromlactic acid bacteria - dextran – from extremophilic bacteria . Fungal polysaccharides - cell wallpolysaccharides - Lichen cell wall polysaccharides fungal exopolysaccharides - Production ofpolysaccharides - Culture techniques and fermentation parameters - Agitation - pH - Aeration –culturemedium - immobilized micro organisms - Solid state fermentation

UNIT IV - Polysaccharides

Applications of polysaccharides - Polysaccharides as food additives – Pharmaceuticalapplications - Oligosaccharides derivatives. Production of amino acids – Historical developments -Manufacturing methods – Extractive isolation - Chemical synthesis - Enzymatic catalysis – Fermentativeproduction - L – Glutamic acid - L- Lysine - uses and applications. Production of vitamins – Generalaspects - Nomenclature and classification - Vitamin B complex - Vitamin B12 - Vitamin B2 - production ofthese vitamins - production by fermentationof*Ashbyagossypii*- Vitamin C. Production of bio insecticides - *Bacillus thuriengensis*- insecticidal protein - endotoxin - engineering with endotoxin gene - rDNA

technology - inserting into maize - cotton - rice - BT cotton. Production of SCP - Single cell proteinadvantages - Source of SCP - Production of bacterial biomass - Production using waste - Starchy waste -from Algae - Nutritive value of SCP - Consumption of SCP - uses of SCP. Bakers yeast - Development and history - The Vienna process - Production of yeast -

Nutrient materials - Concentration of sugar - Aeration - temperature - pH - Molasses ammoniaprocess - yeast from sulphite liquor - Florylin yeast - Food and fodder yeast - yeast products- fat from yeast - vitamins from yeast

UNIT V - Multiple fermentations

Batch fermentation - Fed batch fermentation - Sub batch fermentation – Continuousfermentation - Multiple fermentations - Multistage fermentations. Food based fermented products -Cheese - Types, ripening of cheese - Yogurt – Buttermilk - Acidophilus milk - Cream –Fermentedvegetables - Saurerkraut - pickles - Silage - Kimchi. Olives - Fermented meat - fish - Bread and otherfermented plant products – fermented cereal foods. Wine, production and Beer production and Mushroomproduction . Biochemical changes - fermented legumes foods - Bhallae - Papadam - vada–Fermentedcereal legume foods. Fermented dairy foods - Yoghurt - *Lactobacillus acidophilus* - *Bifidobacterium- Lactobacillus delbrueckii- Lactobacillus bulgaricus*- Standard numberof probiotics to be used - probiotic cheese . Industrial fermentors - Accessories - Types of fermentors -Stirred tank fermentors –

Packed bed fermentors - Fluidized bed fermentors - Bubble column fermentor -Air lift fermentor - Cylindrical fermentors - Flocculated cell culture fermentor - Multi phase bioreactors –Trickling bed bioreactors . Blue green algae - general characters - occurrence - Industrial importance ofBlue green algae - uses of Blue green algae.

TEXT BOOKS:

1. AshokPandey, Christian Larroche, *Advances in Fermentation Technology, 2004.*
2. Presscot / Dunn, *Industrial Microbiology.. 2006.*

REFERENCES BOOKS:

1. Agrawal / Parihar, *Industrial Microbiology - Fundamentals and Applications, 2008*
2. Under kofler and R.J Hickey, *Industrial Fermentation* Vol. II Al., 2006.
3. R.Y Stainer, M.Doudroff, *General Microbiology*, 2003.

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	4	0	-	4	4

FT406 PRODUCT DEVELOPMENT & FORMULATION
(ELECTIVE - V)

Course Description & Objective:

To impart knowledge about basics of product development, market strategy and analysis and consumer behaviour.

Course Outcomes:

Be able to apply and incorporate the principles of Food Science in practical, real-world situations and problems

1. *Integrate information about key food categories, functional ingredients, processing techniques, and packaging to develop product prototypes*
2. *Integrate information about project management, flow diagram for production of the prototype, HACCP, QA/QC, food safety, specifications of raw materials, and labeling*
3. *Develop supporting documentation for the prototype food product*

UNIT I - Product development and formulation

Introduction to the Product development and formulation - Need for Product development. New food product -Definition - General characteristics of New food product - Classes ofnew Food products - Line extensions -Repositioning of existing products - New form of existing product - Reformulation - New packaging – Innovativeproducts and Creative products and Value added products. Difference between Market and Market places;Customers and Consumers;

UNIT II - Marketing Characterstics

Marketing Characteristics of the product , Product Life cycle - profit picture. Factors affecting food productdevelopment - Corporate factors - Market place factors - technological pressures - Governmental issues andlegislations. Stages/Phases of new product development - Company objectives - Perceived needs ofMarket - Ideas - Screening - Feasibility studies - Consumer research - Financial reviewDevelopment - Production - Consumer trials -Test market . Generation of Food product Ideas - Sources of newproduct ideas - The market places - types of market places - With in the company - Outside the market place.

UNIT III - Surveys

Consumer studies - types of studies, methods of data collection - Surveys and polling -telephone and mail surveys - focussed group discussions - dephic oracle and Market placeanalysis and external environment as a source of ideas. Organizing for new product development - Concepts ofresearch and development - Creativity. Criteria of screening - general criteria for screening - Constraints – financialand technical constraints

UNIT IV - Marketing’s Perspective

Development of Strategy from Marketing’s Perspective - Marketing functions, market research, Sales andmarketability of the product. Standardization of product formulation and product design; Adaptable suitabletechnology role of Engineering in the development process. Process design, Scale - up and In– processspecifications, Manufacturing plant and Technicalaspects and-production trials.

UNIT V - Market Testing

Market testing - methods of testing –EvaluationQuality assessment of new developed productsCosting/pricing and economic evaluation of the product Product launch and commercialization of the product

TEXT BOOKS:

1. Brody Aaron. L ,Lord and John B. *Developing new food products for a changing market place(2nd edition)*-Technomic Publishing Co.Inc, Lancaster, 2004
2. Gordon W. Fuller.*New Food Product Development – From concept to market place. SecondEdition*. CRC Press, 2000.

REFERENCES BOOKS:

1. Crawford.I.M. *Agricultural and Food Marketing Management*.FAO/UN, Rome, 2006.
2. Graf and Saguy .*Food product development (From concept to market place)*. CBS publishers,New Delhi, 2002.

IV Year B.Tech. Food Tech. II -Semester

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4	0	-	4	4

FT408 EXTRUSION TECHNOLOGY
(ELECTIVE - VI)

Coure Description & Objectives:

To impart knowledge to the students about extrusion technology, principle of working, classification of extruders according to process and construction, extruded products and their processing.

Course Outcomes:

By the end of the course, the students will be able to

1. *Learn about use of extrusion technology in food industry.*
2. *Study about Extrusion cooking, preconditioning of raw material, types of extruders and operating parameters.*

UNIT I - Extrusion

Extrusion : definition, introduction to extruders and their principles, types of extruders. Extruders in the food industry: History and uses of extruders in the food industry. Single screw extruder: principle of working, net flow, factors affecting extrusion process, co-kneaders. Twin screw extruder: counter rotating and co-rotating twin screw extruder

UNIT II - Twin Extruder

Process characteristics of the twin screw extruder : feeding, screw design, screw speed, screw configurations, die design. Twin screw extruder: Barrel temperature and heat transfer, adiabatic operation, heat transfer operations and energy balances. Problems associated with twin screw extruder

UNIT III - Unit Operation in Extrusion

Pre-conditioning of raw materials used in extrusion process, Pre-conditioning operations and benefits of preconditioning and devolatilization.Interpreted-flight expanders - extruders, dry extruders. Chemical and nutritional changes in food during extrusion.

UNIT IV - Matrial Handling

Practical considerations in extrusion processing: pre-extrusion processes, cooker extruder Profiling. Practical considerations in extrusion processing: Addition and substraction of materials, shaping and forming at the die,

post extrusion processes. Breakfast cereals: introduction, type of cooking - High shear cooking process, steam cookers, low shear, low pressure cookers and continuous staem pre-cooking, available brands.

UNIT V - Processing of Breakfast Cereal

Break fast cereal processes: traditional and extrusion methods, classification of break fast cereals - flaked cereals, oven puffed cereals, gun puffed cereals, shredded products. Texturized vegetable protein: Definition, processing techniques, and foods. Snack food extrusion: Direct expanded (DX) and third generation (3G) Snacks: types, available brands, co- extruded snacks and indirect-expanded products.

TEXT BOOKS:

1. Richardson P. *Thermal Technologies in Food Processing.* Wood head Publishers, Cambridge, 1994.
2. Guy R. *Extrusion Cooking, Technologies and Applications.* Wood head Publishing Limited, Abington, Cambridge, 1996.

REFERENCES BOOKS:

1. Fast R.B. and Caldwell E.F. *Breakfast Cereals and How they are made.*(2000) American
2. Association of Cereal Chemists., St. Paul, Minnesota.
3. Frame N.D. *The Technology of Extrusion Cooking*. (1994) Blackie Academic & Professional, New York.
4. Harper J.M. *Extrusion of Foods.* Vol. 1&2 (1991) CRC Press, Inc; Boca Raton, Florida.
5. O'Connor C. *Extrusion Technology for the Food Industry.* (1987) Elsevier Applied Science, New York.

IV Year B.Tech. Food Tech. II -Semester	**L**	**T**	**P**	**To**	**C**
	4	**0**	**-**	**4**	**4**

FT410 ENTREPRENEURSHIP DEVELOPMENT (ELECTIVE - VI)

Course Description & Objective:

To orient the undergraduate student of B.Tech (Food Technology) to gain knowledge and understanding about the Entrepreneurship Development for moulding them as prospective and dynamic Food Entrepreneurs

Course Outcomes:

By the end of the semester, the students will be able to

1. Know the concept of Entrepreneur, Entrepreneurship and Entrepreneurship Development in relation to food processing Enterprises

2. Study the Globalization and the emerging business entrepreneurial environment in Food Industry in India and Abroad.

UNIT I - Indian Economy

Entrepreneurship Development (ED) : Assessing overall business Environment in Indian Economy.Overview of Indian social, political and economic systems and their implications for decision makingby Individual Entrepreneurs. Globalization and the emerging Business entrepreneurial environment.Globalization and the emerging Business entrepreneurial environment.

UNIT II - Managerial Characteristics

Concept of Entrepreneurship; Entrepreneurial and Managerial characteristics. Managing an Enterprise; Motivation and Entrepreneurship Development. Importance of Planning, Budgeting,Monitoring, Evaluation and Follow-up; Managing competition.

UNIT III - Govt. Schemes

Entrepreneurship Development Programmes (EDP); SWOT Analysis, Generation, Incubation and Commercialization of Ideas and Innovations.Government schemes and Incentives for promotion of Entrepreneurship.Government policy on Small and Medium Enterprises (SMEs) / Small ScaleIndustries (SSIs) / SEZ & Mega Food.Government schemes and Incentives for promotion ofEntrepreneurship. Government policy on Small and Medium Enterprises (SMEs)/Small ScaleIndustries(SSIs).

UNIT IV - Govt. Polices

Government schemes and Incentives for promotion of Entrepreneurship.Government policy on Smalland Medium Enterprises (SMEs)/Small Scale Industries (SSIs).Export and Import Policies relevant toAgriculture sector.Venture capital, Contract Farming and Joint ventures, Public-Private Partnerships.

UNIT V - Ethics

Public-Private Partnerships overview of Agri-inputs industry.Characteristics of Indian agricultural processing and Exportindustry.Social responsibility of Business.Morals and Ethics in Enterprise Management. Project-Meaning, importance, components and preparation

TEXT BOOKS:

1. ThomasW Zimmer and Norman M Scarborough 1996. *Entrepreneurship.* Prentice Hall, New Jersey, U.S.A.
2. Mark.J.Dollinger 1999. *Entrepreneurship Strategies and Resources*. Prentice Hall, Upper SaddleRiver, New Jersey, U.S.A.

REFERENCE BOOKS:

1. Khanka S.S. 1999. *Entrepreneurial Development.*S. Chand and Company, New Delhi.
2. Mohshty Sk. 2007, *Fundamentals of Entrepreneurship.* Prentice Hall, New Delhi.

IV Year B.Tech. Food Tech. II -Semester	L	T	P	To	C
	4	0	-	4	4

FT412 POST HARVEST MANAGEMENT OF FRUITS AND VEGETABLES

(ELECTIVE - VI)

Course Description Objective:*To impart knowledge to the students on the concepts of post-harvest management practices and value addition in fruits and vegetables.*

Course Outcomes:

By the end of the course, the students will be able to

1. *Know about the post harvest losses and it's management.*
2. *Know about maturity indices & harvesting indices of different fruits and vegetables.*

UNIT I - Concepts in Post Harvest Technology

Definition of fruits and vegetables - classification of fruits and vegetables based on derived planttissue and botanical classification. Post harvest technology - Introduction and Definition of Postharvest technology, over view of concept and science. Significance of Post harvest technology in lossreduction, in export, economy, and employment generation. Structure and composition of fruits andvegetables - Chemical composition and Nutritive value – Water, Carbohydrates, Protein, Lipids,organic acids, vitamins and minerals, volatiles Physical textural characteristics of fruits and vegetables

UNIT II - Physiology & Biochemistry

Physiology and biochemistry of fruit and vegetables - physiological development – Fruit ripening.physiology of respiration - Classification of fruits and vegetables based on respiratory pattern-Climacteric fruits - Non climacteric fruits - examples - Differences - Effect of ethylene - Role ofethylene in climacteric and non-climacteric fruits. Biochemistry of Respiration - Aerobic metabolism -EMP sequence - TCA cycle – Respiration quotient - Anaerobic metabolism. Fruit Maturity - Definition,methods of maturity determination, maturity indices for selected fruits and vegetables. Chemicalchanges during maturation - Fruit color, Carbohydrate content, organic acids, Aroma. Effect oftemperature on Sugar - Starch balance, Storage life of produce and Methods of cooling – Roomcooling, Forced air cooling, Hydro cooling, Contact icing, vacuum cooling, Evaporative cooling.

UNIT III - Storage Methods

Effect of water loss and humidity - Factors affecting water loss - Surface area/ volume ratio - Nature ofsurface coatings, Mechanical damage to tissue - Control of water loss – Air movement - Packaging.Storage atmosphere - CO_2 and O_2, Metabolic effects, Effect on microbial growth, Ethylene – Methodsfor modifying CO_2 and O_2 concentrations - Atmosphere control by addition of N_2 and CO_2, storage inplastic films, methods of controlling fruit ripening. Storage methods; controlled atmospheric storage,bead atmospheric storage, hypobaric storage, zero energy cool chambers

UNIT IV - Effect of effective Pot Harvest Management

Physiological disorders - Low temperature disorders - Chilling injury - Physiological disorders – mineraldeficiency disorders. Maturity-Determination of maturity - Determination of commercial maturity –Quality evaluation of fruits and vegetables- Quality standards- Post Harvest factors influencing quality.Harvesting of important fruits and vegetables - Pathology - Control of Post harvest Wastage – Postharvest handling systems adopted for citrus and apple fruits

UNIT V - Commoditeis Treatment, Packing & Storage

Commodity treatments - Controlled ripening, Controlled degreening, Control of superficial scald inApple - Calcium application to apple, Increasing water loss from Apple, Waxing, Plant growthregulators, Sprout inhibitors - Disinfestation.. Handling, Packaging and distribution - Effect ofpackaging on produce quality – Packing and Storage. Technology of storage - Methods of storage- Inground storage, Air cooled storage – Ice refrigeration - Mechanical refrigeration

TEXT BOOKS:

1. Dukwoth, *Fruits and Vegetable Technology*, Pergramon Press, London, 1999
2. L Devisin, *Principles of Horticulture,* MacMillan Publishing Co, Newyork, 2002.

REFERENCE BOOK:

1. B Edmand, T V Senn, F S Andrews, Half Care, R.G. Taja, *Fundamentals of Horticulture,* Mc.Graw Hill, Pub.Co, New Delhi., 2000.

I

YEAR

BIOMEDICAL ENGINEERING

B.Tech.

I SEMESTER

- 16HS101 - Basic Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS106 - Basic Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engg.
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16BT102 - Bioproducts and Bioentrepreneurship
- 16BM101 - Fundamentals of Anatomy and Physiology

COURSE CONTENTS

I SEM AND II SEM

16HS101 BASIC MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	30	10	45	-	-	-	-

Course Description and Objectives:

In this course the fundamental concepts of mathematics are introduced. A treatise of Matlab is also introduced in the practical session.

The objective of the course is to impart knowlege on progressions, partial fractions and binomial theorem. This course also deals with elementary concepts in geometry, trigonometry, differential and integral calculus. Numerical methods are also introduced for finding approximate solutions of algebraic equations. Besides, interpolation techniques and MATLAB environment are emphasized.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: apply arithmetic and geometric progressions.

CO2: understand coordinate geometry and different forms of straight lines.

CO3: use basic concepts of trigonometric ratios and identities.

CO4: understand the concept of limit, continuity and differentiability.

CO5: familiar with basic concepts of integration.

CO6: find roots of algebraic and transcendental equations.

CO7: apply some interpolation techniques.

CO8; use some commands of Matlab for mathematical computations.

SKILLS:

- ✓ *Compute sum of terms of given progression.*
- ✓ *Differentiate the given function.*
- ✓ *Evaluate the integral of given function.*
- ✓ *Interpret interpolation techniques to estimate the functional values.*

ACTIVITIES:

- *Compute the derivative and compare with Matlab output.*
- *Evaluate the integral and compare with Matlab output.*
- *Interpet the given data and estimate the functional values at a given point.*

UNIT - 1 **L-9, T-3**

MATHEMATICAL PRELIMINARIES: Progressions, partial fractions and binomial theorem.

UNIT - 2 **L-9, T-3**

TRIGONOMETRY AND GEOMETRY: Coordinate system, straight line, trigonometric functions and trigonometric identities.

UNIT - 3 **L-9, T-3**

DIFFERENTIAL CALCULUS : Limits, continuity and differentiability.

UNIT - 4 **L-9, T-3**

INTEGRAL CALCULUS: Concepts of integration - rules, integration by parts, integration by partial fractions and integration by inspection (standard forms).

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS: Bisection method, Newton-Raphson method, finite differences, forward and backward difference tables, interpolation by Lagrange's method, Newton's forward and backward methods, Gauss forward and backward methods.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Introduction to MATLAB environment.

Basic mathematical operations using MATLAB.

1. Solving simple expressions.
2. Trigonometric function values.
3. Limits.
4. Continuity.
5. Symbolic differentiation-1.
6. Symbolic differentiation-2.
7. Symbolic integration-1.
8. Symbolic integration-2.
9. Real roots of functions.
10. Newton-Raphson method.
11. Interpolation.

TEXT BOOKS:

1. C. W. Evans, “Engineering Mathematics, A Programmed Approach”, Stanley Thornes (Special Indian Edition) 2011.
2. P. S. Rao, “A text book of Remedial Mathematics”, 1st edition, Parma Med Press, Hyderabad, 2008.

REFERENCE BOOKS:

1. A.Jeffrey, “Mathematics for Engineers and Scientists”, 6th edition, (Special Indian Edition),CRC Press, 2013.
2. R. Pratap, “Getting started with MATLAB”, Oxford University Publication, 2009.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	45	30	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as lasers, optical fibres, photonics, nano and funcational materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.

CO2: acquire basic knowledge in non-destructive techniques.

CO3: understand basic concepts of laser and optical fibre which help in designing and developing new devices in emerging fields.

CO4: grasp the basics of quantum mechanics.

CO5: understand the fabrication of solar devices.

CO6: use nanoscience and technology for innovative and compact design.

CO7: demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

- ✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*
- ✓ *Study the wavelengths of light sources and lasers.*
- ✓ *Estimate the efficiency of a given solar cell.*
- ✓ *Learn about the type of the optical fibre and their ability to propagate light waves from its numerical aperture.*
- ✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS : Introduction – production of ultrasonic waves, piezoelectric method, properties of ultrasonic waves, types of ultrasonic waves, determination of velocity of ultrasonic waves in solids and liquids; SONAR - medical applications.

NDT: Introduction- types, visual inspection and liquid penetrate testing; Ultrasonic testing systems; X - ray radiography.

UNIT - 2 **L-9**

LASERS : Characteristics of laser light – spontaneous and stimulated emission of radiation, He-Ne laser, CO_2 laser, semiconductor laser and applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS : Principle of optical fibre – acceptance angle, numerical aperture, types of fibres, dispersion and attenuation in optical fibres, optical fibre communication system and fibre optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS : Introduction- matter waves, Schroedinger's time independent wave equation, physical significance of the wave function, particle in one dimensional potential well and tunneling phenomenon.

FREE ELECTRON THEORY OF METALS : Introduction – classical free electron theory, electrical conductivity of metal, quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature

PARTICLE ACCELERATORS: Introduction- cyclotron, synchrocyclotron, betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, photovoltaic effect, solar cells, efficiency of solar cell and solar thermal energy conversion systems.

PHOTONICS: LED, LCD, photo conducting materials, photo detectors, photonic crystals, non- linear optical behaviour of materials and applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, fabrication of nano materials, ball milling, sol-gel, physical and chemical properties of nano materials and applications.

FUNCTIONAL MATERIALS: Smart materials, shape memory alloys, chromic materials (thermo, photo and electro), metallic glasses, advanced ceramics, composites, fiber reinforced plastics/ metals and biomaterials.

TEXT BOOKS:

1. V. Rajendran, "Engineering Physics", 7th edition, TMH Publications, 2014
2. D.K. Bhattacharya and P. Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu and P.G. Kshirsagar, "Engineering Physics", 1st edition, S. Chand and Company Ltd, 1992.
3. S.P. Sukhatme, "Solar Energy", 2nd edition, TMH Publication, 2005.
4. Dr. Arumugam, "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimate acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluate thermal conductivity of materials.*
- *Measure temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The teaching efforts in this course will be directed towards making students develop their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: acquire an understanding of the rules of grammar.

CO2: strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.

CO3: have a command of basic vocabulary related to different subject areas.

CO4: have a grasp on the mechanics of writing and express their ideas through construction of simple texts.

CO5: attain language proficiency to participate in the classroom discussions.

SKILLS:

- ✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*
- ✓ *Apply different sub skills like top down, bottoms up approachs to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*
- ✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*
- ✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*
- ✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **Environmental consciousness**

  (Climate change, green cover, pollution, renewable vs. non renewable energy sources (from energy unit)
- Grammar : Articles, prepositions, sentence types and construction
- Vocabulary : Root, prefixes and suffixes
- Composition : Paragraph writing (descriptive and narrative)
- Laboratory Practice : Introduction to phonetics (Organs of speech- consonants, vowels and diphthongs; Syllable, stress and intonation)

UNIT - 2 **L-9**

- Text : **Emerging technologies**
  (Solar power, cloud computing, nanotechnology, wind energy (to be covered from energy unit)
- Grammar : Time and tense (Present, past and future; Helping verbs; Modals)
- Vocabulary : Synonyms and antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **Travel and tourism**
  (Advantages and disadvantages of travel, tourism, *atithi devo bhava*- Tourism in India)
- Grammar : Subject-Verb agreement and sentence construction
- Vocabulary : Idioms and Phrases

  Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role plays (Introducing, greeting, enquiring, informing, requesting and inviting)

UNIT - 4 **L-9**

- Text : **Engineering Ethics**
  (Challenger disaster, biotechnology, genetic engineering, protection from natural calamities, how pertinent is the nuclear option? An environment of energy (from energy unit)) Avoiding sexist language (Gender sensitization)
- Grammar : Sentence transformation (Degrees, voice, speech and synthesis)
- Vocabulary : Phrasal verbs

  Composition : Note-making on Nandan Nilekani's "In search of our energy solutions" (from energy unit) Summarizing on "Flight from conversation" (New York Times)
- Laboratory Practice : Situational conversations – Role plays (Emotions, directions, descriptions, agreements, refusals and suggestions).

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Complete graded grammar exercises in Rosetta Stone.*
- *Complete graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watch TED videos and making notes.*
- *Watch TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Prepare brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and group discussion.*

UNIT - 5 **L-9**

- Text : **Media matters:** (History of media, language and media, milestones in media, manipulation by media, thousands march against nuclear power in Tokyo (from energy unit), entertainment media and interviews)
- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail, short message service (SMS), writing advertisements, reporting; Social Media- blogging, facebook, twitter (acceptable and non acceptable content)
- Laboratory Practice : Group discussions (topics from energy unit) – Dumping of nuclear wastes, exploration of eco-friendly energy options, lifting of subsidies on petrol, diesel, LPG etc)

TEXT BOOK:

1 "Mindscapes - English for Technologists and Engineers", Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. N. Swamy, "Strengthen Your Writing", 1st edition, Orient Longman, 2003.
2. T. E. Berry, "The Most Common Mistakes in English Usage", 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan Ltd., 2000.
4. V. Sasikumar and P.V. Dhamija, "Spoken English: A Self-Learning Guide to Conversation Practice", 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. M. M. Maison, "Examine your English", 1st edition, Orient Longman, 1999.
6. A. Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes and components associated with computers and internet. Students will get exposure to building blocks of computers, operating systems, application software, networking, internet, world wide web, security, maintenance, information systems and the application development processes.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: understand the terms and concepts of computer science and information technology (hardware, software, networking, security, internet/web and technologies).

CO2: use the products and services of computers.

CO3: use internet/web services as a resource for developing shared applications.

CO4: install different operating systems and application software.

SKILLS:

- ✓ *Assemble and disassemble the personal computer system.*
- ✓ *Install different desktop operating systems.*
- ✓ *Use the basic text processing, simple data analysis and data presentation tools.*
- ✓ *Configure network parameters.*
- ✓ *Secure the personal computer and information from various external threats.*

ACTIVITIES:

- *Prepare a report on various generations of computers and their peripherals.*
- *Disassemble and assemble of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an ethernet and configure the same.*
- *Prepare an MS word document.*
- *Prepare a spread sheet with various mathematical operations, charts, sorting etc.*
- *Make a report on power point presentation for the given topic.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS : Introduction to computer, computers for individuals, importance of computers, parts of computer system, memory devices, input and out devices, types of monitors, types of printers, number systems, bits and bytes, text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS : Types of operating systems, user interfaces, PC operating systems, network operating systems, types of software, programming languages, compiler and interpreter, program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES : Networking basics, uses of network, types of networks, network hardware, introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW : Internet's services, world wide web, browser setups, using search engine, email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY : The need of computer security, basic security concepts, threats of users, online spying tools, threats to data, cybercrime and protective measures.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours: 30

1. Demonstrate the personal computer peripherals and get a report on each peripheral.
2. Demonstrate the personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate network interface card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java development kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort and filter using powerpoint tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. P. Norton, “Introduction to Computers”, 7th edition, Tata-McGraw Hill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. E. Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGraw Hill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a ‘C’ program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files and the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: understand the basic terminology used in computer programming to write, compile and debug programs in ‘C’ language.

CO2: use different data types to design programs involving decisions, loops and functions.

CO3: understand the allocation and usage of dynamic memory.

CO4: understand the usage of files and structures.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static and dynamic memory allocation.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO C PROGRAMMING : Structure of C program- comments, processor statement, function header statement, variable declaration statement and executable statement; C character set - constants, identifiers, operators, punctuations, keywords, modifiers, identifiers, variables, c scopes, basic data types, type qualifiers, storage classes, reading and writing characters and formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS : Operators- assignment, arithmetic, relational, logical, bitwise, ternary, address, indirection, size of, dot, arrow and parentheses operators; Expressions precedence of operators and associative rules; Control statements- category of statements, selection, iteration, jump, label, expression and block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS : Function- declaration, prototype, definition, calling by value and call by address, standard library functions and recursive functions; Array- declaration, initialization, reading, writing, accessing and passing as a parameter to functions, 2D-arrays and multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS : Strings- declaration, string library functions, array of strings and command line arguments; Pointers- declaration, initializing pointers, multiple indirection, relationship between arrays and pointers; Scaling up- array of arrays, array of pointers, pointer to a pointer, pointer to an array; pointer to functions and dynamic memory allocation functions.

UNIT - 5 **L-9, T-3**

STRUCTURES AND FILES : Structures - declaration, initialization and accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- choose programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours: 30

1. Compute the factors of a number.
2. Compute the average of ‘n’ numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

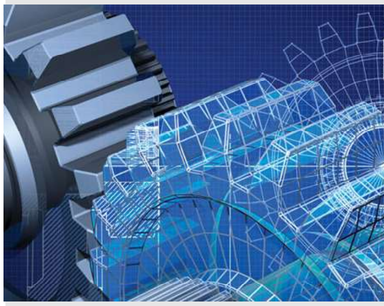
7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's and 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

TEXT BOOK:

1. A. Mittal, "Programming in C - A Practical Approach", Pearson Education, India, 2015

REFERENCE BOOKS:

1. R. Thareja, "Introduction to C Programming", 2^{nd} edition, Oxford University Press India, 2015.
2. C. H. Schildt, "The Complete Reference", 4^{th} edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4^{th} edition, Tata McGraw-Hill, 2008.



16EE101 BASICS OF ENGINEERING PRODUCTS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: gain knowledge and hands-on experience on various engineering products.

CO2: install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.

CO3: understand the concept of conservation of energy.

CO4: gain awareness on choosing appropriate construction materials.

SKILLS:

- ✓ *Identify UPS requirements for a given load.*
- ✓ *Provide a lighting scheme for specific working environment.*
- ✓ *Design a composition of hHeating element for a particular application.*
- ✓ *Troubleshoot issues relating to immersion heater and induction heater.*
- ✓ *Provide an earthing for domestic outlet.*
- ✓ *Select, configure and maintain a few engineering appliances such as TV, radio, telephone, mobile phone, wifi router, micro oven, PA system, etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassemble and Assemble of Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design Electric Wiring system for a prototype house.*
- *Design UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of air-conditioner and refrigerator- components, assembly and disassembly, working principle of centrifugal and reciprocating pumps; Types, parts and applications, working principle of screw jack and its components; Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS : General, qualities and classification of bricks; Tests for bricks; Size and weight of bricks; Timber- definition, qualities of good timber, decay of timber and advantages of timber in construction.

CEMENTS : Types and composition of cement, setting of cement, tests for physical properties of cement, and different grades of cement.

AGGREGATES : Classification of aggregates, source, size and shape of aggregates; Tests for aggregates.

STEEL: Types of steel, physical properties and mechanical properties of steel. Simple layout design, paints, tiles, fittings, ventilation, furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS : Overview of power system structure; Conventional and non conventional generations - types of turbines, generators, substations, towers, earthing procedure, protection schemes, single phase and three phase systems.

Methods of electrical wiring systems - wiring procedure and calculations; Wiring methods.

Uninterruptible power supply (UPS)- components in UPS, its functionality and calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT : Light energy, evolution of light sources, working of incandescent, fluorescent, MV, SV and LED lamps, comparison and applications.

HEAT : Heat energy, modes of heat transfer, resistance and induction heating, comparison and applications.

MOTOR : Electric motors, classification, construction and working principles of motors used in domestic applications, mixer grinder, ceiling and exhaust fan, hair dryer, washing machine, water pump, air coolers, vacuum cleaner, computer cooling motor and electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, radio, remote control, telephone, microwave oven, cell phone, PA system, induction stove, wifi router and DTH.

LABORATORY EXPERIMENTS

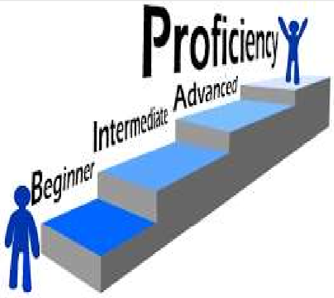
LIST OF EXPERIMENTS Total hours: 30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps
4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box.
13. Ceiling Fan and Mixer.
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, “Concrete Technology”, 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, “Engineering Materials”, 36th edition., Charotar Publishing House, Anad, 2009.
3. Govindasamy, A. Ramesh et al, “Electrical engineering - Electrical machines and Appliances Theory, 1 st edition, Tamilnadu Textbook Corporation, 2010.
4. Janakaraj, A Sumathi et al, “Electrical engineering - Electrical machines and Appliances Theory”, 1 st edition, Tamilnadu Textbook Corporation, 2011.
5. M. Brain, “How Stuff Works”, 1 st edition, John Wiley and Sons, 2001.
6. P. Kumar, “Basic Mechanical Engineering”, 1 st edition, Pearson Publishers, 2013.



16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip students with functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. Students will strengthen their comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: use functional English to speak and express themselves in different social contexts

CO2: write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.

CO3: gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

- ✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*
- ✓ *Read and extract information from different texts & draw inferences by understanding elements like tone and transitional words.*
- ✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*
- ✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

Functions : Introducing self/others; Expressing needs/feelings/opinions (SWOT Analysis)

Skill Focus:

Reading	-	Understanding factual information
Writing	-	Word order and sentence formation
Listening	-	Decoding for meaning following elements of stress, intonation and accent
Speaking	-	Articulating syllables clearly, speaking fluently with correct pronunciation
Vocabulary	-	Discerning to use right word for the given context
Grammar	-	Spellings, use of nouns, adjectives, verbs, prepositions in the sentence structure

Practice: Objective PET Units 1 - 6

UNIT - 2 **P-6**

Functions : Defining and describing people, places, things and process.

Skill Focus:

Reading	-	Inferences from sentences and short messages – true/false
Writing	-	Rewording, sentence transformation and convincing
Listening	-	Understanding the short messages and conversations
Speaking	-	Role plays and short conversations
Vocabulary / Grammar	–	Use of adjectives/adverbs, comparatives and superlatives
Practice	:	Objective PET Units 7 – 12

UNIT - 3 **P-6**

Functions : Describing spatial and temporal relations; Giving directions/ instructions

Skill Focus :

Reading	-	Reading between the lines, inferences, true/false
Writing	-	Developing hints - Writing short messages/paragraphs
Listening	-	Searching for factual information - Gap filling
Speaking	-	Snap talks, JAM and elocution
Vocabulary / Grammar	-	Prepositions, phrasal verbs; PET word list

Practice: Objective PET Units 13 - 18

UNIT - 4 **P-6**

Functions : Narrating, predicting, negotiating and planning

Skill Focus:

Reading	-	Reading for evaluation and appreciation, comprehension
Writing	-	Letters – e-mails – 7 C's
Listening	-	Following long conversations/interviews

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Speaking	-	Discussions, debate and descriptions
Vocabulary / Grammar	-	Modals, conditionals and verb forms (time and tense)
Practice:		Objective PET Units 19 – 24

UNIT - 5 **P-6**

Functions: Requesting, denying, suggesting and persuading

Skill Focus:

Reading	-	Understanding factual information
Writing	-	Short stories and explanatory paragraphs
Listening	-	Inferences from long speeches/conversations
Speaking	-	Announcements and presentations
Vocabulary / Grammar	-	Punctuation and cloze tests

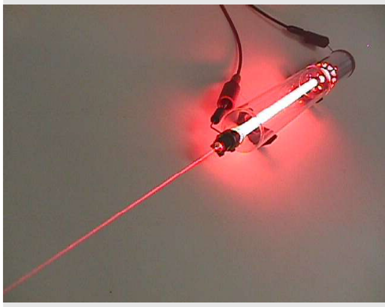
Practice: Objective PET Units 25 – 30

TEXT BOOK:

1. L. Hashemi and B. Thomas, *"Objective PET"*, Student's Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. A. Capel and R. Nixon, *"Introduction to PET"*, Oxford University Press.



16HS110 ENGINEERING PHYSICS LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Description and Objectives:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the following experiments.The students have to perform at least 10 experiments from the list of experiments.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.

CO2: acquire the knowledge on magnetic field theory, thermal conductivity by conducting experiments of field along the axis of a circular coil and thermal conductivity of bad conductor

CO3: understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of velocity of ultrasonic waves in liquids.
2. Melde's experiment - transverse and longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect.

REFERENCE BOOKS :

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics Laboratory Manual – Department of Physics, VFSTR University, 2016.

16HS106 BASIC MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

This course offers basic concepts on matrices, system of equations, differential equations of first and higher order. Further, numerical methods to solve differential equations are introduced.

The objective of the course is to provide the knowledge on the properties of matrices and solving system of equations using matrices. It is also aimed to offer various methods (analytical as well as numerical) to solve first and second order ordinary differential equations.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: understand the basic concepts, properties and operations on matrices.

CO2: determine when a system of equations is consistent or not and solve it whenever possible.

CO3: determine when the matrix has an inverse and find it when it exists.

CO4: identify the method to solve the differential equations.

CO5: find the complete solution of a homogeneous and non homogenerous differential equations with constant coefficients.

CO6: evaluate integrals and solving differential equations using numerical methods.

CO7 compare the solutions of differential equations by numerical methods with exact solution of that equation using MATLAB.

SKILLS:

- ✓ *Compare the inverse of matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Solve given differential equations.*

UNIT - 1 **L-9, T-3**

MATRICES: Definition, types of matrices, algebra of matrices, determinant, minor, cofactor, adjoint, and inverse of a matrix; Elementary row operations, inverse by row operations, rank, determination of rank using Echelon form and normal form.

UNIT - 2 **L-9, T-3**

SYSTEM OF EQUATIONS: System of linear equations, consistency of system of equations, solution by Cramer's rule, matrix inversion method, Gauss-Jordan method and Gauss elimination method.

UNIT - 3 **L-9, T-3**

FIRST ORDER ORDINARY DIFFERENTIAL: Introduction, variable separable, linear equations, Bernoulli equation, homogenous equations and non-homogenous equations.

UNIT - 4 **L-9, T-3**

SECOND ORDER ORDINARY DIFFERENTIAL EQUATIONS : Linear differential equations of second order with constant coefficients with RHS of type e^{ax}, $\sin ax$, $\cos ax$, x^n.

UNIT - 5 **L-9, T-3**

NUMERICAL METHODS - II: Numerical integration by trapezoidal rule and Simpson's rules; Numerical solutions to Differential equations - Euler's method and Runga-Kutte method.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Matrix algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's rule).
5. System of equations (Matrix inversion method).
6. Solutions of first order ODE.
7. Trapezoidal rule.
8. Simpson's one-third rule.
9. Simpson's three-eight rule.
10. Euler's method.
11. RK Method.

Text BOOKS :

1. H. K. Dass and Er. R. Verma, "Higher Engineering Mathematics", S. Chand and Co., 3rd edition, 2014.
2. B. S. Grawel, "Engineering Mathematics", Khanna Publishers, 44th edition, 2014.

Reference BookS :

1. K. S. Rao, "Numerical Methods", 3rd edition, PHI Publishers, 2007.
2. R. Pratap, "Getting started with MatLab", Oxford University Publication, 2009.

ACTIVITIES:

- *Compute the inverse of matrix and compare with MATLAB output.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Solve given differential equations and compare with MATLAB output.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: understand the limitations of using hard water for domestic and industrial purposes.

CO2: choose and apply suitable methods to soften the hard water for industrial and domestic applications.

CO3: understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.

CO4: understand the types of corrosion and their implications followed by their control and prevention methods.

CO5: familiarize the preparation, properties and applications of various polymers.

SKILLS:

✓ *Analyse the total hardness of water sample.*

✓ *Understand the basic principles involved in various batteries.*

✓ *Understand the mechanisms of corrosion and various controlling methods.*

✓ *Synthesize various polymers.*

✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY : Introduction, WHO, BIS standards of water; Hardness of water-determination of hardness by EDTA (numerical problems), disadvantages of hard water, scales and sludges, caustic embrittlement, boiler corrosion, priming and foaming; Softening methods - zeolite process, ion exchange process; Desalination of brackish water- reverse osmosis and electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential; Electrochemical series; Nernst equation; Reference electrodes - Calomel and standard hydrogen electrode, ion selective electrode and glass electrode; Determination of pH by pH meter, primary cell and secondary cell (lead-acid storage cell and lithium ion battery); Fuel cell - hydrogen oxygen and methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION : Introduction, dry corrosion, wet corrosion and mechanisms of wet corrosion; Bimetallic corrosion - concentration cell corrosion; Factors influencing the rate of corrosion; Corrosion control methods - cathodic protection, electroplating, electrolessplating and corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction; Types of polymerization - preparation, properties and applications of polyethylene, PVC, teflon, bakelite, urea, formaldehyde and silicones; Rubber – vulcanization; Synthetic rubbers - buna-S, buna-N and neoprene; Introduction to conducting polymers - poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV - Visible Spectroscopy, Beer - Lambert's law, qualitative and quantitative analysis; Block diagram of UV-Visible spectrophotometer; IR Spectroscopy - types of vibrations and block diagram of IR spectrophotometer.

TEXT BOOKS :

1. P.C Jain and M. Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. S. Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and M. Chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and DeMerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. G. Raj and C. Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
5. J.D. Bares, M.Thomas, B. S. Sankar, J.Mendham and R.C Denney, "Vogel's Text book of Qualitative Chemical Analysis", 6th edition, Pearson Publications, 2009.
6. Dr.S. Rattan, "Experiments in Applied Chemistry", S.K. Kataria and Sons Publications, 2008.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
15		45	6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an "International language of Engineers". It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: sketch engineering objects in the freehand mode.

CO2: create geometric construction with hand tools.

CO3: create dimensions of objects.

CO4: prepare plan and elevation of any pictorial view.

CO5: draw freehand lettering.

CO6: make isometric sketches using graphics.

CO7: draw orthographic multi-view sketches using graphics.

SKILLS:

- ✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*
- ✓ *Draw geometrical objects like polygons, solids of different types.*
- ✓ *Visualize the objects in real time situations.*
- ✓ *Develop 3D views (isometric views).*

UNIT – 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT – 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT – 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT – 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT – 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

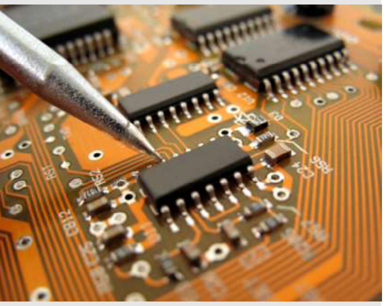
1. N.D.Bhatt, "Engineering Drawing", 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal, C.M.Agrawal "Engineering Drawing" , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, "Engineering Drawing", 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, "Engineering drawing", 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both DC and AC machines. It also deals with the basic electronic components like P-N junction Diode, Zener diode, transistor and their characteristics.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: understand the notation and usage of components in electric circuits.

CO2: analyze AC (single and three phase) and DC using different methods and laws.

CO3: operate various electrical machines.

CO4: understand the concepts of semiconductor devices and their operation.

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT - 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts; Concepts of network- active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law; Kirchhoff's Laws; Application to simple series, parallel circuits, mesh and nodal analysis of simple resistive circuits (simple numerical problems).

UNIT - 2 **L-9**

FUNDAMENTALS OF AC CIRCUITS: Generation of AC voltage - frequency, average value, RMS value, form factor, peak factor for sinusoidal only; Phasor representation of alternating quantities; Analysis of simple series and parallel AC circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (elementary treatment only).

UNIT - 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of magneto motive force, reluctance, flux and flux density, concept of self Inductance and mutual Inductance, coefficient of coupling (only elementary treatment and simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, constructional features, EMF equation (simple numerical problems).

UNIT - 4 **L-9**

DC MACHINES: Constructional details of a DC machine, DC generator, principle of operation; EMF equation, types of DC generators (simple numerical problems).

DC motor- principle of operation, torque equation, types of DC motors (simple numerical problems)

AC MACHINES: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, torque equation, constructional details of synchronous machine.

UNIT - 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory; Intrinsic and extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics; Half and full wave rectifiers; Zener diode and its characteristics; Voltage regulator; Bi polar junction transistor, operation, types and applications.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.

ACTIVITIES:

- *Decode the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of half wave rectifier without filter.
10. Implementation of full wave rectifier without filter.

TEXT BOOKS:

1. V.K. Mehta, “Principles of Electrical Engineering and Electronics”, 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P. Kothari, “Basic Electrical and Electronics Engineering”, 1st edition, TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman and Halkias, “Integrated Electronics”, McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, “Electrical Technology”, Vol– II, S. Chand Publications, 2007.
3. U. Bakshi and A. Bakshi, “Basic Electrical Engineering”, 1st edition, Technical Publications, Pune, 2005.

WEB LINKS:

1. http://nptel.ac.in/courses/108108076/
2. https://books.google.co.in/books/about Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	30

Course Description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: analyse the total hardness present in water samples.

CO2: determine the total alkalinity of water used in industries.

CO3: acquire the knowledge on polymers used as insulators.

CO4: familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of total alkalinity of water.
2. Estimation of total hardness of water.
3. Find the percentage of available chlorine in bleaching powder.
4. Estimation of Fe (II) by dichrometry method.
5. Preparation of phenol - formaldehyde resin.
6. Synthesis of urea- formaldehyde resin.
7. Estimation of concentration of acid by pH metry.
8. Determination of strength of acid by conductometry.
9. Measurement of Mn^{+7} by colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-visible spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS :

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.S. Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Volume I, Pearson Publications, 2009.
2. Dr. S. Rattan, “Experiments in Applied Chemistry”, S.K. Kataria and Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
30	-	-	10	20	4	-	4	-

Course Description and Objectives:

Environmental science and technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: observe and integrate the diverse information from sources outside the classroom.

CO2: think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance and civic mindedness.

CO3: adapt eco-friendly technologies in order to maintain hygienic conditions.

CO4: understand the human activities that are detrimental to environment.

CO5: collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.

CO6: discuss the issues involved in the generation of renewable energy resources.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES : Environmental Studies- definition, scope and its importance; Need for public awareness, natural resources, forest resources and deforestation; Water resources - properties and conflicts; Mineral resources - extraction and impacts; Food resources - modern agriculture methods, fertilizer-pesticide problems, water logging and salinity; Energy resources - renewable and non-renewable energy resources, harness technology, solar energy technologies; Land resources - land degradation, soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY : Ecosystem - concept, structure and functions of an ecosystem; Food chains, food webs, ecological pyramids, energy flow, energy regulation and succession; Biogeochemical cycles; Aquatic ecosystems; Biodiversity - introduction, bio-geographical classification, values of biodiversity, biodiversity at global, national and local levels, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India and conservation of biodiversity.

UNIT - 3 **L -6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY : Solid waste management - causes, effects and control measures of municipal and industrial wastes; Pollution - air, water, thermal, soil and noise pollutions; Role of an individual in prevention of pollution; Remote sensing / GIS - introduction, definitions, applications of the remote sensing; Innovative practices-objectives, innovative practices in agriculture, forest-community and bio-villages; Green technology for sustainable development, life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA : Sustainable development, water conservation, cloud seeding, rainwater harvesting methods, watershed management, global warming, acid rain, ozone layer depletion; Environmental legislation; wildlife protection act, water act, forest conservation act, air act, environmental protection act; Environmental impact asssssment (EIA) - introduction, definition of EIA and EIS, scope and objectives, importance of EIA in proposed projects/industry/developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION : Food sanitation **-** food and drugs act, food preservations, milk sanitation, tests for milk, pasteurization of the milk; Water, air, soil and food borne diseases; Maintenance of sanitary and hygienic conditions; Role of youth in the development; Promoting activities -youth as initiators and activities; Field work/environmental visit - visit to a local area to document environmental assets river/ forest/grassland/hill/mountain; Study of local environment - common plants, insects, birds; Study of simple ecosystems - pond, river, hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. A. Kaushik and C.P. Kaushik, “Perspectives in Environmental Studies”, 5th edition, 2016.
2. B. Joseph, “Environmental studies”, 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008.
3. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.Chand and Company Ltd, 2009.
4. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
5. C. S. Rao, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications, 2004.
7. K. Joseph and R.Nagendram, “Essentials of environmental studies”, Pearson Education Pt Ltd, Delhi, 2007. Education Pt Ltd, Delhi, 2007.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

Source:
Prof. S. Krupanidhi, HoD, BT

16BT102 BIOPRODUCTS AND BIOENTREPRENEURSHIP

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
5	45	2	12	2	5

Course Description and Objectives:

The course offers knowledge on various bio-products and their marketing. The objective of the course is to create awareness on a wide array of biologically derived products. In addition, it also encourages students to explore entrepreneurship in the arena of bioproducts.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: gain insights on a wide range of bioproducts viz., biofuels, biomaterials, biochemicals of therapeutic and nutritional importance.

CO2: analyse and perceive green entrepreneurship and bioproduct market.

SKILLS:

✓ *Evaluate the scope for bioentrepreneurship.*

✓ *Recycle and reuse biowaste.*

✓ *Design small scale industry setup.*

✓ *Analyze bioproducts market trend.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO BIOPRODUCTS: Definition of bioproducts; Categories of bioproducts; Importance of bioproducts; Bioproducts industry - strategies and action plans, global trends and current situation; Bioproducts used for decoration; Biofertilisers; Examples of clonal propagation of plants; Socio-economic and environmental impact of bioproducts.

UNIT - 2 **L-9, T-3**

ENERGY RELATED BIOPRODUCTS: Liquid fuels - ethanol and biodiesel; Carbon neutrality; Conversion mechanisms; Solid biomass for combustion to generate heat and power; Gaseous fuel such as biogas; Renewable energy opportunities for Indian entrepreneurs.

UNIT - 3 **L-9, T-3**

BIOMATERIALS: Bioplastics from plant oils and sugars; Biofoams and biorubber from plant oils and latex; Biocomposites manufactured from agricultural (e.g., hemp, flax, kenaf) and forestry; Biofibres.

UNIT - 4 **L-9, T-3**

BIOCHEMICALS: Industrial - basic and specific chemicals, resins, lubricants and solvents; Pharmaceuticals - examples of monoclonal therapeutic antibodies, interleukins, enzymes (therapeutic and detergent), hormones and vaccines; Antibiotics; Omega 3 fatty acids; Biocosmetics - soaps, body creams and lotions; Biorepellents - case study; Trichoderma.

UNIT - 5 **L-9, T-3**

ENTREPRENEURSHIP RELATED TO BIOPRODUCTS: Entrepreneurship ecosystem and bioeconomy; Perception and analysis of green entrepreneurship ecosystem by its stakeholders; Green entrepreneurship - case studies; Bioproducts manufacturers and suppliers in India.

TEXT BOOKS :

1. N.T. Dunford, "Food and industrial bioproducts and bioprocessing", Wiley-Blackwell publishers, 2012.
2. J.C. Philp and K.C. Pavanan, "Perspectives- bio-based production in a bioeconomy", Asian Biotechnology and Development Review, Vol. 15, No.2, pp 81-88, 2012.

REFERENCE BOOKS :

1. J. W. Lee, "Advanced Biofuels and Bioproducts", Springer New York, 2013.
2. C. T. Hou and J.F. Shaw, "Biocatalysis and Bioenergy", Wiley publishers, 2008.

ACTIVITIES:

- *Models on renewable energy-biomass, biofuels, biogas.*
- *Prepare vermicompost.*
- *Case studies on green entrepreneurship.*

16BM101 FUNDAMENTALS OF ANATOMY AND PHYSIOLOGY

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

This course provides a comprehensive study of the anatomy and physiology of the human body. Topics include in this course are body organization; respiratory, skeletal, circular, urinary, nervous systems and special senses systems. To know basic structural and functional elements of human body, to learn about organs and structures involving in system formation and functions, to understand all systems in the human body.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Distinguish amongst different specialized tissues, bones and muscle types.

CO2: Describe various stages of bone formations and muscle's anatomy & physiology.

CO3: Interpret the fluids exchange & electrophysiology in cardiovascular and respiratory systems by using various physics laws.

CO4: Demonstrate urine formation & predict reproduction cycles based on ion exchanges in kidney and human reproductive system.

CO5: Illustrate the structural and functional aspects of nervous system and special senses using sketches and electrophysiology.

CO6: Categorize the physiological aspects on blood and organ systems using hospital grade equipment.

SKILLS:

- ✓ *location of body parts and identification.*
- ✓ *know the various tissues and their appearances.*
- ✓ *know the physics behind respiratory systems.*
- ✓ *circulatory system's working principle.*

UNIT I **L-8**

BASIC ELEMENTS OF HUMAN BODY: Cell, Structure and organelles, Functions of each component in the cell; Cell membrane, Transport across membrane, Origin of cell membrane potential, Action potential, Tissue - Types, Specialized tissues, Functions.

UNIT II **L-9**

MUSCULO-SKELETALSYSTEM: Skeletal system, Anatomy of bone, Bone types and functions; Joint - Types of Joints–Sinovial joints, Types of movements Cartilage and functions; Muscular system-Types of muscles and their locations, Structure of skeletal muscle, Physiology of muscle contraction, NMJ, Introduction to EMG, Types of muscles in limbs, Locations and their actions.

UNIT III **L-11**

CIRCULATORY SYSTEM: Blood composition, Functions of blood and components Blood groups, Importance of blood groups, Identification of blood groups; Structure of heart – Properties of Cardiac muscle, Conducting system of heart, Cardiac cycle, ECG, Heart sound, Volume and pressure changes and regulation of heart rate, circulatory system; Factors regulating Blood flow. Respiratory System- Components of respiratory system, Respiratory Mechanism, Types of respiration, Oxygen and carbon dioxide transport and acid base regulation, Respiratory volumes.

UNIT IV **L-8**

URINARY AND REPRODUCTIVE SYSTEM: Urinary System-Structure of Kidney and Nephron; Mechanism of Urine formation and acid base regulation, Urinary reflex, Homeostasis and blood pressure regulation by urinary system; Reproductive system-Parts of Male reproductive system, Spermatogenesis and hormonal regulation; Parts of female reproductive system, Oogenesis and hormonal regulation, Menstrual cycle.

UNIT V **L-8**

NERVOUS SYSTEM: Structure of a Neuron, Types of Neuron, Synapses and types, Conduction of action potential in neuron; Central nervous system – Anatomy of brain, Spinal cord, Regions of brain, Brain waves, Neurotransmitters, P.N.S- Spinal reflex, Reflex action, NMJ, A. N. S- Sympathetic and Parasympathetic systems, Special senses.

ACTIVITIES:

- o dissection of human body.dissect human body.
- o identify different organs human body.
- o measure lung capacitance using spirometer.
- o determine bp under various physical positions.
- o visit hospitals to see different physiological parameters and procedures.

LABORATORY EXPERIMENTS

Outcomes:

By the end of the laboratory experiments, students will be able to

- identify organs, in dead body dissections.
- look through the microscopes and identify different tissues.
- examine blood pressure.
- measure some important parameters.

List of Experiments: Total hours-45

1. Observe Histology-Slides of primary tissues of body.
2. Demonstration of Brain Dissection.
3. Dissected Upper limbs and Lower limbs -Its demonstration.
4. Dissection of Pelvis and Pelvic Organs Abdomen and Abdominal Organs.
5. Dissection of thorax – showing heart and major blood vessels, lungs and respiratory system.
5. Record the B.P. and effects of Physical exertion and posture on this parameter.
6. Recording of mechanical response of the muscle on application of induced electric signal.
7. Analyze load, length and force relationship of muscle.
8. Determine the rate of conduction of nerve impulse.
9. Spirometry-Record tidal volume, inspiratory reserve volume, Expiratory reserve volume, Vital capacity and index and effect of posture on vital capacity.
10. Isolated heart perfusion by Legendraff Technique (demonstration).

TEXT BOOK:

1. Elaine.N. Marieb , "Essential of Human Anatomy and Physiology", 8th edition, Pearson Education, New Delhi ,2007.

REFERENCE BOOKS:

1. Gillian Pocock, Christopher D. Richards, " The human Body – An introduction for Biomedical and Health Sciences", Oxford University Press, USA, 2009
2. William F.Ganong, "Review of Medical Physiology", 22nd edition, Mc Graw Hill, New Delhi, 2005
3. Eldra Pearl Solomon, "Introduction to Human Anatomy and Physiology", W.B. Saunders Company, Harcourt Brace Jovanovich, 2003.
4. Guyton & Hall, "Medical Physiology", 12th Edition, Elsevier Saunders, 2010.

II

YEAR

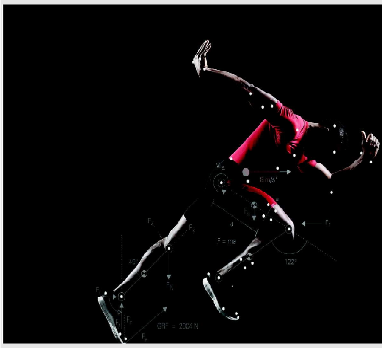
BIOMEDICAL ENGINEERING

B.Tech.

I SEMESTER	16BM201	-	Biomechanics
	16BM202	-	Biostatistics
	16BT101	-	Biochemistry
	16BM203	-	Electronics Engineering-I
	16EC203	-	Network Theory
	16BM204	-	Signals and Systems for Bioengineers
	16EL102	-	Soft Skills Laboratory
		-	Employability and Life Skills Elective
II SEMESTER	16BM205	-	Electronics Engineering - II
	16BM206	-	Biomaterials and Artificial Organs
	16BM207	-	Pathology and Microbiology
	16BM208	-	Transducers and Biosensors
	16EL103	-	Professional Communication Lab
		-	Department Elective
		-	Department / Open Elective
		-	Employability and Life Skills Elective

COURSE CONTENTS

I SEM & II SEM



16BM201 BIOMECHANICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

The course provides an overview of musculoskeletal anatomy, the mechanical properties and structural behavior of biological tissues, and biodynamics. Specific course topics include structure and function relationships in tissues and organs; application of stress and strain analysis to biological tissues; analysis of forces in human function and movement; energy and power in human activity. The course is meant to provide basic background in biomechanics for engineering students considering medical school, industrial positions in the biomedical field.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply mechanical forces to joints and derive the basic constitutive equations for solid and liquid bio elements.

CO2: Identify the properties of structures and functions to human joints for normal and diseased

CO3: Analyse static and dynamic gait postures for analysing kinematic data.

CO4: Select appropriate biomaterials for the manufacturing of implants.

CO5: Derive the equations of fluids for estimating pressures in a vessel.

CO6: Elaborate on forces acting on human joints.

SKILLS :

- ✓ *Analysis of laws of mechanics for bio mechanics.*
- ✓ *Determination of types of flows in vessels.*
- ✓ *Analyze physics behind tissues, bones, structures.*
- ✓ *Analysis of movement and other motion in humans.*

ACTIVITIES:

- *Application of navier's stoke's equations.*
- *Applications of hagen-poiseuille equations.*
- *Analysis of blood vessels based on various laws of structures.*
- *Medical implants processing and manufacturing.*
- *Analyze the movement of body using gait analysis.*

UNIT - 1 **L-9, T-3**

INTRODUCTION TO MECHANICS: Principles of Mechanics, Vector mechanics, Mechanics of motion - Newton's laws of motion, Kinetics, Kinematics of motion, Basic Fluid mechanics – Euler equations and Navier-Stoke's equations, Viscoelasticity, Constitutive equations, Stress transformations, Strain energy function.

UNIT - 2 **L-9, T-3**

BIOFLUID MECHANICS:Introduction, Viscosity and capillary viscometer, Rheological properties of blood, Laminar flow, Couette flow and Hagen-poiseuille equation, Turbulent flow. Cardiovascular system - Biological and mechanical valves development, Artificial heart valves testing of valves, Structure, functions, Material properties and Modeling of Blood vessels.

UNIT - 3 **L-9, T-3**

BIOSOLID MECHANICS: Hard Tissues- Bone structure and composition mechanical properties of bone, Cortical and cancellous bones, Viscoelastic properties, Maxwell and Voight models,Anisotropy; Soft Tissues- Structure, Functions, Material properties and Modeling of Soft Tissues- Cartilage, Tendon, Ligament, Muscle.

UNIT - 4 **L-9, T-3**

BIOMECHANICS OF JOINTS AND IMPLANTS: Skeletal joints, Forces and stresses in human joints, Analysis of rigid bodies in equilibrium, Free body diagrams, Types of joint, Biomechanical analysis of elbow, Shoulder, Spinal column, Hip knee and Ankle. Design of orthopedic implant, Specifications for a prosthetic joint, Biocompatibility, Requirement of a biomaterial, Characteristics of different types of biomaterials, Manufacturing process of implants, Fixation of implants.

UNIT - 5 **L-9, T-3**

MODELLING AND ERGONOMICS:Introduction to Finite Element Analysis, Analysis of bio mechanical systems using Finite element methods, Graphical design; Ergonomics- Gait analysis, Design of work station, Sports biomechanics, Injury mechanics.

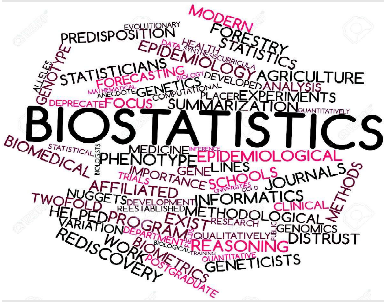
TEXT BOOKS:

1. Y.C. Fung, "Bio-Mechanics- Mechanical Properties of Tissues", Springer-Verlag, 1998.
2. Duane Knudson, "Fundamentals of Biomechanics", 2^{nd}edition Springer Science and Business Media, 2007.
3. Marcelo Epstein, "The Elements of Continuum Biomechanics", ISBN: 978-1-119-99923-2, 2012.

REFERENCE BOOKS:

1. Jay D. Humphrey and Sherry De Lange, "An Introduction to Biomechanics: Solids and Fluids, Analysis and Design", Springer Science and Business Media, 2004.
2. Shrawan Kumar, "Biomechanics in Ergonomics", 2^{nd} edition, CRC Press, 2007.

16BM202 BIOSTATISTICS



Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

This course is an introduction to statistical methods used in health, biological and medical sciences. The main aim of the course is to impart the knowledge about descriptive statistics and performance characteristics of diagnostic tests, to make student know about graphical methods, estimation, hypothesis testing, p-values, correlation and linear regression.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply Handerson- Hasselbalch equation for finding out Ph of buffers; apply principles of viscosity and other mechanisms to living organisms

CO2: Analyze the physical properties of carbohydrates and metabolic pathways

CO3: Categorize lipids and the metabolic pathways

CO4: Evaluate the structural organization and separation of proteins

CO5: Illustrate the enzyme action and their concentrations.

CO6: Examine the human body biochemistry with chemical analyzers.

SKILLS :

- ✓ *Organization of assorted data into meaningful information using statistical methods.*
- ✓ *Develop analytical capability to visualize data and give the pattern for data.*
- ✓ *Determination of various statistical procedures.*
- ✓ *Curve fittings.*

ACTIVITIES:

- *Solve regression models and analysis.*
- *Determination of probability. And distribution.*
- *Assessment of severity state of a patient with prognosis of outcome of a disease.*
- *Hypothesis testing for various populations.*

UNIT - 1 **L-9, T-3**

CONCEPTS OF BIOSTATISTICS: Basic statistical measures, measures of central tendency, measures of dispersion, variance, standard deviation, properties of probability, probability distributions, sampling distributions.

UNIT - 2 **L-9, T-3**

ESTIMATION AND HYPOTHESIS TESTING: Confidence intervals for data, t distribution, determination of sample size for estimating means and proportions; Hypothesis testing for a single population mean/proportion difference between two population means/proportions, sample size to control type I and type II errors.

UNIT - 3 **L-9, T-3**

ANALYSIS OF VARIANCE: The completely randomized design, random sized complete block design, repeated measures design.

UNIT - 4 **L-9, T-3**

REGRESSION AND CORRELATION: Simple linear regression model, regression equation, the correlation model, multiple linear regression model, multiple regression equation, multiple correlation model, additional techniques of regression analysis.

UNIT - 5 **L-9, T-3**

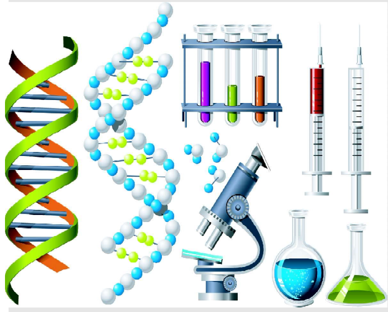
CHI-SQUARE DISTRIBUTION: tests of good fit, independence, homogeneity, non-parametric statistical procedures, regression analysis.

TEXT BOOKS:

1. Stanton A. Glantz, “Primer of biostatistics”, Mc Graw Hill , 2nd edition.
2. Wayne S. Daniel, “Biostatistics: A foundation for analysis in the health sciences”, John Wiley and sons 6th edition.

REFERENCE BOOKS:

1. P Mariappan, “Biostatistics: An Introduction”, Pearson, 1st edition, 2013.
2. Rao.P.S.S.Sundar and Richard J, “Introduction to Biostatistics and Research Methods”, PHI, 5th edition, 2012.



16BT101 BIOCHEMISTRY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	5

Course Description and Objectives:

This course surveys the structure and function of biological molecules, including carbohydrates, lipids, and proteins. Topics of this course include enzyme activity, special properties of biological membranes, hormones, vitamins, metabolic pathways, biotransformation and molecular biology, Introduction to Biochemistry.Familiarized with the Classification, structure and properties of carbohydrates, Lipids, Protein and Enzyme.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: explain the fundamentals of biochemistry.

CO2: identify the DNA and RNA structures.

CO3: know the all carbohydrates and their properties.

CO4: know the classifications, functions and properties of proteins.

CO5: understand the kinetics of enzymes and factors affecting enzymatic activity.

SKILLS :

- ✓ *Functioning and understanding of various body fluids.*
- ✓ *Interpretation of harnessing of energy in organ system.*
- ✓ *Replications, DNA synthesis.*
- ✓ *Explain the basis for enzyme kinetics.*

ACTIVITIES:

- *Study of amount of creatine.*
- *Estimation of urea, glucose.*
- *Study Ph of different solutions.*
- *Chromatography of amino acids.*

UNIT - 1 **L-9**

INTRODUCTION TO BIOCHEMISTRY: Water as a biological solvent, Weak acid and bases, PH, buffers, Handerson-Hasselbalch equation, Physiological buffers, Fitness of the aqueous environment for living organism; Principle of viscosity, Surface tension, Adsorption, Diffusion, Osmosis and their applications in biological systems.

UNIT - 2 **L-9**

CARBOHYDRATES: Classification of carbohydrates - Mono, Di, Oligo and polysaccharides. Isomerism, racemization and mutarotation .Structure, physical and chemical properties of carbohydrates; Metabolic pathways and bioenergetics – Glycol sis, glycogen sis, Glycogenolysis and its hormonal regulation; TCA cycle and electron transport chain; Oxidative phosphorylation.

UNIT - 3 **L-9**

LIPIDS: Classification of lipids- Simple, Compound and derived lipids; Nomenclature of fatty acid, Physical and Chemical properties of fat; Saponification number, Reichert- Meissl number and iodine number; Metabolic pathways-Synthesis and degradation of fatty acid (beta oxidation), Hormonal regulation of fatty acid metabolism, Ketogenesis, Structural architecture and Significance of biological membrane.

UNIT - 4 **L-9**

NUCLEIC ACID AND PROTEIN: Structure of purines and pyrimidines, Nucleoside, Nucleotide, DNA act as a genetic material, Chargaff's rule; Watson and crick model of DNA; Structure of RNA and its type, Classification, Structure and properties of proteins, Structural organization of proteins, Classification and properties of amino acids, Separation of protein, Gel filtration, Electrophoresis and Ultracentrifugation.

UNIT - 5 **L-10**

ENZYME AND ITS KINETICS: Classification of enzymes, Apoenzyme, Coenzyme, Holoenzyme and cofactors; Kinetics of enzymes - Michaelis-Menten equation; Factors affecting enzymatic activity- Temperature, PH, Substrate concentration and Enzyme concentration, Inhibitors of enzyme action, Competitive, Non- competitive, Irreversible; Enzyme- Mode of action, Allosteric and covalent regulation, Clinical significance of enzymes, Measurement of enzyme activity and interpretation of units.

LABORATORY EXPERIMENTS

The student will be able to:

- measure the PH level of various solutions.
- quantitative estimation of glucose and other molecules.
- cerebrospinal fluid anlysis.

LIST OF EXPERIMENTS: Total hours-30

1. Study of Plasma protein electrophoresis.
2. Study of Chromatography of amino acids.
3. Study of Colorimetry.
4. Study of Spectrophotometry.
5. Study of pH meter.
6. Study of Flame photometry-Analysis of Na and K in an unknown sample.

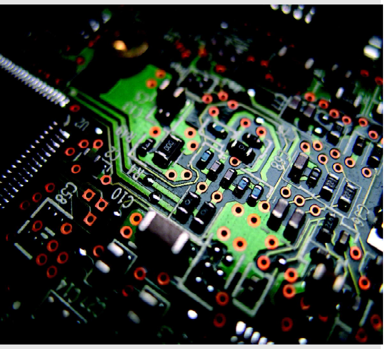
7. Quantitative estimation of glucose.
8. Quantitative estimation of Urea.
9. Quantitative estimation of Creatinine.
10. Quantitative estimation of Serum proteins, A/G Ratio.
11. CSF Analysis.
12. Clearance Tests-Demonstration.

TEXT BOOKS:

1. David.W.Martin, Peter.A.Mayes and Victor. W.Rodwell, "Harper's Review of Biochemistry", 19th edition, LANGE Medical Publications, 1981.
2. Keith Wilson and John Walker, "Practical Biochemistry - Principles and Techniques", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Trevor palmer, "Understanding Enzymes", Ellis Horwood Ltd. 1991.
2. Pamela.C.Champe and Richard.A.Harvey, "Lippincott Biochemistry Lippincott's Illustrated Reviews", Raven publishers,1994.



16BM203 ELECTRONICS ENGINEERING-I

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	46	6	12	3	2

Course Description and Objectives:

This course is aimed at offering fundamental concepts of semiconductor devices and circuits. It starts with the physics concepts that form the basis for semiconductor material formation. Then it introduces the Junction Diode, Transistor, FET and other basic devices that are designed with semiconductor materials. It also includes the concepts of simple circuits that are designed with the help of these basic devices. As a first-level course in electronics, it forms the basis to understand advanced electronic courses that will be studied in subsequent semesters.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the working of semiconductor devices with the help of V-I characteristics.

CO2: Design half wave and full wave rectifiers and Zener diode as voltage regulator.

CO3: Investigate the characteristics of Amplifier Circuits employing BJT and FET devices.

CO4: Compare CB, CE, CC configurations of BJT and CG, CD, CS configurations of FET.

CO5: Analyze the different multistage amplifiers and demonstrate negative feedback amplifier circuits and positive feedback oscillators.

CO6: Apply the concepts of basic electronic devices to design various circuits.

SKILLS:

- ✓ *Identify a Semiconductor Diode for a specific application and power handling capacity.*
- ✓ *Identify the transistor type for a given application (switch/amplifier).*
- ✓ *Recognize the require specifications of the transistor.*
- ✓ *Identify the amplification factor required.*
- ✓ *Test the working condition of the transistor.*

UNIT - 1 L-9

PN JUNCTION DEVICES:PN junction diode, Structure, Operation and V-I characteristics, Diffusion and transient capacitance, Rectifiers, Half Wave and Full Wave Rectifier, Display devices, LED, Laser diodes, Zenar diode characteristics, Zenar Reverse characteristics, Zenar as regulator.

UNIT - 2 L-9

TRANSISTORS:BJT, JFET, MOSFET, Structure, Operation, Characteristics and Biasing UJT, Thyristor and IGBT, Structure and characteristics.

UNIT - 3 L-9

AMPLIFIER:BJT small signal model, Analysis of CE, CB, CC amplifiers, Gain and frequency response, MOSFET small signal model, Analysis of CS and Source follower, Gain and frequency response High frequency analysis.

UNIT - 4 L-9

MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER:BIMOS cascade amplifier, Differential amplifier, Common mode and Difference mode analysis, FET input stages, Single tuned amplifiers, Gain and frequency response, Neutralization methods, Power amplifiers,Types (Qualitative analysis).

UNIT - 5 L-9

FEEDBACK AMPLIFIERS AND OSCILLATORS:Advantages of negative feedback, Voltage, Current, Series, Shunt feedback, Positive feedback, Condition for oscillations, Phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.

LABORATOTY EXPERIMENTS

Outcomes:

students will be able to :

- assemble simple circuits to get basic circuits.
- understand the V-I characteristics of P-N junction diode and hence determine the diodeforward, reverse currents, static and dynamic resistances.
- analyze the V-I characteristics of zener diode under reverse biased condition and observethe application as voltage regulator.
- calculate the efficiency and ripple factor of all rectifiers and analyze their performance withand without filter.
- understand the input and o/p characteristics of all BJT configurations in active region anddetermine its current amplification factors.
- understand the drain and transfer characteristics of FET and determine its amplificationfactor.
- understand the diode application as a clipper.

LIST OF EXPERIMENTS Total hours-30

1. Characteristics of PN Junction Diode.
2. Zener diode Characteristics & Regulator using Zener diode.

ACTIVITIES:

- *Choose a diode for a Cell-phone/ Laptop/ Tablet adapter/ for various rating.*
- *Zenar diode as a current regulator.*
- *Design three types of biasing circuits and determine the stability factors in each case.*
- *Transistor as an amplifier for the given specifications.*
- *Design a wideband amplifier with FET.*

3. Common Emitter input-output Characteristics.
4. Common Base input-output Characteristics.
5. FET Characteristics.
6. Common Emitter/Common source amplifier.
7. Cascade Amplifier.
8. Wien Bridge Oscillator using Transistors.
9. Class A Power Amplifier (Transformer less).
10. Class B Complementary Symmetry Amplifier.
11. Single Tuned Voltage Amplifier.
12. High Frequency Common base (BJT) / Common gate(JFET) Amplifier.

TEXT BOOKS:

1. David A. Bell ,"Electronic devices and circuits", Prentice Hall of India, 2004.
2. Sedra and smith, "Microelectronic circuits " Oxford University Press, 2004.

REFERENCE BOOKS:

1. Rashid, "Micro electronic circuits" Thomson publications, 1999.
2. Floyd, "Electron devices" Pearson Asia 5th edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L.Boylestad, "Electronic devices and circuit theory", 2002.
5. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, 2004.

16EC203 NETWORK THEORY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	46	6	12	3	5

Course Description and Objectives:

This course enables the students to learn advanced concepts in circuit analysis which are applicable in solving electronic circuits. The aim of this course to introduce the student to the derivation of transient responses of RC, RL and RLC circuits, steady state response of circuits to sinusoidal excitation in time domain, application of phasors to circuit analysis and introduction to graph theory to analyze circuits.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply KVL, KCL, source transformation, star-delta transformation, voltage and current division rules on Electrical networks.

CO2: Apply the concepts of various network theorems and applying to the linear circuits.

CO3: Analyze the transient response of RL, RC and RLC circuits for DC.

CO4: Investigate Series and Parallel resonant circuits

CO5: Analyze the two port network parameters and their Interconnections.

CO6: Examine the branch currents and voltages using Tie set and cutest Matrices

SKILLS:

- ✓ *Determine currents and voltages of all elements of any electrical system network.*
- ✓ *Analysis of simple house wiring diagram.*
- ✓ *Analysis of simple circuits by using theorems.*
- ✓ *Calculate power, current and voltage in any AC and DC circuits.*
- ✓ *Design of suitable Battery for small applications.*
- ✓ *Application of two- port network parameters to analyze transmission lines and filters.*

ACTIVITIES:

- *Measure the Resistance of any resistive Electrical Appliance like water heater, incandescent bulb.*
- *Design of small size house wiring system.*
- *Design circuits with suitable load to get maximum power from source.*
- *Determination of RLC values for given resonant frequency connected series/parallel combination.*
- *Design resonant circuit for oscillator and filter applications.*
- *Design of Power bank for mobile charger circuit.*
- *Determination of Voltage and current characteristics of given Black box.*
- *Verify duality for a given Network.*

UNIT - 1 **L-9, T-3**

INTRODUCTION OF CIRCUIT ELEMENTS: Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and current division, V-I characteristics of passive elements and their series / parallel combination, Energy stored in Inductors and capacitors, Kirchhoff's voltage law and Kirchhoff's current law, Mesh and nodal analysis, Star and delta conversions.

UNIT - 2 **L-9, T-3**

SINUSOIDAL STEADY STATE ANALYSIS AND RESONANCE: Instantaneous, Peak, Average ,RMS values, Crest factor and form factor of periodic waveforms, Notation and concept of phasors, Response of R, L, C series and parallel combination circuits to sinusoidal excitation, Calculation of active and reactive powers, Resonance - Series and parallel resonance circuits, concept of bandwidth and Q factor.

UNIT - 3 **L-9, T-3**

NETWORK TRANSIENT ANALYSIS: Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C and sinusoidal excitations, Initial conditions, Time domain and laplace transform methods of solutions.

UNIT - 4 **L-9, T-3**

NETWORK THEOREMS: Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Millman theorem, Application of theorems to DC and AC circuits.

UNIT - 5 **L-9, T-3**

TWO PORT NETWORK PARAMETERS: Introduction to Two port networks, Open circuit impedance and short circuit admittance (Y), Transmission and inverse transmission, Hybrid and inverse hybrid parameters, Relation between parameter sets, Interconnection of two port networks, Graph theory - Definitions, Graph, Tree, Basic tie-set and basic cut set matrices for planar networks, Loop and nodal methods of analysis of networks with independent and dependent voltage and current sources, Duality and dual networks.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 7th edition,Tata McGraw-Hill, 2007.
2. A Sudhakar and Shyammohan S Palli, "Circuits & Networks: Analysis and Synthesis", 5th edition Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1. Syed A. Nasar, "Electric Circuits", Tata McGraw-Hill, Schaum's Series, 1988.
2. Franklin F.Kuo, "Network Analysis and Synthesis", 2nd Edition, John Wiley and Sons, 2003.
3. Mahmood Nahvi and Joseph Edminister, "Electric Circuits", 4th edition, Schaum's Outline series, Tata McGraw-Hill, 2004.

16BM204 SIGNALS AND SYSTEMS FOR BIOENGINEERS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

This course explains the basic properties of signal and systems and the various methods of classification and Laplace Transform and Fourier transform and their properties. It is useful to know Z transform and DTFT and their properties to characterize LTI systems in the Time domain and various Transform domains

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Describe basic signals and systems representation

CO2: Analyze continuous time signals by using appropriate mathematical tools like Fourier Transform and Laplace Transform.

CO3: Determine the response of a LTI continuous and discrete system to any arbitrary inputs and learn about signal transmission through linear systems.

CO4: Apply the concepts of convolution and correlation for continuous time signals.

CO5: Apply the sampling theorem to test a signal is over or under sampled.

CO6: Test the concepts of signals and systems using matlab.

SKILLS:

- ✓ *Test and design a stable system*
- ✓ *To Know real-world problems involving bio signals such as EEG, ECG and EMG*
- ✓ *Understand the abnormalities present in the physiological systems*
- ✓ *Learn and understand the various transforms and their applications in the analysis of signals and systems*
- ✓ *Use programming skills to visualize theoretical results*

ACTIVITIES:

- *Recording of various signals like Speech.*
- *Noise, Audio signals*
- *Analysis using Matlab and spectrum analyzer.*
- *Determine the quality of signals and improvement of them.*

UNIT - 1 **L-9**

CLASSIFICATION OF SIGNALS AND SYSTEMS: Continuous time signals (CT signals), Discrete time signals (DT signals), Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals, Periodic and A periodic signals, Deterministic and Random signals, Energy and Power signals, CT systems and DT systems Classification of systems, Static and Dynamic, Linear and Nonlinear, Time-variant and Time-invariant, Causal and Noncausal, Stable and Unstable.

UNIT - 2 **L-9**

ANALYSIS OF CONTINUOUS TIME SIGNALS: Fourier series analysis-spectrum of Continuous Time (CT) signals, Fourier and Laplace Transforms in CT Signal Analysis, Properties.

UNIT - 3 **L-9**

LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS: Differential Equation, Block diagram representation, Impulse response, Convolution Integrals, Fourier and Laplace transforms in Analysis of CT systems.

UNIT - 4 **L-9**

ANALYSIS OF DISCRETE TIME SIGNALS: Baseband Sampling, DTFT, Properties of DTFT, Z Transform, Properties of Z Transform.

UNIT - 5 **L-9**

LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS: Difference Equations, Block Diagram Representation, Impulse response, Convolution sum, Discrete Fourier and Z Transform Analysis of Recursive and Non-Recursive systems.

LABORATORY EXPERIMENTS

Outcomes:

Upon completion of the lab:

- explain the importance of superposition in the analysis of linear systems.
- list and apply properties of different transforms.
- use Fourier and Laplace transforms to solve differential equations, and to determine the response of linear systems to known inputs.
- understand the relationship between the stability and causality of systems and the regionof convergence of their Laplace transforms.
- demonstrate the relation among the transfer function, convolution, and the impulse response.
- understand the fundamentals of sampling including the implications of the sampling theorem.

LIST OF EXPERIMENTS: **Total hours-30**

1. Introduction to MATLAB.
2. Vectors and Matrices generation and operations on it.
3. Generation and plotting of Trigonometric and exponential functions.
4. Standard Signal Generation (Impulse,Step, Ramp & Sinc).
5. Operations on signals (Folding, Shifting and Scaling).
6. Periodic and Non-periodic signal generation.
7. Analysis of periodic signals.
8. Analysis of Non-periodic signals.
9. Analysis of transfer function.
10. System Analysis by using poles and zeroes.
11. Sampling theorem verification.
12. System Response.
13. Convolution of Continuous signals.
14. Correlation of Continuous signals.

Note: Any twelve of the above experiments.

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, 3rd edition,Pearson, 2007.

REFERENCE BOOKS:

1. B. P. Lathi, “Principles of Linear Systems and Signals”, 2nd edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals and Systems - Continuous and Discrete”,4th edition, Pearson, 2007.
3. John Alan Stuller, “An Introduction to Signals and Systems”,1st edition, Thomson, 2007.
4. M.J.Roberts, “Signals & Systems Analysis using Transform Methods and MATLAB”, 2nd edition,Tata McGraw Hill, 2007.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, preparing resumé, group discussion and interview skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: think critically on issues for informed decision making and know how to communicate effectively through choice of appropriate language and speech, while dealing with others at the workplace.

CO2: identify and introspect on individual strengths and weaknesses.

CO3: improve levels of self-awareness and self-worth for greater efficacy at workplace.

SKILLS:

- ✓ *Communicate and understand the difference between soft skills and hard skills.*
- ✓ *Professionalism and employability skills.*
- ✓ *Plan career by drawing their SWOT, setting the goal, learn the importance of time and stress management.*
- ✓ *Vocabulary, situational english, group discussion, reading comprehension and listening comprehension which are essential for all competitive examinations.*
- ✓ *Prepare resumé and learn how to face interview.*
- ✓ *Gender sensitive language, good manners, emotional intelligence and essential skills.*

UNIT - 1 **P-8**

A) COMMUNICATION: Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY: Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH: Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION: Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY: Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING: Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY: Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS: Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 4 **P-4**

A) READING COMPREHENSION: Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY: Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION: Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY: Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

UNIT - 5 **P-6**

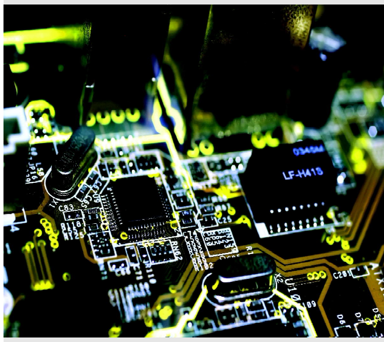
IMPACT OF LANGUAGE ON PERSONALITY: Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other’s views, Assisting others, Sharing, Participating actively.

ACTIVITY: Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, “Ace the Corporate Personality”, McGraw Hill,2001.
2. Adrian Furnham, “Personality and Intelligence at Work”, Psychology Press, 2008.
3. John Adair Kegan Page, “Leadership for Innovation”, 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, “Effective Technical Communication”, 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan and NP Singh, “Speaking English Effectively”, 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, “English and Soft Skills”, Orient Blackswan, 2011.
8. Rajiv K. Mishra, “Personality Development”, Rupa and Co, 2004.

16BM205 ELECTRONICS ENGINEERING - II



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

This course introduces the theoretical and circuit aspects of op-amp, timer, which are the backbone for the basics of linear integrated circuits and to understand the various linear and non-linear applications of op-amp deals with fundamentals of number systems, Boolean expressions which are used to realize combinational and sequential circuits with their logic families. Its objective is to introduce the concepts and techniques associated with the number systems and codes, to minimize the logical expressions using Boolean postulates, to design various combinational and sequential circuits and to provide with a sufficient number of applications for the techniques and mathematics used in this course.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand number systems and its conversion; simplify Boolean expressions by different methods and implementation using logic gates.

CO2: Apply the Boolean algebra knowledge of mathematics to analyze combinational and sequential digital electronic circuits using K-map.

CO3: Understand the characteristics and specifications of operational amplifiers.

CO4: Analyze operational amplifiers based circuits used for various applications.

CO5: Analyze the operation of timer, phase locked loop and voltage controlled oscillators and its applications.

CO6: Evaluate the digital circuits and some common electronic circuits using linear ICs and its applications.

SKILLS:

- ✓ *Making conversions between numbers of different radices.*
- ✓ *Identifying the different gates and their properties.*
- ✓ *Minimize Boolean expression.*
- ✓ *Constructing different combinational circuits.*
- ✓ *Constructing different sequential circuits.*
- ✓ *Verify the functionality of digital circuits.*
- ✓ *Designing memories.*

ACTIVITIES:

- *Design digital circuits using universal gates.*
- *Design Combinational circuits like adder encoder, decoder.*
- *Design Sequential circuits like flip flops, counter.*

UNIT - 1 **L-9**

NUMBER SYSTEMS AND LOGIC GATES: **NUMBER SYSTEMS AND LOGIC GATES**: Decimal, Binary, Octal and Hexadecimal Numbers, Conversion between these number systems, Complements r's and (r-1)'s complements.- subtraction using complements – Encoding numbers and characters using Binary digits,Binary coded Decimal, Gray code, Binary to Gray code conversion, ASCII Code, Logic gates, Truth tables, NOT, AND, OR, NOR, NAND, XOR, XNOR, Boolean Laws and theorems, Solving Boolean expressions, Truth Tables and Logic circuits, The Karnaugh Map, Half adder, Full adder, Multiplexers and DE multiplexers, Decoders and encoders, Coding of Combination Circuits in verilog.

UNIT - 2 **L-9**

REGISTERS AND COUNTERS: **REGISTERS AND COUNTERS**: Flip Flops – RS, D, T, JK Flip Flops, Characteristic equations, exciting tables, JK Master, Slave flip-flop, Universal shift register, Design of modulo, N counters,Counter design using state diagram,Sequential circuit design with verilog.

UNIT - 3 **L-10**

OPERATIONAL AMPLIFIERS: **OPERATIONAL AMPLIFIERS**: The characteristics of Ideal Operation,Slew rate, Offset voltage, Bias current, CMRR, bandwidth,Equivalent circuit of an op-Amp,Virtual ground concept, Linear applications of op-amp,Inverting and noninverting amplifier, Summing, Subtracting, Averaging amplifier,Voltage to current converter,Current to voltage converter, Differential amplifiers,Differentiator and integrator, Nonlinear applications, Comparator, Schmitt Triggers, Precision Diode Half wave and full wave rectifiers, Average detectors, Peak detector.

UNIT - 4 **L-9**

ACTIVE FILTERS AND SIGNAL GENERATOR: **ACTIVE FILTERS AND SIGNAL GENERATOR**: Active filters (first and second order), Low pass, High pass, Band pass filters, Band reject filters (notch filters), Oscillators, RC Phase shift and Wein-bridge, Waveform generators, Square, Triangular and saw tooth.

UNIT - 5 **L-9**

TIMER, PLL, A/D AND D/A CONVERTERS: **TIMER, PLL, A/D AND D/A CONVERTERS**:555 Timer (internal diagram) and its applications, Monostable Multivibrator, Astable Multivibrator; Phase locked Loop (565 - block diagram approach) and its applications, Frequency multiplication, Frequency translation, Voltage to frequency and frequency to voltage converters; DAC, Binary weighted DAC and R-2R DAC; ADC, single slope and dual slope ADCs, Successive approximation ADC.

LABORATORY EXPERIMENTS

Course outcomes:

The student will be able to:

- design Circuits using logic gates
- build Circuits for different application using opamp
- differentiate between oscillator and wave form generator
- convert Signals from Analog to Digital Vice versa

LIST OF EXPERIMENTS: TOTAL HOURS-30

1. Study of logic gates, Half adder and Full adder.
2. Encoder and BCD to 7 segment decoder.
3. Multiplexer and demultiplexer using digital ICs.
4. Universal shift register using flip flops.
5. Design of mod-N counter.
6. Inverting, non-inverting amplifier and comparator.
7. Integrator and Differentiator.
8. Active filter – first order and second order LPF and HPF.
9. Current to Voltage convertor and Voltage to Current Convertor.
10. Comparator, Peak detector and Average detector.
11. Instrumentation amplifier using IC741 49.
12. Wein bridge oscillator 13. Multivibrator using IC555 Timer.
14. Timer.
15. Phase Lock Loop.
16. A/D and D/A converter.

TEXT BOOKS:

1. M. Morris Mano, “Digital Logic and Computer design”, Prentice Hall 1994.
2. Ramakant A. Gayakwad , “Op-AMP and Linear Ics”, Prince Hall, 1994.

REFERENCE BOOKS:

1. Robert B.Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, CRC Press, 2004.
2. Sergio Franco, “Design with Operational Amplifiers and analog Integrated circuits”, McGraw-Hills, 2003.
3. Millman J and Halkias .C., “Integrated Electronics”, TMH, 2007.
4. John. F. Wakerly, “Digital Design Principles and Practices”, 4^{th} edition, Pearson Education, 2007 .
5. Charles H. Roth, Jr, “Fundamentals of Logic Design”, 4^{th} edition, Jaico Books, 2002.

16BM206 BIOMATERIALS AND ARTIFICIAL ORGANS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	46	6	12	3	2

Course Description and Objectives:

This course aims at imparting the knowledge of material science, chemistry and characteristics and classification of Biomaterials. It is useful to learn about different metals and ceramics used as biomaterials, polymeric materials and combinations for mechanism of tissue replacement implants and also gives knowledge of the artificial organ development.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: analyze structural and functional aspects of living organisms.

CO2: explain the function of microscope.

CO3: discuss the importance of public health.

CO4: describe methods involved in treating the pathological diseases.

SKILLS:

- ✓ *Identify a Semiconductor Diode for a specific application and power handling capacity.*
- ✓ *understand the importance of importance of biomaterials and implants in the health care.*
- ✓ *study various materials for biocompatibility.*
- ✓ *determinE and selection of right materials for its bio applications.*
- ✓ *apply specific design and quality control.*

UNIT - 1 **L-9, T-3**

STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY: Definition and classification of bio-materials, Mechanical properties, Visco elasticity, Wound healing process, Body response to implants, Blood compatibility.

UNIT - 2 **L-9, T-3**

IMPLANT MATERIALS :**IMPLANT MATERIALS**: Metallic implant materials, Stainless steels, Co-based alloys, Ti-based alloys, Ceramic implant materials, Aluminum oxides, Hydroxyapatite, Glass ceramics, Carbons, Medical applications.

UNIT - 3 **L-9, T-3**

POLYMERIC IMPLANT MATERIALS :Polymerization, Polyamides, Acryrilic polymers, rubbers, High strength Thermoplastics, Medical applications, Bio polymers- Collagen and Elastin; Medical Textiles-Silica, Chitosan, PLA composites, Sutures, Wound dressings; Materials for ophthalmology-Contact lens, Intraocular lens, Membranes for plasma separation and Blood oxygenation.

UNIT - 4 **L-9, T-3**

TISSUE REPLACEMENT IMPLANTS: Small intestinal submucosa and other decellarized matrix biomaterials for tissue repair; Softtissue replacements, Sutures, surgical tapes, adhesive, Percutaneous and skin implants, Maxillofacial augmentation, Vascular grafts, hard tissue replacement Implants, Joint replacements, Pancreas replacement.

UNIT - 5 **L-9, T-3**

ARTIFICIAL ORGANS: Artificial blood, Artificial skin, Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane), Dental Implants.

TEXT BOOK:

1. Sujata V. Bhatt, “Biomaterials”, Second Edition, Narosa Publishing House, 2005.

REFERENCE BOOKS:

1. Park J.B., “Biomaterials Science and Engineering”, Plenum Press, 1984.
2. Myer Kutz, “Standard Handbook of Biomedical Engineering and Design” Mc Graw Hill, 2003.
3. John Enderle, Joseph D. Bronzino, Susan M.Blanchard, “Introduction to Biomedical Engineering”, Elsevier, 2005.
4. A.C Anand, J F Kennedy, M.Miraftab, S.Rajendran,”Woodhead Medical Textiles and Biomaterials for Healthcare”, Publishing Limited 2006.
5. D F Williams, “Materials Science and Technology: Volume 14, Medical and Dental Materials: A comprehensive Treatment Volume”, VCH Publishers, 1992.
6. B D Ratner, AS Hoffmann,FJ Schoen and JE Lemmons, “An introduction to Materials in Medicine”, Academic Press 1996.

ACTIVITIES:

- *Classify biomaterials.*
- *Characterize the polymers based on strength, yielding and other mechanical properties specific to application.*
- *Biomaterials used for medical grafts,*
- *Determine and select the right materials for surgeries, or implants or whole organs replacement with artificial organs.*

16BM207 PATHOLOGY AND MICROBIOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	46	6	12	3	2

Course Description and Objectives:

This course deals with the principles and mechanism of pathological processes,cell injury, reversible and persistent cell injury reactions,Necrosis and apoptosis. It also explains about Acute, chronic and granulomatous inflammations, Systemic manifestations of inflammation. The course aims at learning role of pathogenic bacteria and viruses in causing disease laboratory diagnosis, methods of prevention and treatment, gaining knowledge of the structural and functional aspects of living organisms and also useful to know the etiology and remedy in treating the pathological diseases.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: describe the purpose and methods of measurements.

CO2: explain different display and recording devices for various applications.

CO3: know the different display and recording devices.

CO4: use different biosensors in various applications to acquire the information.

SKILLS:

- ✓ *Classification of cells and functions.*
- ✓ *Repair mechanisms of cells, tissues.*
- ✓ *Blood and bodily fluids regulations and disorders.*
- ✓ *Pathogens and other bacterial identifications.*
- ✓ *Study of immune response and various antigens.*

UNIT - 1 **L-9**

CELL DEGENERATION, REPAIR AND NEOPLASIA: Cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification, Cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumors, Carcinogenesis, Spread of tumors, Autopsy and biopsy.

UNIT - 2 **L-9**

FLUID AND HEMODYNAMIC DERRANGEMENTS: Edema, Normal hemostasis, Thrombosis, Disseminated intravascular coagulation, Embolism, Infarction, Shock, Hematological Disorders-Bleeding disorders, Leukaemias, Lymphomas.

UNIT - 3 **L-9**

MICROSCOPES: Light microscope,Bright field, Dark field, Phase contrast, Fluorescence, Electron microscope (TEM & SEM); Preparation of samples for electron microscope, Staining methods – Simple, Gram staining and AFB staining.

UNIT - 4 **L-9**

MICROBIAL CULTURES: Morphological features and structural organization of bacteria, Growth curve, Identification of bacteria, Culture media and its types, Culture techniques and Observation of culture.

UNIT - 5 **L-9**

IMMUNOLOGY: Natural and artificial immunity, Opsonization, Phagocytosis, Inflammation, Immune deficiency syndrome, Antibodies and its types, Antigen and antibody reactions, Immunological techniques-Immune diffusion, Immuno electrophoresis, RIA and ELISA, Monoclonal antibodies, Disease caused by bacteria, Fungi, Protozoal, Virus and Helminthes.

LABORATORY EXPERIMENTS

Course outcomes:

Student will be able to :

- study the histological slides
- observe stains under the microscopes.
- calculate clotting and bleeding times.

LIST OF EXPERIMENTS: Total hours-30

1. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood)
2. Study of parts of compound microscope
3. Histopathological slides of benign and malignant tumours.
4. Manual paraffin tissue processing and section cutting (demonstration)
5. Cryo processing of tissue and cryosectioning (demonstration)
6. Basic staining – Hematoxylin and eosin staining.

ACTIVITIES:

- *Identification of bacteria and colonies with staining.*
- *Observing cells under micro-scopes and identifying.*
- *Culturing cells to colonies to identify bacteria.*
- *Finding anti bodies and antigens using ELISA and RIA tests and more.*

7. Special stains – cresyl fast Blue (CFV)- Trichrome – oil red O – PAS
8. Simple stain.
9. Gram stain.
10. AFB stain.
11. Slides of malarial parasites, micro filaria and leishmania donovani.
12. Haematology slides of anemia and leukemia. Study of bone marrow charts.
13. Bleeding time and clotting time.

TEXT BOOKS:

1. Ramzi S Cotran, Vinay Kumar & Stanley L Robbins, "Pathologic Basis of Diseases", 7th edition, WB Saunders Co., 2005.
2. Prescott, Harley and Klein, "Microbiology", 5th edition, McGraw Hill, 2002.

REFERENCE BOOKS:

1. Underwood JCE: "General and Systematic Pathology Churchill Livingstone", 3rd edition, 2000.
2. Ananthanarayanan and Panicker, "Microbiology" Orientblackswan, 2005.
3. Dubey RC and Maheswari DK. "A Text Book of Microbiology" , Chand & Company Ltd, 2007.

16BM208 TRANSDUCERS AND BIOSENSORS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

This Course imports the knowledge of Classification and descriptions of transducers, Survey of possible energy conversions. this course is useful to learn the purpose of measurement, the methods of measurements, errors associated with measurements and to know the principle of transduction, classifications and the characteristics of different transducers and study its Biomedical applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: describe the purpose and methods of measurements.

CO2: explain different display and recording devices for various applications.

CO3: know the different display and recording devices.

CO4: use different biosensors in various applications to acquire the information.

SKILLS:

✓ *Determination of common instrument parameters.*

✓ *Finding the characteristics of transducers.*

✓ *Identify different transducers and sensors*

✓ *Verification through different measuring systems.*

ACTIVITIES:

- o *Measuring and calibrating a system*
- o *Measuring displacement, pressure.*
- o *Measuring temperature, capacitance, inductance for biomedical applications*
- o *Recording and displaying of parameters.*

UNIT - 1 **L-9**

SCIENCE OF MEASUREMENT: Measurement System, Instrumentation, Classification and Characteristics of Transducers, Static and Dynamic, Errors in Measurements, Calibration, Primary and secondary standards.

UNIT - 2 **L-9**

DISPLACEMENT, PRESSURE AND TEMPERATURE SENSORS: Strain Gauge- Gauge factor, Sensing elements, Configuration, Unbounded strain gage, Biomedical applications; Strain gauge as displacement andPressure transducers, Capacitive transducer, Inductive transducer, LVDT; Passive types- RTD materials and range, Relative resistance vsTemperature characteristics, Thermistor characteristics, Biomedical applications of Temperature sensors; Active type-Thermocouple,Characteristics.

UNIT - 3 **L-9**

PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS: Phototube, Scintillation counter, Photo Multiplier Tube (PMT), Photovoltaic, Photo conductive cells, Photo diodes, Phototransistor, comparison of photoelectric transducers, Spectro photometric applications of photo electric transducers; Piezoelectric active transducer and biomedical applications as pressure and Ultrasound transducer.

UNIT - 4 **L-9**

SIGNAL CONDITIONING AND SIGNAL ANALYSER: AC and DC Bridges, Wheat stone bridge, Kelvin, Maxwell, Hay, Schering – Concepts of filters, Preamplifier,Impedance matching circuits,Isolation amplifier, Spectrum analyzer.

UNIT - 5 **L-9**

DISPLAY AND RECORDING DEVICES: Digital voltmeter, Multi meter, CRO,Block diagram, CRT – Vertical and horizontal deflection system, DSO, LCD monitor, PMMC writing systems, Servo recorders, Photographic recorder, Magnetic tape recorder, Inkjet recorder, Thermal recorder.

LABORATORY EXPERIMENTS

Course Outcomes:

Student will be able to:

- have a knowledge on the pressure sensors, how they care used.
- have a knowledge on how the temperature sensors are used.
- signal conditioning for the sensors and transducers.

List of Experiments : **Total hours:30**

I. Study the characteristics of following Transducers:

1. Thermistors, Thermocouple, RTD
2. Potentiometric transducer
3. Strain Gauge and Load Cell
4. LVDT
5. Capacitive transducer (Linear and Angular)
6. Piezoelectric transducer

7. Photoelectric transducer(LDR)
8. Hall Effect transducer

II. Signal conditioners for the following transducers:

(i) Piezoelectric transducers

(ii) Thermocouple

(iii) Phonocardiography transducer

(iv) Strain gauge (v) LVDT

(vi) Plethysmographic transducer

(vii) Capacitive transducer

(viii) Electromagnetic flow transducer

(ix) Optical transducer

TEXT BOOK:

1. A.K.Sawhney, "Electrical and Electronics Measurement and Instrumentation",10th edition, Dhanpat Rai and Co, New Delhi, 2010.

REFERENCES:

1. Ernest O Doebelin and Dhanesh N Manik, Measurement systems, Application and design, 5th edition, Mc Graw-Hill, 2007.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
3. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
4. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004.
5. L.A Geddas and L.E.Baker, "Principles of Applied Biomedical Instrumentation", John Wiley and Sons, 3rd edition, Reprint 2008.
6. Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: clear industry recognized certification such as BEC Vantage by the University of Cambridge.

CO2: stand out both in the professional setting as well as for further pursuits in the academic world.

CO3: succeed confidently in all four critical components of communication - LSRW (listening, speaking, reading and writing).

SKILLS:

✓ *Grammar rules in writing sentences, paragraphs and paraphrasing.*

✓ *Compose business emails, memos, letters, reports and proposals.*

✓ *Comprehend business articles and documents.*

✓ *Use of expressions in professional context and acquire presentation skills like one minute talk and pair discussion.*

✓ *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT - 1 **LEARNING-3 HRS+ PRACTICE -3HRS =06 HRS**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage) **Elements of Technical Writing**- Sentence structure, reducing verbosity, arranging ideas logically, building coherence, paragraph level and document level, topic sentence, cohesive devices, transitional words, paraphrasing and précis-writing.

Mechanics of Writing- Stylistic elements, the rapporteur, the purpose, the reader's viewpoint (audience), elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, weak links in business correspondence, ethical concerns in business writing, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication.

UNIT - 2 **LEARNING-3 HRS+ PRACTICE -3HRS =06 HRS**

BUSINESS CORRESPONDENCE: E-mail- nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and minutes of the meeting, notice, circular and memo.

Letter Writing - Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiring, claim letter, letter of apology etc]; Introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts of a report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusions, recommendations, citations, references and appendices).

UNIT - 3 **LEARNING-3 HRS+ PRACTICE -3HRS =06 HRS**

SPEAKING: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), features of a good power point presentation (making the PPT), delivering the presentation effectively, telephone etiquettes, delivering seminar/proposal/ report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations.

UNIT - 4 **LEARNING-3 HRS+ PRACTICE -3HRS =06 HRS**

READING: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **LEARNING-3 HRS+ PRACTICE -3HRS =06 HRS**

LISTENING: Specific information in business context, listening to telephonic conversations/messages and understanding the correct intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion and enable active listening.

TEXT BOOKS: BEC

1. G. B. Hart, "Cambridge English Business Bench Mark: Upper Intermediate', 2nd edition, CUP, 2004.
2. CUP, Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

ONLINE REFERENCES:

1. http://www.cambridgeenglish.org/exams/business-certificates/business vantage/preparation/
2. https://www.youtube.com/watch?v=qxFtn9pGaTI.

ACTIVITIES:

- *Basic grammar practice, framing paragraphs on topics allocated.*
- *Paraphrasing an article or a video in your own words. Finding topic sentences in newspaper articles.*
- *Finding out new words from a professional viewpoint. Understanding the meaning and its usage.*
- *Perusing samples of well prepared proposals and reports.*
- *Draft different proposals/reports on topics assigned.*
- *Watching videos/ listening to audios of business presentations.*
- *Classroom activities of team and individual presentations.*
- *Using PPTs, mock exercises for BEC speaking.*
- *Presenting (speaking) the written components completed in Unit 1.*
- *Hand-outs; matching the statements with texts.*
- *Finding missing appropriate sentence in the text from multiple choice, multiple choices.*
- *Using right vocabulary as per the given context and editing a paragraph.*

VFSTR UNIVERSITY

III Year - B.Tech. BME
CURRICULUM

I SEM & II SEM

III Year B.Tech. Biomedical I - Semester

L	T	P	To	C
4	-	-	4	4

BM301 - MICROPROCESSORS AND MICROCONTROLLERS FOR BIOENGINEERS

Course description and Objectives:

This course introduces basic architecture and operation of microprocessor and microcontroller to the student. The course objective is to study the architecture and addressing modes of 8086/8051 and to know the importance of different peripheral devices and their interfacing to 8086.

Course Outcome:

Upon successful completion of this course, students should be able to:

- *Impart knowledge on the architecture and software aspects of microprocessor 8086*
- *Write assembly language program in 8086 for various application.*
- *Create the memory and IO interfacing techniques with 8086 and 8051*
- *Give an overview on the architecture and basic concepts of microcontroller*
- *Write assembly language program in microcontroller 8051 for various application*

UNIT - I

Introduction to microprocessors: Evaluation of microprocessors, 8086 microprocessor, architecture, register model, physical address generation, Pin diagram of 8086, addressing modes ,Interrupts of 8086, Interrupt vector table

UNIT – II

Interfacing of 8086 with programmable devices:, interfacing of 8086 with 8255 PPI(interfacing with switches and LEDs, ADC and DAC) , Direct Memory Access (DMA) and serial communication interface(USART)

UNIT -III

Introduction to Microcontroller: Differences between microprocessor and microcontrollers, 8051

Architecture, Internal & External memory organization, Pin diagram, addressing modes, Instruction set and assembly language programming ,Interrupts of 8051, Interfacing external memory to 8051,.ARM7TD.

UNIT IV

Arduino- Introduction, features and importance -Types of Arduino boards- arduino UNO - layout-arduino IO- Install the Arduino *IDE* - Arduino-compatible shields.

UNIT V

Coding structure and interfacing examples - Data types and operators,Function, Control statements [if, if… else, switch case.],Loop statements[while, for, do… while.]- Common functions. Interfacing examples

TEXT BOOKS :

1. Douglas V.Hall, "Microprocessors & Interfacing", 2nd ed., TMH, 2003.
2. Kenneth J. Ayala, "8051 Microcontrollers", Cengage Learning, 2008.

REFERENCE BOOKS :

1. A K Ray and K M Bhurchandi, "Advanced Microprocessors & Peripherals", 2nd ed., TMH, 2006.
2. Raj Kamal, "Microcontroller architecture, programming, Interfacing and System Design", Pearson Education, 2005
3. The 8051 Microcontroller and Embedded Systems using Assembly and C – Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, Pearson Education, 2008.
4. Barry B.Brey: Intel Microprocessor Architecture, Programming and Interfacing- 8086/8088, 80186, 80286, 80386 and 80486,PHI,1995.

III Year B.Tech. Biomedical I - Semester	**L**	**T**	**P**	**To**	**C**
	4	-	-	4	4

BM303 - BIOMEDICAL INSTRUMENTATION

Course description and Objectives:

The study of Bio potentials and electrodes are used to construct instrumentation systems to acquire and process different physiological signals. The use of display devices and recorders are also considered, and can be used to display or record type acquired signals. The students learn about analytical instruments and their working features along with their medical applications.

Course Outcomes:

Upon Completion of the Course the students will be able to

- *Explain the origins of various bio potentials and their conduction and propagation.*
- *Explain various biomedical instruments.*
- *Gain knowledge on circuitry behind medical instruments.*
- *Explain the principles of chemical analysis instruments.*

UNIT-I - Introduction to Medical Instrumentation: Block diagram of a medical instrumentation system, Bio-signals: Origin and characteristics of Biopotentials-ECG, EEG, EGG, EMG, ENG, EOG, and ERG; Problems encountered with measurements from human beings; Generalized medical instrument specifications, Electrode-Electrolyte Interface, Half cell potential, Offset Voltage; Types of Electrodes- external; Internal and Microelectrodes; Mathematical Treatment of Electrodes: Equivalent circuits and applications.

UNIT-II - Medical display Devices and recorders: Display Devices: Basic requirements for the display and recording of Bio-signals, Types of medical display devices. Medical recorders: Classification of recorders, PMMC writing systems. General features of ink-jet, thermo-sensitive and optical recorders. Oscilloscopes: Basic description, Cathode Ray Oscilloscope (CRO), Dual beam oscilloscope, Analog storage oscilloscope, Digital storage oscilloscope, Medical, Multibeam & Non-fade display systems. Liquid crystal displays: Introduction, Passive-matrix and active –matrix addressed LCDs.

UNIT III - Cardiac Instrumentation: Electrocardiography: Block diagram. Circuits, electrodes and their placement, Lead configuration and general ECG waveforms, ECG monitors: Single channel& multi-channel ECG systems; Holter monitors, Stress test systems. Blood Pressure measurement: Introduction to blood pressure; Direct and indirect methods of Blood Pressure measurements; Blood Flow measurement: Introduction to hemodynamics,Electromagnetic and Ultrasonic techniques of Blood flow measurement, Heart sounds: Origin of Heart Sounds, types of microphones for heart sound measurement, and non-contact type of measurement, Phonocardiography.

UNIT -IV - Neuro-muscular Instrumentation: Electroencephalography: EEG-Block diagram and circuits, electrodes and their placement, Lead configuration and general EEG graphs, Evoked potentials and their measurement. Filters for EEG rhythm analysis, Electromyography: Introduction to EMG signals, EMG-Block diagram and circuits; Electrodes and their placement, Nerve conduction velocity determination using EMG, Stimulators for EMG recording.

UNIT V - Medical Analytical Instrumentation: Methods of chemical analysis. Absorption Photometry, emission photometry; Flurometry, Colorimeter, spectrophotometer, Flame photometer, Mass spectrophotometer, Electrophoresis, chromatography, blood gas analyzer, Semi and fully automated analyzers.

TEXT BOOKS :

1. Webster J.G., *Medical Instrumentation Application and Design*. Houghton Mifflin, 2009.
2. Khandpur R.S. *Hand Book of Biomedical Instrumentation*, Tata McGrawHill,2003

REFERENCES :

1. Carr and Brown, *Introduction to Bio medical equipment technology*, 2011.
2. Khandpur R.S. *Hand Book of Analytical Instrumentation*, Tata McGrawHill,2010
3. John Enderle, Susan M. Blanchard, and Joseph Bronzino, *Introduction to Biomedical Engineering*, Second edition,2005

III Year B.Tech. Biomedical I - Semester

L	T	P	To	C
4	-	-	4	4

BM305 - DIAGNOSTIC AND THERAPEUTIC EQUIPMENT- I

Course description and Objectives*:*

The student should be made to:

Understand the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmitting them .Learn some of the cardiac assist devices .Learn to measure the signals generated by muscles.Understand the need and use of some of the extracorporeal devices

Course Outcomes:

At the end of the course, the student should be able to:

- *Use different medical devices applied in measurement of parameters related to cardiology, neurology*
- *Explain about cardiac assist devices, its continuous monitoring and transmission*

  Measure signals generated by muscles

UNIT I - CARDIAC EQUIPMENT

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Holter Monitor, Phonocardiography, Plethysmography. Cardiac Pacemaker- Internal and External Pacemaker– Batteries, AC and DC Defibrillator- Internal and External.

UNIT II - NEUROLOGICAL EQUIPMENT

Clinical significance of EEG, Multi-channel EEG recording system, Epilepsy, Evoked Potential–Visual, Auditory and Somatosensory, MEG (Magneto Encephalo Graph). EEG Bio Feedback Instrumentation.

UNIT III - SKELETAL MUSCULAR EQUIPMENT

Generation of EMG, recording and analysis of EMG waveforms, fatigue characteristics, Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

UNIT IV- PATIENT MONITORING AND BIOTELEMETRY

Patient monitoring systems, ICU/CCU Equipments, Infusion pumps, bed side monitors, Central consoling controls, Radio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

UNITV - EXTRA CORPOREAL DEVICES AND SPECIAL DIAGNOSTIC TECHNIQUES

Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenerators, finger pump, roller pump, electronic monitoring of functional parameter; Hemo Dialyser unit, Lithotripsy, Principles of Cryogenic technique and application, Endoscopy, Laproscopy. Thermography – Recording and clinical application, ophthalmic instruments.

TEXT BOOK:

1. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi, 2003.

REFERENCE BOOKS:

1. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design”, Mc Graw Hill, 2003.
2. L.A Geddes and L.eBaker, “Principles of Applied Biomedical Instrumentation”, 3rd edition, 2008
3. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Pearson Education, New Delhi, 2007.
4. Antony Y.K.Chan, “Biomedical Device Technology, Principles and design”, Charles Thomas Publisher Ltd, Illinois, USA, 2008.
5. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, Pearson education, 2004.
6. John G.Webster, “Medical Instrumentation Application and Design”, third edition, John Wiley and Sons, New York, 2006.

III Year B.Tech. Biomedical I - Semester

L	T	P	To	C
4	-	-	4	4

BM307 - ELECTRONICS ENGINEERING - II

Course Description and Objectives:

This course introduces the theoretical and circuit aspects of op-amp, timer, which are thebackbone for the basics of linear integrated circuits and to understand the various linear and non-linear applications of op-amp deals with fundamentals of number systems, Boolean expressions which are used to realize combinational and sequential circuits with their logic families.

Its objective is to introduce the concepts and techniques associated with the number systems and codes, to minimize the logical expressions using Boolean postulates, to design various combinational and sequential circuits and to provide with a sufficient number of applications for the techniques and mathematics used in this course.

Course Outcomes:

Students will be able to:

- explain the application of analog ics in the designing circuit.
- do applications of digital ics.
- understand the basic of the digital systems.
- design various functional circuits using these ics.
- understand the basic of the digital systems.

UNIT I NUMBER SYSTEMS AND LOGIC GATES

Decimal, Binary, Octal and Hexadecimal Numbers.-Conversion between these number systems.- Complements r’s and (r-1)’s complements-subtraction using complements – Encoding numbers and characters using Binary digits –Binary coded Decimal –Gray code - Binary to Gray code conversion –ASCII Code. Logic gates – Truth tables – NOT, AND, OR, NOR, NAND, XOR, XNOR - Boolean Laws and theorems – Solving Boolean expressions, Truth Tables and Logic circuits – The Karnaugh Map – half adder, full adder, Multiplexers and Demultiplexers - Decoders and encoders.

UNIT II REGISTERS AND COUNTERS

Flip Flops – RS, D, T, JK Flip Flops – Characteristic equations, exciting tables – JK Master – Slave flip-flop – Universal shift register; Design of modulo-N counters – counter design using state diagram.

UNIT III OPERATIONAL AMPLIFIERS

The characteristics of Ideal Operation – slew rate, offset voltage, bias current, CMRR, bandwidth - equivalent circuit of an op-Amp – virtual ground concept – Linear applications of op-amp – inverting and noninverting amplifier, summing, subtracting, averaging amplifier - voltage to current converter – current to voltage converter – Differential amplifiers – differentiator and integrator; Nonlinear applications – comparator - Schmitt Triggers – Precision Diode Half wave and full wave rectifiers – Average detectors – peak detector

UNIT IV ACTIVE FILTERS AND SIGNAL GENERATOR

Active filters (first and second order) – Low pass, high pass, band pass filters, band reject filters (notch filters). Oscillators - RC Phase shift and Wein-bridge. Waveform generators - Square, triangular and saw tooth.

UNIT V TIMER, PLL, A/D AND D/A CONVERTERS

555 Timer (internal diagram) and its applications – monostable multivibrator, astable multivibrator. Phase locked Loop (565 - block diagram approach) and its applications - Frequency multiplication, Frequency translation, voltage to frequency and frequency to voltage converters; DAC – Binary weighted DAC and R-2R DAC. ADC – single slope and dual slope ADCs, successive approximation ADC

TEXT BOOKS:

1. M. Morris Mano , "Digital Logic and Computer design " Prentice Hall 1994.
2. Ramakant A. Gayakwad , "Op-AMP and Linear Ics", Prince Hall, 1994

REFERENCE BOOKS:

1. Robert B.Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, 2004.
2. Sergio Franco, "Design with Operational Amplifiers and analog Integrated circuits", McGraw- Hills, 2003.
3. Millman J and Halkias .C., "Integrated Electronics", TMH, 2007.
4. John. F. Wakerly, "Digital Design Principles and Practices", Fourth edition, Pearson Education, 2007 .
5. Charles H. Roth, Jr, "Fundamentals of Logic Design", Fourth edition, Jaico Books, 2002.

III Year B.Tech. Biomedical I - Semester

L	T	P	To	C
4	-	-	4	4

BM309 - PHYSIOLOGICAL CONTROL SYSTEMS

***Course description and Objectives**:*

This course is designed to gain basic knowledge about the concepts of control systems and study its application in physiological modeling. To understand the system concepts and different mathematical modeling techniques applied in analyzing any given system.

Course Outcomes:

Upon Completion of the Course the students will be able to

- *Analyze the given system in time domain and frequency domain*
- *Know techniques to plot the responses iboth domain analyses using various plots.*
- *Explain concepts of physiological modeling sysyems and apply them to understand biological systems.*

UNIT-I Open and closed loop systems; Mathematical models of physical systems, Transfer functions; Block diagram algebra, Signal flow graphs.Feedback characteristics of control systems; Control systems and components; DC and AC servomotors, Principles of stepper motors.

UNIT-II Standard test signals, Time response of first order and second order systems; Design specifications of second order systems; Proportional controller; Proportional derivative controller; Proportional-Integral controller Proportional-Integral-Derivative controller Performance indices of control systems; Necessary conditions for stability; Hurwitz and Routh stability criteria, Relative stability.

UNIT-III Concept and construction of root locus, Root contours, Frequency response analysis, Correlation between time and frequency response, Bode plots, Stability in frequency domain,Nyquist stability criteria.

UNIT-IV Difference between general control systems and physiological control systems, examples of positive and negative feedback physiological control systems; Body temperature Regulation; Blood glucose regulation, Pupil Control System, Visual Fixation System, Oculo-motor System, Muscle stretch reflex, Skeletal muscle Servo-mechanism.

UNIT-V Cardiovascular Control Systems-Regulation of heart rate, blood pressure and cardiac output, Respiratory Control system-Chemical regulation of ventilation, Cheyne Stokes breathing.

TEXT BOOKS:

1. NagrathI.J and Gopal M., *Control Systems Engineering*, 3rd ed, New Age Publishers, 2002
2. Michael C. Khoo, *Physiological Control Systems-Analysis, Simulation and Estimation*, IEEE Press, 2000 4. Suresh R. Devasahayam "*Signals and Systems in Biomedical Engineering".*

REFERENCE :

1. A. Nagoor Kani "*Digital Signal Processing",*2nd ed.

III Year B.Tech. Biomedical I - Semester

L	T	P	To	C
4	-	-	4	4

BM311 - BIO INFORMATICS

Course description and Objectives*:*

The student should be made to:

Expose to the need for Bioinformatics tools. Be familiar with the modeling techniques. Learn microarray analysis. Expose to Pattern Matching and Visualization.

Course Outcomes:

Upon Completion of the Course the students will be able to:

UNIT - I - INTRODUCTION

Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT - II - DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

UNIT - III - MODELING FOR BIOINFORMATICS

Hidden markov modeling for biological data analysis – Sequence identification –Sequence classification – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.

UNIT - IV - PATTERN MATCHING AND VISUALIZATION

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT - V - MICROARRAY ANALYSIS

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model - Benchmark – Tradeoffs

TEXT BOOK:

1. Yi-Ping Phoebe Chen Edition, “BioInformatics Technologies”, First Indian Reprint, Springer Verlag, 2007.

REFERENCE BOOKS:

1. Bryan Bergeron, “Bio Informatics Computing”, Second edition, Pearson Education, 2003.
2. Arthur M Lesk, “Introduction to Bioinformatics”, Second edition, Oxford University Press, 2005.

III Year B.Tech. Biomedical I - Semester

L	T	P	To	C
4	-	-	4	4

BM313 - TOTAL QUALITY MANAGEMENT

Course description and Objectives:

To facilitate the understanding of Quality Management principles and process.

Course Outcomes:

Upon Completion of the Course the students will be able to

- *Apply the tools and techniques of quality management to manufacturing and services processes.*
- *Ascertain the standards specific to product selection and development of project related*

UNIT - I - INTRODUCTION

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT - II - TQM PRINCIPLES

Leadership - Strategic quality planning, Quality Councils - Employee involvement - MotivationEmpowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT - III - TQM TOOLS AND TECHNIQUES I

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT - IV - TQM TOOLS AND TECHNIQUES II

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT - V - QUALITY

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.

TEXT BOOK:

1. Dale H. Besterfiled, et at., "Total quality Management", Third Edition, Pearson Education Asia, Indian Reprint, 2006.

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.

2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

III Year B.Tech. Biomedical I - Semester

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BM315 - MICROPROCESSOR AND MICROCONTROLLER FOR BIO ENGINEERS LAB

PART A STUDY EXPERIMENTS:

1. Software Downloading / Installing & Interface
2. Basic Code
3. Sensors: Potentiometers
4. Sensor: Infrared Distance
5. Actuator: Servo Motor
6. Sensor: Force, Bend, Stretch
7. Sensor: Accelerometer, Gyro, IMU
8. Shield: Wheatstone Bridge & LCD
9. Programming Arduino Platforms Using a Different IDE

PART B PROGRAMMING:

1. Blinking LED
2. Write an Arduino program to control LED using switch SW
3. Write an Arduino program to control the six LEDs using the six corresponding switches
4. Write an Arduino program to write your name
5. Write an Arduino program to write your name in the first line and your roll number in the second line
6. Write an Arduino program to read the LM35 sensor, convert the value into temperature and display it on the serial monitor
7. Write an Arduino program to read the LM35 sensor, convert the value into temperature and display it on the LCD
8. Write an Arduino program to read the LDR sensor and display it on the serial monitor.

III Year B.Tech. Biomedical I - Semester

L	T	P	To	C
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BM317 - BIOMEDICAL INSTRUMENTATION LAB

LIST OF EXPERIMENTS:

I. Design systems

1. Experiment on Electrodes- ECG, EEG, EMG
2. Design/Fabrication and test:
   (i) ECG system
   (ii) EEG system
   (iii) EMG system
   (iv) GSR system

II. Clinical Experiments:

1. Colorimeter
2. Spectrophotometer
3. Electrophoresis Apparatus (Paper and Gel)
4. Body mass index experiment
5. Tuning fork experiment to test the hearing ability of the subject
6. Blood Pressure measurement by using Sphygmomanometer

III. Design Experiments

1. Design of Instrumentation amplifiers for ECG, EEG, and EMG
2. Design of filters for ECG, EMG, and EEG.
3. Common Mode Rejection Ratio (CMRR) of Medical instrumentation amplifier
4. Design of RC phase shift oscillator for LVDT.

TEXT BOOKS:

1. Webster J.G., “Medical Instrumentation Application and Design”, 4th edition, Houghton Mifflin,2009.
2. Khandpur R.S. “Hand Book of Biomedical Instrumentation”, 3rd edition, ata McGrawHill,2003.

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II Year B.Tech. ECE II - Semester

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HS304 PROFESSIONAL COMMUNICATION LAB

Course description and Objectives:

The Professional Communication exposes students to conventions of corporate communication and documentation procedures involved in the day-to-day functioning of the business world. The course is aimed at improving written communication skills of undergraduate students and preparing them to meet professional challenges in the work spheres. Writing and Personality are not two exclusive spheres of influence and this course will work on the relationship between professional writing and a personality that is able to meet the goals of an organization in creative and innovative ways.

Course outcomes:

- *To enable students to write logical sentences and paragraphs, use appropriate diction, grammar and punctuation.*
- *To expose them to the world of business and business register*
- *To make them compose clear and concise business messages*
- *To produce business documents for mailing to external recipients or intra-organizational circulation*
- *To enable them to speak business English for handling various business situations*

UNIT I-Mechanics of writing

- Elements of Technical Writing : Sentence structure - reducing verbosity - arranging ideas logically – building coherence - paragraph level and document level - topic sentence - cohesive devices – transitionals – paraphrasing – précis-writing.
- Mechanics of Writing: Stylistic elements – the rapporteur- the purpose- the reader (audience) -elementary rules of grammar- choice of diction - elementary principles of composition - matters of form – punctuation - conventions of business communication -language and tone - weak links in business correspondence - ethical concerns in business writing

UNIT II- Business Report Writing

- Parts of the Report: Writing an abstract - features of a good abstract – approach - compare and contrast - cause and effect.

Types of Technical Reports : Drafting a technical proposal - formal and informal proposals - factual reports, feasibility reports, survey reports – parts of a report - title page –declaration – acknowledgements – table of contents - abstract – introduction – conclusion – citations – references - appendices - oral reports and presentations

UNIT III- Business Letter Writing

- Letter-Writing - Formal and informal letters - structure of formal letters - expressions of salutations, introductory and concluding paragraphs - different types of letters - sales letter - complaint letter - adjustment letter - letter to the editor - covering letter - claim letter – letter of condolence.

UNIT IV- Business E- writing

- E-mail – nature and scope - e-mail etiquette – Common Errors in composing e-mails –
- Quotations - Inviting quotations - sending quotations –placing orders
- Office Communication - agenda - notice - circular
- Effective Resume-Writing: Structure and presentation - defining career objective - projecting one's strengths and skill-sets
- Summarizing - formats and styles - covering letter.

UNIT V -Business visual presentations

- Business Proposals: Drafting business proposals - calculating profit and loss-averages - ratios and proportions – partnership - simple interest - compound interest - calculating volumes and areas
- course of action - cause and effect- theme detection - making judgments -logical deductions - analyzing arguments – syllogisms -

- Venn diagrams - matching definitions -verbal reasoning - numerical reasoning - working out justifications.

REFERENCE BOOKS:

1. Strunk , William, Jr.*The Elements of Style*, Fourth Edition,
2. Rozakis, Laurie, Ph.D, (2003). *English Grammar for the Utterly Confused*, McGraw-Hill
3. Sharma. C. (1978) *Business Correspondence & Report Writing*, Tata McGraw-Hill
4. Kirkman, John. *Good Style: Writing for science & technology*, Routledge Study Guides, second edition.
5. Monippally, Matthukutty. M. 2001. *Business Communication Strategies*. 11th Reprint. Tata McGraw-Hill. New Delhi

III Year B.Tech. Biomedical II - Semester

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EC431 - DIGITAL SIGNAL PROCESSING

***Course description and Objectives**:*

Understanding sampling and reconstruction in both the time and frequency domains .Understanding linear time-invariant systems, system properties, the convolution sum, and properties of convolution.Understanding the system frequency response, magnitude response and phase response. Understanding the Z-transform and its application to identifying system properties, solving difference equations, and determining the frequency response of a system.Understanding MATLAB as a tool for signal processing.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- *Design digital IIR filters by designing prototypical analog filters and then applying analog to digital conversion techniques such as the bilinear transformation.*
- *Design digital FIR filters using the window method.*
- *Analyze signals using the discrete Fourier transform (DFT).*
- *Understand circular convolution, its relationship to linear convolution, and how linear convolution can be achieved via the discrete Fourier transform.*
- *Understand the Decimation in time and frequency FFT algorithms for efficient computation of the DFT.*
- *Alter the sampling rate of a signal using decimation and interpolation.*

UNIT - I

Introduction: Review of Signals and Systems, linear shift invariant systems, stability, and causality; Linear constant coefficient difference equations: Impulse response, step response, response to arbitrary inputs. Frequency domain representation of discrete time signals and systems: Z-Transform and properties, analysis of linear time invariant systems using Z-domain.

UNIT - II

Frequency Analysis of Discrete Time Signals: Discrete Fourier representation of periodic sequences(DTFT), Properties, Frequency response.

Discrete Fourier Transform: Discrete Fourier transforms, Properties of DFT, linear convolution of sequences using DFT, Computation of DFT.

UNIT - III

Fast Fourier Transform: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, Radix-4 FFT, Filtering of long data sequences: Overlap save and overlap add methods.

UNIT - IV

FIR Filter Design & Realization: FIR System function, Characteristics of FIR Digital Filters, frequency response; Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique; Structures of FIR: Direct form structure, cascade form structure, Linear Phase structure, signal flow graphs and transposed structures.

UNIT - V

IIR Filter Design & Realization: IIR System Function, Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Analog-to- Digital transformations. Structures of IIR : Direct form I and II, cascade form, parallel form, signal flow graphs and transposed Structures; Comparison of IIR & FIR filters.

TEXT BOOKS :

1. John G. Proakis, Dimitris G.Manolakis, “Digital Signal Processing, Principles, Algorithms and Applications”, Pearson Education / PHI, 2007.
2. A.V.Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, PHI, 1997.

REFERENCE BOOKS :

1. Ramesh Babu, “Digital Signal Processing”, Scitech, 2003.
2. M H Hayes, “Digital Signal Processing : Schaum’s Outlines”, TATA McGraw Hill, 2007.
3. Alan V. Oppenheim, Ronald W. Schafer, “Digital Signal Processing”, PHI, 2006.
4. Salivahanan, Vallavaraj, Gnanapriya, “Digital Signal processing”,

III Year B.Tech. Biomedical II - Semester

L	T	P	To	C
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CS218 - DATA STRUCTURES

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explaining how to implement them. It begins with the basic concepts of data and data structures and introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

Course Outcomes:

The student will be able to:

- *apply advanced C programming techniques such as pointers, dynamic memory allocation, structures to develop solutions for particular problems.*
- *analyze characteristics of various data structures.*
- *differentiate between Graphs and Trees.*
- *understand the importance of sorting and applying it wherever useful.*
- *understand the usefulness of data structures in solving problems.*

UNIT I

Linear Data Structures-arrays Introduction – Data, Data type, Data Structures – Primitive and Non-primitive, Storage structures – Sequential and linked storage representations, File structures, Abstract Data Type (ADT). Overview of Structures-arrays, operations on arrays(retrieval of an element, search an element, insertion deletion of an element), manipulations on arrays such as finding the sum of elements of an array, adding two arrays, and reversing an array; Maximum sub sequence problem, Multi dimensional arrays.

UNIT II

Linked Lists Types of Linked Lists Singly Linked List, Doubly Linked List, Circular Linked List; Operations on linked lists-insertion, deletion, traversing forward/reverse order; Multi lists, Applications of Linked Lists; VFSTR UNIVERSITY Computer Science & Engineering 30.

UNIT III

Stacks And Queues Stacks – ADT, Array and Linked representations, Implementation and their applications; Queues – ADT, array and linked representations, Implementation of linear, circular and doubly-ended queues, and their applications.

UNIT IV

Non-linear Data Structures-trees Preliminaries –Binary Tree – ADT, array and linked representations, Binary tree properties, tree traversal, Implementation, Expression trees; The Search Tree ADT –Binary Search Trees, Implementation; AVL Trees – Single Rotations, Double rotations.

UNIT V

Graphs Graphs – ADT, definitions and properties, modeling problems as graphs, representation – adjacency matrix and adjacency list, basic graph traversals – breath first search and depth first search; Applications of graphs.

TEXT BOOKS:

1. Richard F.Gilberg, Behrouz A. Forouzan, “Data Structures –A Pseudocode Approach with C”, 2nd edition, Cengage Learning, 2005.
2. Y.Langsam, M.J.Augeustein and A.M.Tenenbaum, “Data Structures Using C”, Pearson Education Asia, 2004.

REFERENCE BOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second edition, Pearson Education,1997.
2. Sartaj Sahni, Data Structures, Algorithms and Applications in C++ , Universities Press, Second edition, 2005.
3. Jean Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications,Tata Mc-Graw Hill, Second edition, 26th Reprint 2004.
4. KRUSE, Data Structures and Programming Design-PHI.

III Year B.Tech. Biomedical II - Semester

L	T	P	To	C
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BM302 - DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS – II

Course description and Objectives:

The student should be made to:

Gather basic knowledge about measurements of parameters related to respiratory system. Learn measurement techniques of sensory responses Understand different types and uses of diathermy units. Know ultrasound imaging technique and its use in diagnosis.Know the importance of patient safety against electrical hazard.

Course Outcomes:

At the end of the course, the student should be able to:

- *Explain about measurements of parameters related to respiratory system*
- *Describe the measurement techniques of sensory responses*
- *Analyze different types and uses of diathermy units*
- *Discuss ultrasound imaging techniques and its usefulness in diagnosis*
- *Outline the importance of patient safety against electrical hazard*

UNIT - I - RESPIRATORY MEASUREMENT STSTEM

Instrumentation for measuring the mechanics of breathing – Spirometer - Lung Volume and vital capacity, measurements of residual volume, pneumotachometer – Airway resistance measurement, Whole body plethysmography, Intra-Alveolar and Thoracic pressure measurements, Apnea Monitor. Types of Ventilators – Pressure, Volume, Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators

UNIT - II -SENSORY MEASUREMENT

Psycho Physiological Measurements-for testing and sensory Responses, Electro occulograph, Electro retinograph, Audiometer-Pure tone, Speech; EGG (Electrogastrograph), galvanic skin resistance (GSR).

UNIT - III - DIATHERMY **9**

IR and UV lamp and its application.Short wave diathermy, ultrasonic diathermy, Microwave diathermy, Electro surgery machine - Current waveforms, Tissue Responses, Electro surgical current level, Hazards and safety procedures.

UNIT - IV - ULTRASONIC TECHNIQUE **9**

Diagnosis: Tissue Reaction, Basic principles of Echo technique, display techniques A, B and M mode, B Scan, Application of ultrasound as diagnostic tool – Echocardiogram, Echoencephalogram, abdomen, obstetrics and gynecology, ophthalmology.

UNIT - V - PATIENT SAFETY **9**

Physiological effects of electricity – important susceptibility parameters – Macro shock – Micro shock hazards – Patient s electrical environment – Isolated Power system – Conductive surfaces – Electrical safety codes and standards – Basic Approaches to Protection against shock, Protection equipment design, Electrical safety analyzer – Testing the Electric system.

TEXT BOOK:

1. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi, 2003.

REFERENCE BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007
2. John G. Webster, “Medical Instrumentation Application and Design”, John Willey and Sons, 2006.
3. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, Pearson Education, 2004.
4. Richard Aston “Principles of Biomedical Instrumentation and Measurement”, Merril Publishing Company, 1990.
5. L.A Geddas and L.E.Baker “Principles of Applied Biomedical Instrumentation” 2004.
6. John G. Webster, “Bioinstrumentation”, John Willey and sons, New York, 2004.
7. Myer Kutz “Standard Handbook of Biomedical Engineering & Design”, McGraw-Hill Publisher, 2003.

III Year B.Tech. Biomedical II - Semester

L	T	P	To	C
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BM304 - MEDI EMBEDDED SYSTEMS AND RTOS

***Course description and Objectives**:*

The student should be made to:

Able to write programs to interface with 8085/8086 .Write programs to interface with 8051. Know the concept of interfacing PIC microcontroller.

Course Outcomes:

Upon the successful completion of the course, the student should be able to:

- *Understand difference between micro processor and micro controller.*
- *Design small embedded systems with 8051.*
- *Use kernel objects.*
- *Know the design methodologies.*

UNIT- I

Embedded Systems: Basic concepts, requirements, categories, design challenges embedded operating system –Types, Hardware architecture, Software architecture, application software, communication software, and process of generating executable image, development /testing tools

UNIT - II

Embedded System Development —The development process, requirements engineering, design, implementation, integration and testing, packaging, configuration management, management of development projects

UNIT-III

The execution environment-memory organization, system space, code space, data space, unpopulated memory space, i/o space, system start up, interrupt response cycle, Functions Calls & Stack Frames, run time environment.

UNIT- IV

Architecture of Kernel, Tasks and Task Scheduler - Task States, Content Switching, Scheduling Algorithms, Rate Monotonic Analysis, Task Management Function Calls. Interrupt Service Routines, Semaphores, mutex, mailboxes, message queues, event registers, pipes, signals, timers, memory management, Priority Inversion Problem

UNIT - V

Design methodologies and design flows, case studies- fetal heart rate monitor, versatile drop foot stimulator, myoelectric arm, telemonitoring system

TEXT BOOKS:

1. Arnold S. Berger, *An introduction to Processes, Tools and Techniques*, CMP books, 2005.
2. Dr.K.V.K.K.Prasad*, Embedded Real time Systems*, Dreamtech Press, 2003.
3. Wayne wolf , “Computers as Components: Principles of Embedded Computer systems design”, Morgan Kaufmann Publishers,2000

III Year B.Tech. Biomedical II - Semester

L	T	P	To	C
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BM306 - BIO MATERIALS AND ARTIFICIAL ORGANS

Course description and Objectives:

The student should be made to

Learn characteristics and classification of Biomaterials. Understand different metals and ceramics used as biomaterials. Learn polymeric materials and combinations that could be used as a tissue .Replacement implants. Know artificial organ developed using these materials.

Course Outcomes:

At the end of the course, the student should be able to:

- *Analyze different types of Biomaterials and its classification.*
- *Perform combinations of materials that could be used as a tissue replacement implant.*

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY

Definition and classification of bio-materials, mechanical properties, visco elasticity, wound healing process, body response to implants, blood compatibility.

UNIT II IMPLANT MATERIALS

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implantmaterials, aluminum oxides, hydroxyapatite, glass ceramics, carbons, medical applications.

UNIT III POLYMERIC IMPLANT MATERIALS

Polymerization, polyamides, Acryrilic polymers, rubbers, high strength Thermoplastics, medicalapplications; Bio polymers: Collagen and Elastin; Medical Textiles: Silica, Chitosan, PLA composites, Sutures, wound dressings; Materials for ophthalmology: contact lens, Intraocular lens; Membranes for plasma separation and Blood oxygenation.

VFSTR UNIVERSITY

UNIT - IV - TISSUE REPLACEMENT IMPLANTS

Small intestinal sub mucosa and other decullarized matrix biomaterials for tissue repair. Soft tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, Vascular grafts, hard tissue replacement Implants, joint replacements, Pancreas replacement.

UNIT- V - ARTIFICIAL ORGANS

Artificial blood, Artificial skin, Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyzer membrane), Dental Implants.

TEXT BOOK:

1. Sujata V. Bhatt, “Biomaterials”, Second edition, Narosa Publishing House, 2005.

REFERENCE BOOKS:

1. Park J.B., “Biomaterials Science and Engineering”, Plenum Press, 1984.
2. Myer Kutz, “Standard Handbook of Biomedical Engineering and Design” Mc Graw Hill, 2003
3. John Enderle, Joseph D. Bronzino, Susan M.Blanchard, “Introduction to Biomedical Engineering”,Elsevier, 2005.
4. A.C Anand, J F Kennedy, M.Miraftab, S.Rajendran,”Woodhead Medical Textiles and Biomaterialsfor Healthcare”, Publishing Limited 2006.

III Year B.Tech. Biomedical II - Semester

L	T	P	To	C
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BM308 - PHYSIOLOGICAL SYSTEMS MODELLING

Course description and Objectives:

The student should be made to

To appreciate the value and application of physiological models .To understand the process of modeling dynamically varying physiological systems. To understand methods and techniques to analyze and synthesize dynamic models .To develop differential equations to describe the dynamic behavior of physiological systems. To simulate and visualize dynamic responses of physiological models using computers . To solve and implement a modeling and design problem from inception to completion

Course Outcomes:

Upon completion of the course, students should able to

- *understand methods and techniques to analyze and synthesize dynamic models .*
- *develop differential equations to describe the dynamic behavior of physiological systems.*
- *simulate and visualize dynamic responses of physiological models using computers .*
- *solve and implement a modeling and design problem from inception to completion .*

UNIT I

Modeling concepts: The techniques of mathematical modeling; Classification of models characteristics of models, Metabolic and Endocrine Systems: Chemical reactions; Transport process. Diffusion, Transport by circulation, Controlled process.

UNIT II

Approaches to modeling: Mathematical representation of compartment and control system models; Perturbation schemes. Steady state; Dynamic

equilibrium, Convolution approach; Biological receptors: Receptor characteristics ,adaptation, rate sensitivity.

UNIT III

Glucose- insulin model to estimate insulin sensitivity; Insulin sensitivity; development of models of optimal complexity; Model decomposition; Models of glucose utilization; Model comparison; Insulin sensitivity index.

UNIT IV

Statistical approach modeling: Introduction, Discrete statistical signals; Continuous statistical signals; Averaging computations.

UNIT V

Tracer dynamics: Organ compartment model to relate Organ volume and flow-rate to monitored trace concentration, administration and its time profile; Model for measuring carbohydrate metabolism from monitoring of intravenously injected glucose.

TEXT BOOKS:

1. Kapoor J.N., Mathematical modeling, Wiley Eastern Lt ., 1988.
2. Carson E.R., Cobelli C. and Finkelstein L., The Mathematical Modeling of Metabolic and Endocrine Systems, John Willey and sons,1983.

REFERENCE :

1. William Simon, Mathematical techniques for Biology and Medicine, Dover Pub.1986.

III Year B.Tech. Biomedical II - Semester

L	T	P	To	C
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EC320 - VLSI DESIGN

Course description and Objectives:

In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied. Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed. The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

Course Outcomes:

Upon completion of the course, students should

- *Explain the basic CMOS circuits and the CMOS process technology.*
- *Discuss the techniques of chip design using programmable devices.*
- *Model the digital system using Hardware Description Language.*

UNIT I MOS TRANSISTOR PRINCIPLE

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties ofCMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverterscaling, propagation delays, Stick diagram, Layout diagrams.

UNIT II COMBINATIONAL LOGIC CIRCUITS

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles.

UNIT III SEQUENTIAL LOGIC CIRCUITS

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memoryarchitecture and memory control circuits, Low power memory circuits, Synchronous andAsynchronous design

UNIT IV DESIGNING ARITHEMETIC BUILDING BLOCKS

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TEXT BOOKS:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective". Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application specific integrated Circuits", Addisson Wesley, 1997

REFERENCE BOOKS:

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India, 2005
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.

III Year B.Tech. Biomedical II- Semester

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BM310 - DIGITAL SIGNAL PROCESSING LABORATORY

Course description and Objectives:

The student should be made to:

To implement Linear and Circular Convolution.To implement FIR and IIR filters.To study the architecture of DSP processor.To demonstrate Finite word length effect.

Course Outcomes:

Student will be able to

- *Demonstrate their abilities towards DSP processor based implementation of DSP systems.*
- *Analyze Finite word length effect on DSP systems.*
- *Demonstrate the applications of FFT to DSP.*
- *Implement adaptive filters for various applications of DSP.*

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of sequences (functional & random) & correlation.
2. Linear and Circular Convolutions.
3. Spectrum Analysis using DFT.
4. FIR filter design.
5. IIR filter design.
6. Multirate Filters.
7. Equalization.

DSP PROCESSOR BASED IMPLEMENTATION

8. Study of architecture of Digital Signal Processor.
9. MAC operation using various addressing modes.

10. Linear Convolution.
11. Circular Convolution.
12. FFT Implementation.
13. Waveform generation.
14. IIR and FIR Implementation.
15. Finite Word Length Effect.

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS (**2 students per system**)

- PCs with Fixed / Floating point DSP Processors (Kit / Add-on Cards) 15 Units

List of software required:

- MATLAB with Simulink and Signal Processing Tool Box or Equivalent Software in desktop systems -15 Nos
- Signal Generators (1MHz) – 15 Nos

III Year B.Tech. Biomedical II - Semester

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BM312 - EMBEDDED SYSTEMS LAB

1. Study of different microcontroller development systems.
2. Digital interfaces.
3. Analog interfaces
4. Keyboard interface.
5. LCD Display: Alphanumeric mode.
6. LCD Display: Graphic mode.
7. PC interface: RS 232.
8. PC interface: Ethernet.
9. PC –Wireless LAN.
10. EZPic Motherboard based experiments: Pic 18 F 452

Note:
The experiments to be conducted under this lab should include design/ fabrication/ evaluation/technical reporting/case-studies/mini projects. The students should be encouraged to take up different challenging mini projects in this lab.

III Year B.Tech. Biomedical II - Semester

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BM314 - MINI PROJECT

I

YEAR

PETROLEUM ENGINEERING

B.Tech.

I SEMESTER

- 16HS103 - Engineering Mathematics - I
- 16HS102 - Engineering Physics
- 16HS105 - Technical English Communication
- 16CS101 - Basics of Computers and Internet
- 16CS102 - Computer Programming
- 16EE101 - Basics of Engineering Products
- 16HS104 - English Proficiency and Communication Skills
- 16HS110 - Engineering Physics Laboratory

II SEMESTER

- 16HS108 - Engineering Mathematics - II
- 16HS107 - Engineering Chemistry
- 16ME101 - Engineering Graphics
- 16EE102 - Basics of Electrical and Electronics Engineering
- 16HS111 - Engineering Chemistry Laboratory
- 16HS109 - Environmental Science and Technology
- 16ME103 - Workshop Practice
- 16PL102 - Basics of Petroleum Engineering

COURSE CONTENTS

I SEM & II SEM

16HS103 ENGINEERING MATHEMATICS - I

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	30	10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer various analytical as well as numerical methods to solve first and second order ordinary differential equations; to impart the knowledge of partial differentiation; to acquaint with the various methods to solve first and second order partial differential equations; to make the student familiar with applications of first order ordinary differential equations. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- recognise and solve different types of first order ordinary differential equations.
- find the complementary functions and particular integral of second and higher order ordinary differential equations with constant coefficients.
- apply the knowledge of ordinary differential equations in some instances.
- solve ordinary differential equations, with initial conditions, numerically.
- find the local maxima/minima of given function of two variables.
- eliminate arbitrary constants/functions from given relations to form partial differential equations.
- solve linear and non-linear partial differential equations of standard types.
- classify second order partial differential equations and solve them.

SKILLS:

✓ *Solve given differential equation by suitable method.*

✓ *Compute numerical solutions of differential equation by apt method.*

✓ *Compute maxima/minima of given function.*

✓ *Solve given partial differential equation by appropriate method.*

ACTIVITIES:

- *Differentiate methods to solve given differential equation.*
- *Compute numerical solutions to differential equation and compare the result with MATLAB output.*
- *Compute maxima/minima of given function.*
- *Differentiate methods to solve given partial differential equation.*
- *Estimation of acoustic impedance of a given material.*

UNIT - 1 **L- 9, T-3**

FIRST ORDER DIFFERENTIAL EQUATIONS: Variable separable, Homogeneous differential equations, Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

UNIT - 2 **L- 9, T-3**

SECOND ORDER DIFFERENTIAL EQUATIONS: Linear differential equations with constant coefficients, Homogeneous differential equations of second and higher order, Methods to find particular integral when RHS is of the form - e^{ax}, sinax, cosax and x^n.

UNIT - 3 **L- 9, T-3**

APPLICATIONS OF FIRST ORDER DIFFERENTIAL EQUATIONS: Orthogonal trajectories (including polar form), Newton's law of cooling, Law of natural growth and decay.

NUMERICAL METHODS TO SOLVE DIFFERENTIAL EQUATIONS: Taylor series method, Picard's method, Euler's and modified Euler's method, Runge-Kutta method.

UNIT - 4 **L- 9, T-3**

MAXIMA/MINIMA OF FUNCTIONS OF TWO VARIABLES: Review of partial differentiation - Partial derivatives, Partial derivatives of higher order; Homogeneous function, Euler's theorem, Total differential coefficient, Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

JACOBIANS : Definition, Properties, Jacobian of implicit functions.

UNIT - 5 **L- 9, T-3**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations, Linear (Lagrange) equations, Method of multipliers, Non-linear partial differential equations (Types), Charpit's method, Second order linear equations with constant coefficients only, Classifications, Rules to find complimentary function and particular integral (special cases).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Basic mathematical operations using MATLAB.
2. Solving simple expressions.
3. Limits.
4. Continuity.
5. Symbolic differentiation.
6. Symbolic integration.
7. Plotting of curves.
8. Plotting of surfaces.
9. Maxima & minima of functions of one variable.
10. Maxima & minima of functions of two variable.

11. Solving first order O.D.E.

12. Euler's Method and R-K Method.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co, 2014.

2. B. S. Grewal, "Higher Engineering Mathematics", 44th edition, Khanna Publishers, 2014.

3. Rudra Pratap, "Getting started with MATLAB", Oxford University Publication, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.

2. B. V. Ramana, "Advanced Engineering Mathematics", McGraw Hill education, 25th reprint, 2015.

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fiber which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

✓ *Determine the velocity of ultrasonics in a given liquid using interferometer.*

✓ *Study the wavelengths of light sources and lasers.*

✓ *Estimate the efficiency of a given solar cell.*

✓ *Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.*

✓ *Know voltage – current characteristics of a given light emitting diode.*

UNIT - 1 **L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2 **L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO_2 laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3 **L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schroedinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4 **L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non- linear optical behaviour of materials, Applications.

UNIT - 5 **L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V.Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*

16HS105 TECHNICAL ENGLISH COMMUNICATION

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	15	5	6	4	5

Course Description and Objectives :

To introduce students the specific use of English for the purpose of Technical Communication that would strengthen their skills in the areas of writing and speaking and thereby enable them to function effectively in their professional sphere. The objective of this course is to direct the students towards developing their technical writing skills in particular and overall language proficiency in general. It will be done by making students peruse good samples of technical writing covering a wide range of contemporary issues relevant to the engineering profession. Students will, also be revisiting, the fundamentals of grammar to get trained on use of standard English.

Course Outcomes:

The student will be able to:

- acquire an understanding of the rules of grammar.
- strengthen their reading and listening comprehension skills to follow the academic discourse in the engineering classroom.
- have a command of basic vocabulary related to different subject areas.
- have a grasp on the mechanics of writing and express their ideas through construction of simple texts.
- attain language proficiency to participate in the classroom discussions.

SKILLS:

✓ *Apply different sub skills like skimming, scanning, reading for information, reading for inference etc to understand different kinds of text.*

✓ *Apply different sub skills like top down, bottom up approaches to listening, and understand phonetic and phonological features of the English language to deconstruct long spoken discourses.*

✓ *Use functional vocabulary relevant to subject areas like environment, tourism, engineering, technology and media to express ideas lucidly.*

✓ *Use appropriate sentence structure, cohesive devices and diction to construct simple text in writing and regular correspondence like e-mails, letters etc.*

✓ *Capture and understand key points during class room discourses through applying sub skills of writing like note-making, paraphrasing and summarizing.*

UNIT - 1 **L-9**

- Text : **ENVIRONMENTAL CONSCIOUSNESS**
  (Climate Change, Green Cover, Pollution, Renewable vs. Non renewable energy sources (from Energy Unit)
- Grammar : Articles, Prepositions, Sentence types and construction
- Vocabulary : Root, Prefixes, Suffixes
- Composition : Paragraph writing (Descriptive and narrative)
- Laboratory Practice : Introduction to phonetics
  (Organs of Speech, Consonants, Vowels and Diphthongs, Syllable, Stress and Intonation)

UNIT - 2 **L-9**

- Text : **EMERGING TECHNOLOGIES**
  (Solar power, Cloud computing, Nanotechnology, Wind energy (to be covered from Energy unit))
- Grammar : Time and tense (Present-past-future; Helping verbs, Modals)
- Vocabulary : Synonyms, Antonyms
- Composition : Letter writing (Informal)
- Laboratory Practice : Grammar Practice (Speaking of past, present and future)

UNIT - 3 **L-9**

- Text : **TRAVEL AND TOURISM**
  (Advantages and disadvantages of travel-tourism, Atithi devo bhava, Tourism in India)
- Grammar : Subject-Verb agreement, Sentence construction
- Vocabulary : Idioms and phrases
- Composition : Letter writing (Formal)
- Laboratory Practice : Situational conversations – Role - Plays
  (Introducing, Greeting, Enquiring, Informing, Requesting, Inviting)

UNIT - 4 **L-9**

- Text : **ENGINEERING ETHICS**
  (Challenger disaster, Biotechnology, Genetic engineering, Protection from natural calamities, How pertinent is the nuclear option? An environment of energy (from Energy Unit))
  Avoiding sexist language (Gender Sensitization)
- Grammar : Sentence transformation (Degrees, Voice, Speech and Synthesis)
- Vocabulary : Phrasal verbs

  Composition : Note-making, Text, Nandan Nilekani's In Search of Our Energy Solutions (from Energy Unit)
  Summarizing, Text on “Flight from conversation” (New York Times)
- Laboratory Practice : Situational conversations, Role-Plays (Emotions, Directions, Descriptions, Agreements, Refusals, Suggestions)

ACTIVITIES:

- *Doing phonetic transcription of selected words from the list provided using talking dictionaries of AHD and CALD.*
- *Completing graded grammar exercises in Rosetta Stone.*
- *Completing graded listening and reading comprehension exercises in Rosetta Stone.*
- *Watching TED videos and making notes.*
- *Watching TED videos to paraphrase and summarize.*
- *Ad- making.*
- *Preparing brochure.*
- *Dialogue writing followed by role play.*
- *Poster designing.*
- *Team presentation with PPTs and Group Discussion.*

UNIT - 5 **L-9**

- Text : **MEDIA MATTERS**

  (History of media, Language and media, Milestones in media, Manipulation by Media, Thousands march against nuclear power in Tokyo (from Energy Unit), Entertainment media, Interviews)

- Grammar : Common errors
- Vocabulary : One-word substitutes
- Composition : E-mail – Short message service (SMS), Writing advertisements, Reporting; Social media - Blogging, Facebook, Twitter (acceptable and non acceptable content)
- Laboratory

  Practice : Group discussions – (Topics from Energy Unit), Dumping of nuclear wastes, Exploration of eco-friendly energy options, Lifting of subsidies on petrol, Diesel, LPG etc)

TEXT BOOK:

1 *"Mindscapes* - English for Technologists and Engineers", Orient Black Swan, 2012.

REFERENCE BOOKS:

1. V. R. Narayana Swamy, "Strengthen Your Writing", 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, "The Most Common Mistakes in English Usage", 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanian, "A Textbook of English Phonetics for Indian Students", Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. "Spoken English: A Self-Learning Guide to Conversation Practice", 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, "Examine Your English", 1st edition, Orient Longman, 1999.
6. Ashraf Rizwi, "Effective Technical Communication", Tata McGraw Hill, 2005.

16CS101 BASICS OF COMPUTERS AND INTERNET

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides students with a working knowledge of the terminology, processes, and components associated with Computers and Internet. Students will get exposure to Building blocks of Computers, Operating Systems, Application software, Networking, Internet, World Wide Web, Security, Maintenance, Information Systems, and the application development processes.

Course Outcomes:

The student will be able to:

- understand the terms and concepts of Computer Science and Information Technology (hardware, software, networking, security, Internet/Web, and Technologies).
- use the products and services of computers.
- use Internet/Web services as a resource for developing shared applications.
- install different operating systems and application software.

SKILLS:

- ✓ *Assemble and disassemble the personal computer system.*
- ✓ *Install different desktop operating systems.*
- ✓ *Use the basic text processing, simple data analysis and data presentation tools.*
- ✓ *Configure network parameters.*
- ✓ *Secure the personal computer and information from various external threats.*

UNIT - 1 **L-10**

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors.

UNIT - 2 **L-10**

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3 **L-8**

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and database management systems.

UNIT - 4 **L-8**

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and other internet applications.

UNIT - 5 **L-9**

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

ACTIVITIES:

- *Prepare a report on various generations of computers and its peripherals.*
- *Disassembling and assembling of a personal computer system.*
- *Install the Linux operating system and other software required in a personal computer system.*
- *Connect the system to an Ethernet and configure the same.*
- *Prepare an MS Word Document.*
- *Prepare a spread sheet with various mathematical operations, charts and sorting etc.*
- *Make a report on power point presentation for the given topic.*

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- know the usage of the computer systems.
- setup the IDEs for the computer programming languages.
- get exposure on office automation tools like Microsoft Word, Excel, and power point.
- identify the different computer system and data threats and also protect them by installing antivirus software.

LIST OF EXPERIMENTS Total hours-30

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.

6. Demonstrate the following experiments using Office automation tools.
   a. Text formatting and table.
   b. Mathematical equations.
   c. Watermarking using Analysis tool.
   d. Calculate student mark details.
   e. Create four types of charts.
   f. Import external data, sort & filter using Power Point tool.
   g. Create text and images with effects.
   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

TEXT BOOK :

1. Peter Norton, “Introduction to Computers”, 7th edition, Tata-McGrawHill, 2010.

REFERENCE BOOKS:

1. ITL Education Solution Limited, “Introduction to Computer Science”, 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, “Fundamentals of Network Security”, 3rd edition, Tata-McGrawHill, 2004.

16CS102 COMPUTER PROGRAMMING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
48	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	5

Course Description and Objectives:

This course is aimed at offering fundamental concepts of programming language to the students. It starts with the basics of C-programming and deals with the structure and various attributes required for writing a 'C' program. It also introduces various operators and control statements used in programming. Then it switches to functions and arrays. It goes on with strings, pointers, files & the user defined data types. As a first-level course in computer science, it forms the basis to understand usage of various attributes in writing a program.

Course Outcomes:

The student will be able to :

- understand the basic terminology used in computer programming to write, compile & debug programs in 'C' language.
- use different data types to design programs involving decisions, loops and functions.
- understand the allocation and Usage of dynamic memory.
- understand the usage of files & structures.

SKILLS:

- ✓ *Identify suitable data types for an application.*
- ✓ *Apply control statements for decision making problems.*
- ✓ *Use multidimension array for matrix application.*
- ✓ *Design a program to calculate average of a class.*
- ✓ *Analyze the difference between static & dynamic memory allocation.*

UNIT - 1 **L- 10, T-3**

INTRODUCTION TO C PROGRAMMING: Structure of C program - Comments, Processor statement, Function header statement, Variable declaration statement and Executable statement; C character set, Constants, Identifiers, Operators, Punctuations, Keywords, Modifiers, Identifiers, Variables, C scopes, Basic data types, Type qualifiers, Storage classes, Reading and writing characters, Formatted I/O.

UNIT - 2 **L-9, T-3**

OPERATORS AND CONTROL STATEMENTS: Operators - Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Indirection, Sizeof, Dot, Arrow, Parentheses operators; Expressions - Operator precedence, Associative rules; Control statements - Category of statements, Selection, Iteration, Jump, Label, Expression and Block.

UNIT - 3 **L-9, T-3**

FUNCTIONS AND ARRAYS: Function - Declaration, Prototype, Definition, Calling by value and call by address, Standard library functions and Recursive functions; Array - Declaration, Initialization, Reading, Writing, Accessing and Passing as a parameter to functions, 2D-arrays, Multidimensional arrays.

UNIT - 4 **L-9, T-3**

STRINGS AND POINTERS: Strings - Declaration, String library functions, Array of strings, Command line arguments; Pointers - Declaration, Initializing pointers, Multiple indirection, Relationship between arrays and pointers; Scaling up - Array of arrays, Array of pointers, Pointer to a pointer, Pointer to an array; Pointer to functions, Dynamic memory allocation functions.

UNIT - 5 **L-8, T-3**

STRUCTURES AND FILES: Structures - Declaration, Initialization and accessing, Array of structures and passing structures to functions, Structure pointers, Arrays and structures within structures, Unions, Bit-fields, Types and enumerations; Files - I/O and processing operations on text and binary files; Pre-processor directives.

ACTIVITIES:

- *Implement matrix operations.*
- *Implement malloc and calloc functions.*
- *Copy the content of one file into the other.*
- *Implement string manipulations functions.*

LABORATORY EXPERIMENTS

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- write, compile and debug programs in C language.
- formulate problems and implement algorithms in C.
- develop programming components that efficiently solve computing problems in real-world.

LIST OF EXPERIMENTS Total hours-30

1. Compute the factors of a number.
2. Compute the average of 'n' numbers.
3. Find whether a number is palindrome or not.
4. Find whether a number is a power of 2 or not.
5. Compute the factorial of a number.
6. Implement any kind of operation (+,-,*,/,%) using a switch case.

7. Swap two values useing call by value and call by reference.
8. Using structure of arrays.
9. Find the reversal of a number.
10. Find the frequency of each number in the array.
11. Which takes 0's & 1's as input and the array should consist of all 0's first and then 1's.
12. Copy the first 10 words of a file into the other file.
13. Count the number of words in a file.
14. Create a structure which stores the student's information in a class.
15. Reverse the contents of the array.
16. Implement pointer of pointers.
17. Give n^{th} term of the Fibonacci number.
18. Find the factorial of a number using recursion.
19. Find the number of vowels in a file.
20. Access the structure and union members.

TEXT BOOK:

1. Ajay Mittal, "Programming in C - A practical Approach", 1^{st} edition, Pearson Education, India, 2015.

REFERENCE BOOKS:

1. Reema Thareja, "Introduction to C Programming", 2^{nd} edition, Oxford University Press India, 2015.
2. Herbert Schildt, C, "The Complete Reference", 4^{th} edition, Tata McGraw-Hill, 2000.
3. E. Balagurusamy, "Programming in ANSI C", 4^{th} edition, Tata McGraw- Hill, 2008.

16EE101 BASICS OF ENGINEERING PRODUCTS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course enables the students to understand the basics of civil, mechanical, electrical and electronics systems and components used in day-to-day life. It deals with construction materials, power generation principles and working of a few commonly used household appliances. Besides, the student will be able to identify/appreciate various concepts, service and maintainance of engineering products.

Course Outcomes:

The student will be able to:

- gain knowledge and hands-on experience on various engineering products.
- install, operate, maintain and troubleshoot basic mechanical, electrical and electronic appliances.
- understand the concept of conservation of energy.
- gain awareness on choosing appropriate construction materials.

SKILLS:

✓ *Identify UPS requirements for a given load.*

✓ *Provide a Lighting scheme for specific working environment.*

✓ *Design a composition of Heating element for a particular application.*

✓ *Trouble shoot issues relating to Immersion Heater and Induction Heater.*

✓ *Provide an earthing for Domestic Outlet.*

✓ *Select, Configure and maintain a few engineering appliances. Such as TV, Radio, Telephone, Mobile phone, Wifi Router, Micro oven, PA system etc.*

ACTIVITIES:

- *Trouble shooting of immersion heater and induction heaters.*
- *Disassembe and Assembe the Domestic Appliances such as Mixer Grinder, Fan etc.,*
- *Provide Earthing for Domestic Outlet.*
- *Design the Electric Wiring system for a prototype house.*
- *Design the UPS for a defined load.*
- *Practice assembly of a FM radio.*
- *Configure a Wifi Router for required number of users.*

UNIT - 1 **L-9**

WORKING PRINCIPLE OF AC, REFRIGERATOR, PUMPS, IC ENGINES AND SCREW JACK: Working principle of Air - Conditioner and Refrigerator, Components, Assembly and disassembly; Working principle of Centrifugal and Reciprocating pumps - Types, Parts and applications, Working principle of Screw jack and its components, Working principle of IC engines- 2 stroke and 4 stroke.

UNIT - 2 **L-10**

BRICKS: General, Qualities and Classification of bricks, Tests for bricks, Size and Weight of bricks,

Timber - Definition, Qualities of good timber, Decay of timber and Advantages of timber in construction.

CEMENTS: Types and composition of Cement, Setting of cement, Tests for physical properties of

cement, Different grades of cement.

AGGREGATES: Classification of aggregates, Source, Size and Shape of aggregates, Tests for aggregates.

STEEL: Types of steel, Physical properties and Mechanical properties of steel, Simple layout design, Paints, Tiles, fittings, Ventilation, Furniture and green house aspects.

UNIT - 3 **L-8**

ELECTRIC ENERGY SYSTEMS: Overview of Power System Structure, Conventional and Non Conventional Generations, Types of Turbines, Generators, Substations, Towers, Earthing procedure, Protection schemes, Single Phase and Three Phase Systems, Methods of Electrical Wiring Systems, Wiring procedure and calculations, Wiring methods, Un-Interruptible Power Supply (UPS), Components in UPS, Its functionality, Calculation of ratings for UPS components to a specific load.

UNIT - 4 **L-10**

LIGHT: Light Energy, Evolution of Light sources, Working of Incandescent, Fluorescent, MV, SV and LED Lamps, Comparison and Applications.

HEAT: Heat Energy, Modes of Heat Transfer, Resistance and Induction Heating, Comparison and applications.

MOTOR: Electric Motors, Classification, Construction and working principles of motors used in Domestic applications, Mixer grinder, Ceiling and exhaust fan, Hair dryer, Washing machine, Water pump, Air coolers, Vacum cleaner, Computer cooling motor, Electric bike.

UNIT - 5 **L-8**

HOUSE HOLD ELECTRONIC APPLIANCES: Working principles of television, Radio, Remote control, Telephone, Microwave oven, Cell phone, PA system, Induction stove, WiFi router and DTH.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

Demonstration of Modelling / functioning / disassembly / assembly / fault rectification / understanding of the following.

1. Air-conditioners and Refrigerators
2. 2 Stroke and 4 Stroke Engines
3. Reciprocating Pumps

4. Power Screw Jack
5. Size and Water absorption capacity of Bricks
6. Initial and final setting time of Cement
7. Toughness value of coarse aggregates
8. Bulking of Sand
9. Earthing Schemes
10. Electric Wiring
11. UPS system
12. Immersion Heater, Induction Heater and Iron Box
13. Ceiling Fan and Mixer
14. Television
15 Radio
16. Remote Control
17. Telephone
18. Fax Machine
19. Mobile Phone
20. PA System

TEXT BOOKS:

1. M.S.Shetty, "Concrete Technology", 1st edition, S.Chand and Co, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, Anad, 2009.
3. Govindasamy and A Ramesh, "Electrical engineering - Electrical machines and Appliances Theory, 1st edition, Tamilnadu text book corporation, 2010.
4. Janakaraj, A Sumathi et al, "Electrical engineering - Electrical machines and Appliances Theory", 1st edition, Tamilnadu text book corporation, 2011.
5. Marshall Brain, "How Stuff Works", 1st edition, John Wiley&Sons, 2001.
6. Pravin Kumar, "Basic Mechanical Engineering", 1st edition, Pearson Publishers, 2013.

16HS104 ENGLISH PROFICIENCY AND COMMUNICATION SKILLS

Hours Per Week :

L	T	P	C
0	-	2	1

Total Hours :

L	T	P
0	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To equip the students with Functional English by exposing them to a wide range of language use in different contexts and thereby encourage them to use the language comfortably in real life situations. The objective of this course is to strengthen the comprehension skills of listening and reading by acquiring adequate vocabulary through perusing authentic materials gathered from news papers, journals and other mass communication media.

Course Outcomes:

The student will be able to:

- use functional English to speak and express themselves in different social contexts
- write simple letters, narratives, factual reports and descriptive passages for both academic and non-academic purposes in English.
- gain proficiency to undergo Preliminary English Test (PET), an Intermediate Level English Certification Test administered by Cambridge English Language Assessment, UK.

SKILLS:

✓ *Use appropriate words in right order for effective sentence formation, and writing short texts.*

✓ *Read and extract information from different texts and draw inferences by understanding elements like tone and transitional words.*

✓ *Understand short and long spoken discourses through analysis of elements like stress and intonation.*

✓ *Articulate clearly thoughts and ideas on simple every day topics.*

UNIT - 1 **P-6**

FUNCTIONS: Introducing Self/Others, Expressing needs/feelings/opinions (SWOT Analysis)

SKILL FOCUS:

Reading – Understanding factual information

Writing – Word order and sentence formation

Listening – Decoding for meaning following elements of stress, Intonation and accent

Speaking – Articulating syllables clearly, Speaking fluently with correct pronunciation

Vocabulary – Discerning to use right word for the given context

Grammar – Spellings, Use of Nouns, Adjectives, Verbs, Prepositions in the sentence structure

PRACTICE: Objective PET Units 1 - 6

UNIT - 2 **P-6**

FUNCTIONS: Defining; Describing People, Places, Things and Process.

SKILL FOCUS:

Reading – Inferences from sentences and short messages, True or False

Writing – Rewording, Sentence transformation, Convincing

Listening – Understanding the short messages and conversations

Speaking – Role-plays, Short conversations

Vocabulary / Grammar – Use of Adjectives/Adverbs, Comparatives and Superlatives

PRACTICE: Objective PET Units 7 – 12

UNIT - 3 **P-6**

FUNCTIONS: Describing Spatial and Temporal Relations, Giving Directions/Instructions

SKILL FOCUS:

Reading – Reading between the lines, Inferences, True/False

Writing – Developing hints, Writing short messages/paragraphs

Listening – Searching for factual information, Gap filling

Speaking – Snap Talks, JAM, Elocution

Vocabulary / Grammar – Prepositions, Phrasal Verbs, PET word list

PRACTICE: Objective PET Units 13 - 18

UNIT - 4 **P-6**

FUNCTIONS: Narrating, Predicting, Negotiating, Planning

SKILL FOCUS:

Reading – Reading for evaluation and appreciation, Comprehension

Writing – Letters, e-mails, 7 C's

Listening – Following long conversations / Interviews

ACTIVITIES:

- *SWOT Analysis.*
- *Snap talks.*
- *Spell Bee.*
- *Short conversations.*
- *Role play.*
- *Quiz.*
- *Elocution.*
- *JAM.*
- *Group. Discussion Debate.*
- *Team presentations.*

Speaking – Discussions, Debate, Descriptions

Vocabulary / Grammar – Modals, Conditionals, Verb forms (Time and Tense)

PRACTICE: Objective PET Units 19 – 24

UNIT - 5 **P-6**

FUNCTIONS: Requesting, Denying, Suggesting, Persuading

SKILL FOCUS:

Reading – Understanding factual information

Writing – Short Stories, Explanatory Paragraphs

Listening – Inferences from long speeches/conversations

Speaking – Announcements, Presentations

Vocabulary / Grammar - Punctuation, Cloze tests

PRACTICE: Objective PET Units 25 – 30

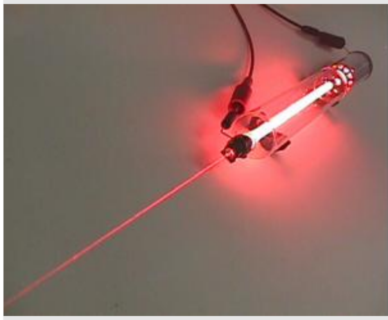
TEXT BOOK:

1. Louise Hashemi and Barbara Thomas, “Objective PET”, Student’s Book with Answers, 2nd edition, Cambridge University Press, 2015.

REFERENCE BOOKS :

1. Cambridge Preliminary English Test Without Answers 8.
2. Annette Capel and Rosemary Nixon, “Introduction to PET”, Oxford University Press.

16HS110 ENGINEERING PHYSICS LABORATORY



Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course objectives and Description:

This lab is intended to make the students realize the theoretical concepts of physics having hands on experience in conducting the experiments.The students have to perform at least ten from the list of experiments.

Course Outcomes:

The student will be able to:

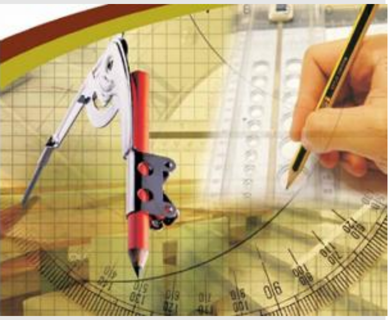
- realize the concept of resonance by conducting the experiments of AC sonometer and Melde's experiment.
- acquire the knowledge on magnetic field theory and thermal conductivity by conducting experiments, field along the axis of a circular coil and thermal conductivity of bad conductor
- understand the concepts of light by conducting the experiments of determination of wave length, numerical aperture of an optical fibre and also from V–I characteristics of Solar cell and LED.

LIST OF EXPERIMENTS

1. Determination of Velocity of ultrasonic waves in liquids.
2. Melde's Experiment - Transverse and Longitudinal modes.
3. Determination of wave length – Helium - Neon laser.
4. Determination of Planck's constant.
5. Determination of Frequency of Alternating current.
6. Field along the axis of a circular coil – Stewart and Gee's apparatus.
7. Band gap of semiconductor.
8. Determination of Hall coefficient.
9. Thermal conductivity of bad conductor - Lee's method.
10. Optical Fibre – Determination of numerical aperture.
11. Solar Cell – Efficiency.
12. Study of V – I characteristics of LED.
13. Seebeck effect - Determination of Seebeck coefficient of a thermo couple.

REFERENCE BOOKS:

1. Jayaraman, "Engineering Physics Laboratory manual", 1st edition, Pearson Education, 2014.
2. Engineering Physics laboratory Manual – Department of Physics, VFSTR University, 2016.



16HS108 ENGINEERING MATHEMATICS – II

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	45	-	-	-	-

Course Description and Objectives:

It is aimed to offer different methods for finding rank of a matrix, solving linear equations using matrices, to compute Eigen values and Eigen vectors, to verify C.H.T and apply it to find power of a matrix. Also, to make the students familiarize with double and triple integrals, to make the student acquainted with the concepts of vector differentiation and integration. To make the student to use different mathematical tools of MATLAB related to above concepts.

Course Outcomes:

The student will be able to:

- carry out the basic operations of matrix algebra.
- use row operations to reduce a matrix to echelon form, normal form.
- determine consistency of a system linear equations.
- compute eigen values and eigen vectors.
- evaluate double integrals and triple integrals.
- evaluate double integrals in polar coordinates.
- utilize Cartesian and polar coordinates to find area.
- understand the concept of gradient, divergance and curl.
- apply vector integral theorems in finding surface and volume integrals.

SKILLS:

- ✓ *Appreciate various methods to find the rank of a matrix.*
- ✓ *Solve given system of linear equations.*
- ✓ *Compute Eigen values and Eigen vectors of a matrix.*
- ✓ *Compute the power of a matrix by suitable method.*
- ✓ *Evaluate Multiple integrals.*
- ✓ *Evaluate surface and volume integrals through vector integral theorems.*

UNIT - 1 **L-9, T-3**

RANK OF MATRIX AND LINEAR EQUATIONS: Rank of a matrix, Normal form, Triangular form, Echelon from, Consistency of system of linear equations, Gauss-Jordan method, Gauss elimination method, Gauss-Siedal method.

UNIT - 2 **L-9, T-3**

EIGEN VALUES AND EIGEN VECTORS: Eigen values, Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalisation of a matrix.

UNIT - 3 **L-9, T-3**

MULTIPLE INTEGRALS: Double integrals, Evaluation, Evaluation in polar coordinates, Change of order of integration, Change of variables, Applications to area in cartesian coordinates and polar coordinates, Triple integrals, Fundamentals, Evaluation of triple integrals.

UNIT - 4 **L-9, T-3**

VECTOR DIFFERENTIATION: Vector function, Differentiation, Scalar and vector point function, Gradient, Normal, Divergence, Directional derivative, Curl, Vector identities.

UNIT - 5 **L-9, T-3**

VECTOR INTEGRATION: Line integral, Surface integral, Volume integral, Green's theorem, Stoke's theorem, Gauss theorem of divesergence (without proofs).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-30

1. Matrix Algebra.
2. Rank of a matrix.
3. System of equations (Direct method).
4. System of equations (Cramer's Rule).
5. System of equations (matrix inversion method).
6. Eigen values and Eigen vectors of a matrix.
7. Powers of matrix & Cayley-Hamilton Theorem.
8. Vector algebra.
9. Gradient.
10. Divergence.
11. Curl.
12. Multiple Integrals (Area etc).
13. Interpolation.

TEXT BOOKS:

1. H. K. Dass and Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd edition, S. Chand & Co., 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th edition, 2014.
3. Rudra Pratap, "Getting started with Matlab", Oxford University Press, 2009.

REFERENCE BOOKS:

1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", Oxford Publications, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", 25th reprint, McGraw Hill Education, 2015.
3. R K Jain and S R K Iyengar, "Advanced Engineering Mathematics", 2nd edition, Narosa Publishing House, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons (Asia) Pvt. Ltd., 2001.

ACTIVITIES:

- *Differentiate the methods to find the rank of a matrix.*
- *Solve given system of linear equations and compare with MATLAB output.*
- *Compute Eigen values and Eigen vectors of a matrix and compare with MATLAB output.*
- *Compute the power of a matrix by suitable method.*
- *Evaluate multiple integrals and compare with MATLAB output.*
- *Evaluate surface and volume integrals through vector integral theorems.*

16HS107 ENGINEERING CHEMISTRY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	20	45	-	10	-	-

Course Description and Objectives:

This course aims to develop fundamental knowledge on new engineering materials and their significance in science and engineering applications. In addition, characterization of materials using basic and advanced experimental techniques is also offered. Besides, analysis of water sample and treatment method for domestic, commercial and industrial applications are also covered.

Course Outcomes:

The student will be able to:

- understand the limitations of using hard water for domestic and industrial purposes.
- choose and apply suitable methods to soften the hard water for industrial and domestic applications.
- understand electrochemistry and its importance for applications such as fuel cells, modern lithium ion batteries etc.
- understand the types of corrosion and their implications followed by their control and prevention methods.
- familiarize the preparation, properties and applications of various polymers.

SKILLS:

✓ *Analyse the total hardness of water sample.*

✓ *Understand the basic principles involved in various batteries.*

✓ *Understand the mechanisms of corrosion and various controlling methods.*

✓ *Synthesize various polymers.*

✓ *Identify the functional groups present in chemical compounds using Infrared and Ultraviolet instruments.*

UNIT - 1 **L-9**

WATER TECHNOLOGY: Introduction, WHO, BIS standards of water, Hardness of water, Determination of hardness by EDTA (Numerical Problems), Disadvantages of hard water, Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming, Softening methods - Zeolite process, Ion Exchange process; Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - 2 **L-9**

ELECTRO CHEMISTRY: Electrode potential, Electrochemical series, Nernst equation, Reference electrodes, Calomel and standard hydrogen electrode, Ion selective electrode, Glass electrode, Determination of pH using glass electrode; Primary cell, Secondary cell - Lead-acid storage cell, Lithium ion battery; Fuel cells - Hydrogen oxygen, Methanol oxygen.

UNIT - 3 **L-9**

SCIENCE OF CORROSION: Introduction, Dry corrosion, Wet corrosion, Mechanisms of wet corrosion, Bimetallic corrosion, Concentration cell corrosion, Factors influencing the rate of corrosion; Corrosion control methods - Cathodic protection, Electroplating, Electrolessplating, Corrosion inhibitors.

UNIT - 4 **L-9**

POLYMERS: Introduction, Types of polymerization - Preparation, Properties and applications of polyethylene, PVC, Teflon, Bakelite, Urea formaldehyde, Silicones; Rubber, Vulcanization, Synthetic rubbers - Buna-S, Buna-N, Neoprene; Introduction to conducting polymers; Poly thiophene.

UNIT - 5 **L-9**

INSTRUMENTAL TECHNIQUES: Interaction of radiation with matter, UV-Visible spectroscopy - Beer, Lambert's law, Qualitative and quantitative analysis, Block diagram of UV-Visible spectrophotometer, IR spectroscopy - Types of vibrations, Block diagram of IR spectrophotometer.

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chavala, "A Text book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.

REFERENCE BOOKS:

1. K.S. Maheswaramma and Mridula chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.
2. M.R. Senapati, "Advanced Engineering Chemistry", 2nd edition, Lakshmi Publications, 2006.
3. H. W. Wilard and Demerit, "Instrumental methods of Analysis", 7th edition, CBS Publications,1986.
4. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.

ACTIVITIES:

- *Collect water samples from different villages near VFSTR University and determine the total hardness, and total alkalinity.*
- *Present the water analysis report to the villagers and suggest proper measures to be taken.*
- *Measure the rate of corrosion of iron objects by weight loss method.*
- *Identify some of the functional groups like carboxylicacid, aldehyde and ketones by I.R. Spectroscopy.*
- *Collect water sample from different villages and estimate the fluoride present in the raw water and suggest some steps for the removal of fluoride.*

16ME101 ENGINEERING GRAPHICS

Hours Per Week :

L	T	P	C
1	-	3	3

Total Hours :

L	T	P
15		45

WA/RA	SSH/HSH	CS	SA	S	BS
6	15	-	5	-	-

Course Description and Objectives:

The main aim of this course is to familiarize the students with the conventional concepts of engineering drawing and computer aided applications in various fields. Engineering graphics is an "International language of Engineers". It is the most effective method of communicating technical ideas in a 2D and 3D format.

Course Outcomes:

The student will be able to:

- sketch engineering objects in the freehand mode.
- create geometric construction with hand tools.
- create dimensions of objects.
- prepare plan and elevation of any pictorial view.
- draw freehand lettering.
- make isometric sketches using graphics.
- draw orthographic multi-view sketches using graphics.

SKILLS:

✓ *Draw free hand sketches, layouts, circuit diagrams, plan and elevations.*

✓ *Draw geometrical objects like polygons, solids of different types.*

✓ *Visualize the objects in real time situations.*

✓ *Develop 3D views (isometric views).*

UNIT - 1 **L-3, P-10**

INTRODUCTION TO ENGINEERING DRAWING: Types of lines, Lettering, Dimensioning, Construction of polygon and conics (Ellipse, Parabola and Hyperbola by general method), Ellipse by oblong method.

UNIT - 2 **L-3, P-8**

ORTHOGRAPHIC PROJECTIONS: Principle of projection, Planes of projections, Projections of points, Projection of straight lines, Inclined to one plane and both the planes, Projections of planes, Simple planes, Planes inclined to one reference planes.

UNIT - 3 **L-3, P-8**

PROJECTIONS OF SOLIDS: Projections of prisms, Pyramids, Cylinders, Cones, Solid axis inclined to one plane.

UNIT - 4 **L-3, P-10**

AUTOCAD: Introduction to AutoCAD

ISOMETRIC VIEWS: Isometric drawing of simple objects, Isometric view of prisms, Pyramids, Cone and cylinder, Simple orthographic views into isometric views through AutoCAD.

UNIT - 5 **L-3, P-9**

ORTHOGRAPHIC VIEWS: Conversion of pictorial views into orthographic views through AutoCAD.

TEXT BOOKS:

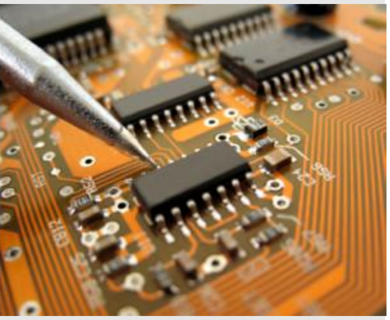
1. N.D.Bhatt, “Engineering Drawing”, 53rd edition, Charotar Publication, 2014.
2. Basant Agrawal , C.M.Agrawal “Engineering Drawing” , 2nd edition., Tata McGraw Hill,2014.

REFERENCE BOOKS:

1. J. hole, “Engineering Drawing”, 2nd edition, Tata McGraw Hill, 2008.
2. K.L. Narayana, “Engineering drawing”, 2nd edition, Scitech Publications, 2008.

ACTIVITIES:

- *Draw line diagram of different machineries.*
- *Draw plan and elevations of buildings and engineering products.*
- *Understand, visualize 3-D components/ products and develop drawings.*
- *Draw different curves used in several engineering applications such as bridges, dams etc.*



16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC, AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

SKILLS:

✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*

✓ *Develop a simple loop generator.*

✓ *Design a voltage regulator using Zener diode.*

✓ *Design a half wave rectifier using PN junction diode.*

✓ *Design a full wave rectifier using PN junction diodes.*

UNIT – 1 **L-9**

FUNDAMENTALS OF DC CIRCUITS: Circuit concepts, Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Ohm's Law, Kirchhoff's Laws - Application to simple series, Parallel circuits, Mesh and nodal analysis of simple resistive circuits (Simple numerical problems).

UNIT – 2 **L-9**

FUNDAMENTALS OF A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

UNIT – 3 **L-9**

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self Inductance and mutual Inductance, Coefficient of coupling (only elementary treatment and Simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

UNIT – 4 **L-9**

DC MACHINES: Constructional details of a D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C MACHINES: Principle of operation of three phase induction motors, Slip ring and squirrel cage motors, Torque equation, Constructional details of synchronous machine.

UNIT – 5 **L-9**

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory, Intrinsic and Extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics, Half and Full wave rectifiers, Zener diode and its characteristics, Voltage regulator, Bi polar junction transistor, Operation, Types, Applications.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

LIST OF EXPERIMENTS Total hours-30

ACTIVITIES:

- *Decoding the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of Energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.
8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of Half Wave Rectifier without filter.
10. Implementation of Full Wave Rectifier without filter.

TEXT BOOKS:

1. V.K.Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P Kothari, "Basic Electrical and Electronics Engineering", 1st edition., TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman & Halkias, "Integrated Electronics", McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, "Electrical Technology", Vol.– II, S Chand Publications, 2007.
3. U.Bakshi & A.Bakshi, "Basic Electrical Engineering", 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. http:// nptel.ac.in/courses/108108076/
2. https:// books.google.co.in/books/about
   Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC

16HS111 ENGINEERING CHEMISTRY LABORATORY

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

Course description and Objectives:

This course is aimed at enlightening the importance of theoretical concepts of chemistry and experimental techniques for characterization of materials.

Course Outcomes:

The student will be able to:

- analyse the total hardness present in water samples.
- determine the total alkalinity of water used in industries.
- acquire the knowledge on polymers used as insulators.
- familiarize advanced techniques in chemical analysis using conductometer and pH meter.

LIST OF EXPERIMENTS

1. Determination of Total Alkalinity of water.
2. Estimation of Total hardness of water.
3. Find the percentage of available chlorine in Bleaching powder.
4. Estimation of Fe (II) by Dichrometry method.
5. Preparation of Phenol - Formaldehyde Resin.
6. Synthesis of Urea- Formaldehyde Resin.
7. Estimation of Concentration of acid by pH metry.
8. Determination of Strength of acid by Conductometry.
9. Measurement of Mn^{+7} by Colorimetry.
10. Determination of concentration of a salt by ion exchange method.
11. Find the concentration of Mn^{+7} and Cr^{+6} by UV-Visible Spectrophotometry.
12. Find the rate of corrosion by weight loss method.

TEXT BOOKS:

1. J.Mendham, R.C.Denney, J.D. Bares, M.Thomas and B.Siva Sankar, “Vogel’s Text book of qualitative Chemical Analysis”, Pearson Publications - Volume I, 2009.
2. Dr.Sunita Rattan “Experiments in Applied Chemistry”, S.K. Kataria & Sons Publications, 2008.

16HS109 ENVIRONMENTAL SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
30	-	-	10	20	4	-	4	-

Course Description and Objectives:

Environmental Science and Technology offers technological aspects of environmental science and in maintaining environmental integrity in relation to human development. It helps every engineer to plan appropriate strategies for addressing environmental issues and also contribute to the development of innovative technologies for solving such issues. It produces professionals who will ensure sustainable development of the nation in general and environmental in particular.

Course Outcomes:

The student will be able to:

- observe and integrate the diverse information from sources outside the classroom.
- think critically, creatively, resourcefully and strategically, including identifying steps needed to reach goals, manage projects, evaluate progress, and adapt approaches, developing both self reliance, and civic mindedness.
- adapt eco-friendly technologies in order to maintain hygienic conditions.
- understand the human activities that are detrimental to environment.
- collaborate across diverse disciplines to identify and create solutions that conserve and help maintain biodiversity in the long term.
- discuss the issues involved in the generation of renewable energy resources.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to adrress the challenges, improvise and devise solutions.*
- ✓ *Identify solutions to environment and development issues, using planning, analysis, modeling, and new approaches.*
- ✓ *Acquire fieldwork techniques to study, observe and prepare documents, charts, PPTs, Models etc.*
- ✓ *Understand how natural resources should be used judiciously, to protect biodiversity and maintain ecosystem.*

UNIT - 1 **L-6**

NATURAL RESOURCES: Environmental studies - Definition scope and its importance, Need for public awareness; Natural resources - Forest resources, Deforestation, Water resources, Properties and conflicts, Mineral resources, Extraction and impacts, Food resources, Modern agriculture methods, Fertilizer pesticide problems, Water logging, Salinity, Energy resources, Renewable and non-renewable energy resources, Harness technology, Solar energy technologies, Land resources, Land degradation, Soil erosion; Role of an individual in conservation of natural resources.

UNIT - 2 **L-6**

ECOSYSTEMS AND BIODIVERSITY: Ecosystem - Concept, Structure and functions of an ecosystem, Food chains, Food webs, Ecological pyramids, Energy flow, Energy regulation, Succession, Biogeochemical cycles, Aquatic ecosystems; Biodiversity - Introduction, Bio-geographical classification, Values of biodiversity, Biodiversity at global, National and local levels, Hot-spots of biodiversity, Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

UNIT - 3 **L-6**

WASTE MANAGEMENT AND GREEN TECHNOLOGY: Solid waste management - Causes, Effects and control measures of municipal and Industrial wastes; Pollution - Air, Water, Thermal, Soil and noise pollutions, Role of an individual in prevention of pollution; Remote sensing / GIS - Introduction, definitions, Applications of the remote sensing; Innovative practices - Objectives, Innovative practices in agriculture and forest community, Bio-villages; Green technology for sustainable development; Life cycle assessment and its concept.

UNIT - 4 **L-6**

SOCIAL ISSUES AND EIA: Sustainable development, Water conservation, Cloud seeding, Rainwater harvesting methods watershed management, Global warming, Acid rain, Ozone layer depletion, Environmental legislation - Wildlife protection act, Water act, Forest conservation act, Air act, Environmental protection act; Environmental Impact Assssment (EIA) - Introduction, Definition of E.I.A and E.I.S, Scope and objectives, Importance of E.I.A in proposed projects / industry / developmental activity.

UNIT - 5 **L-6**

ENVIRONMENTAL SANITATION: Food sanitation - Food and drugs Act, Food preservations, Milk sanitation, Tests for milk, Pasteurization of the milk; Water, Air, Soil and food borne diseases, Maintenance of sanitary and hygienic conditions; Role of youth in the development, Promoting activities, Youth as initiators, Field work/environmental visit - Visit to a local area to document environmental assets river/ forest/ grassland / hill /mountain, Study of local environment, Common plants, Insects, Birds; Study of simple ecosystems - Pond, River, Hill slopes etc., Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik and CP Kaushik, "Perspectives in Environmental Studies", 5th edition, 2016
2. Benny Joseph, "Environmental studies", 2nd edition, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Dr. M. Chandrasekhar, "A Text book of Environmental Studies", HI-TECH publications, 2006.
2. Dr. M. Anji Reddy, "A Text book of environmental science and Technology", B S Publications, 2008.
3. Dr. K. Mukkanti, "A Text book of Environmental Studies", S.CHAND and Company Ltd, 2009.
4. EHILRS and ST, "Text book of Municipal and Rural Sanitation", M.S Hill, 1998.
5. C. S. Rao, Wiley Eastern Ltd, "Environmental Pollution Control Engineering", New Age International Ltd, 2001.
6. Dr. M. Anji Reddy, "Introduction to Remote Sensing", B S Publications, 2004.
7. Kurian Joseph and R.Nagendram, "Essentials of environmental studies", Pearson Education Pt Ltd, Delhi, 2007.

ACTIVITIES:

- *Painting contests on environmental issues and themes.*
- *Models of energy resources, Pollution and Solid Waste Management-3R strategy.*
- *Quiz competition.*
- *Essay writing competition.*
- *Skit, JAM and debate.*
- *Field work and documentation.*
- *Assignments.*

16ME103 WORKSHOP PRACTICE

Hours Per Week :

L	T	P	C
-	-	3	2

Total Hours :

L	T	P
-	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	20	-	-

Course Description and Objectives :

This course is aimed to impart knowledge and provide hands-on experience in Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring. In addition it also provides knowledge on various manufacturing processes such as Foundary, Welding, Machine Shops and CNC Machines.

Course Outcomes :

The student will be able to:

- identify various tools connected to the trades such as Carpentry, Fitting, Tinsmithy, Blacksmithy and House wiring.
- fabrication of wooden joints and understand joining of metals.
- make metal joints and sheet metal work.
- make metal tools like knives, needles, swords, arrows etc.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Electrical wiring and power supply in residences.*
- ✓ *Make funnels, trays, locker, steel almirahs etc.*
- ✓ *Fabrication of various agriculture tools, hooks, axes, axels, rims etc.*
- ✓ *CNC machines and various machining operations and processes.*

EXERCISES IN THE FOLLOWING TRADES :

1. Carpentry.
2. Fitting.
3. Tin smithy and Black smithy.
4. House wiring.
5. Foundry and welding (Demonstration).
6. Machine shop and CNC (Demonstration).

Note: In each trade, the student has to perform at least two jobs.

TEXT BOOKS:

1. S.K. Hazra Choudhury, “Elements of workshop Technology”, 11th edition, Media Promoters, 1997.
2. Gopal, T.V., Kumar, T., and Murali, G., “A first course on workshop practice: Theory, Practice and Work Book”, Suma Publications, Chennai, 2005.
3. Venkatachalapathy, V. S, “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai, 1999.

ACTIVITIES:

- *To make wooden joints like Mortise and Tenon joint, T-lap Joint which are used to prepare a wooden furniture.*
- *To prepare metal joints and metal sheet products like V-Joint and trays by using mild steel flats and Galvonised iron sheets.*
- *Trials on electrical circuit connections.*

16PL102 BASICS OF PETROLEUM ENGINEERING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	7	45	3	10	-	-

Course Description and Objectives:

This course provides a general introduction to the field of petroleum engineering. The objective of this course is to provide basic understanding on the fundamentals of petroleum engineering and also to provide knowledge of production operations in the oil and gas wells.

Course Outcomes:

The student will be able to:

- demonstrate knowledge in the fundamentals of various petroleum engineering courses like reservoir engineering, well drilling technology, heat, mass transfer etc.
- understand various drilling operations in petroleum production.
- understand various methods of transportation of petroleum.

SKILLS:

- ✓ *Demonstrate basic knowledge in the fundamental of petroleum engineering.*
- ✓ *Identify common equipments used in petroleum production and refining operations.*
- ✓ *Demonstrate basic knowledge in petroleum composition and refining.*
- ✓ *Demonstrate basic knowledge in well drilling and completion technology.*

UNIT - I **L-9, T-3**

NATURE OF PETROLEUM : Composition & properties. Concepts of Petroleum Geology & Basic Rock Properties –source, migration & accumulation of petroleum. Porosity, permeability and rock pressure concepts of rocks.

UNIT - II **L-9, T-3**

PETROLEUM EXPLORATION METHODS : Geological & geophysical. Drilling: Brief history, various techniques of drilling. Drilling tools & equipment. Various types of rigs, Concepts of Well Logging & Formation Evlauation Techniques.

UNIT - III **L-9, T-3**

CONCEPTS OF DRILLING FLUIDS AND CEMENTING : Composition and properties of drilling fluids. Types of Tubing and Casing, Types of Cement and Cementing Practice's..

UNIT - IV **L-9, T-3**

WELL COMPLETIONS : Types, perforation techniques, Corning Needs and core analysis. Drill Stem Testing (DST).
Production of Oil: Basic concepts of Production, gathering, treatment, storage.

UNIT - V **L-9, T-3**

PETROLEUM REFINING AND TRANSPORTATION : Concept of Refining, Gas Processing & Petrochemicals.
Tank-Trucks and Rail Transportation: Oceanic Tanker Transportation, Inland Water, Coastal and Oceanic, Tanker Size, Power, Cargo Sapce, Marine Storage Terminals, Shore Installatio, Line Specifications, Plastic Pipes.

TEXT BOOKS:

1. Howard, "Oil & Gas Production Handbook", ABB Publisher, Edition 3, August 2013.
2. Carl Gatlin, "Petroleum Engineering Drilling & Welling completion", Prentice Hall Inc, 2006.

REFERENCE BOOKS:

1. David A.T. Donobue, Karl R.Lang, "A First Course in Petroleum Technology", Prentice Hall PTR, 1986.
2. D. R.Skinner, "Introduction to Petroleum production Vol. I,II,II", Gulf Publishing Co, 1981.
3. Donlad L. Katz, "Natural Gas Engineering (Hand Book)", Mc Graw Hill, Singapore, 1956.

ACTIVITIES:

- *Case study on identification of rocks and calculations of rock properties.*
- *Case study on types of drilling and drilling fluids.*

II

YEAR

PETROLEUM ENGINEERING

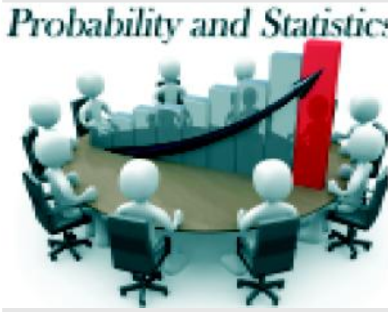
B.Tech.

I SEMESTER	16HS202	-	Probability and Statistics
	16EL102	-	Soft Skills Laboratory
	16PL201	-	Fundamentals of Geology
	16PL203	-	Petroleum Geology
	16PL204	-	Surveying and Offshore Structures
	16CH201	-	Chemical Process Calculations
	16CH202	-	Momentum Transfer
		-	Employability and Life Skills
II SEMESTER	16EL103	-	Professional Communications Laboratory
	16PL202	-	Petroleum Exploration
	16PL205	-	Petroleum Engineering Thermodynamics
	16PL206	-	Drilling Fluids and Cementing Technology
	16CH207	-	Process Heat Transfer
		-	Department Elective
		-	Department / Open Elective
		-	Employability and Life Skills

COURSE CONTENTS

I SEM & II SEM

16HS202 PROBABILITY AND STATISTICS



Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	35	-	10	2	-

Course Description and Objectives:

This course deals with descriptive statistics, correlation and regression and their applications, probability, theoritical distributions and testing of hypothesis.

The objective of this course is to enable the student to understand and apply statitical techniques, curve fitting, correlation and regression, probability and also to make the student familiar with discrete, continuous distributions and testing of hypothesis.

Course Outcomes:

The student will be able to:

- distinguish between quantitative and categorical data and represent the data in graphical and tabular forms.
- calculate and interpret measures for the centre and spread of a data set.
- decide how and when to use the normal model.
- calculate and interpret correlation coefficient and regression lines.
- understand the rules of probability and apply them.
- compute probabilities using theoritical distributions.
- test hypothesis for population parameters.

UNIT - 1 **L-9**

STATISTICS : Basic definitions, Frequencies, Graphical representation, Histogram, Ogive curves, Measures of central tendency, Arithmetic mean, Median, Mode, Mean deviation, Standard deviation, Symmetry and skewness, Karl Pearson's coefficient of skewness.

UNIT - 2 **L-9**

CURVE FITTING, CORRELATION & REGRESSION : Least squares method, Curve fitting (straight line and parabola only). Covariance, Correlation, Types, Pearson's coefficient of correlation, Rank correlation, Spearman's rank correlation. Regression, Regression lines.

UNIT - 3 **L-8**

PROBABILITY : Introduction, Definition (classical and axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT - 4 **L-8**

DISTRIBUTIONS: Random variables, Discrete and continuous variables, Introduction to distributions.

BINOMIAL DISTRIBUTION : Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

POISSON DISTRIBUTION : Definition, Mean and standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

NORMAL DISTRIBUTION : Definition, Normal curve, Mean and standard deviation, Median, Mode, Normal distribution applications.

UNIT - 5 **L-12**

SAMPLING METHODS : Population and sampling, Parameters and statistics, Types of sampling~~.~~ Test of hypothesis and test of significance: Null hypothesis, Errors, Level of significance, Confidence Limits, Testing large samples, Sample distribution of proportion~~,~~ T-distribution for small sample, difference between means of small sample, Chi square test for goodness of fit, Chi square test for test of independence.

TEXTBOOKS:

1. Miller and Freund, "Probability and Statistics for Engineers", 8th edition, Pearson Publishers, 2013.
2. H. K. Dass & Er. Rajanish Verma, "Higher Engineering Mathematics", 3rd revised edition, S. Chand and Company, 2014.

REFERENCE BOOK:

1. S.C. Gupta and V.K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Company, New Delhi, 2005.

16EL102 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P
-	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students on employability skills. Designed to impart work related skills, the course will enable trainees to develop interpersonal communication, leadership, Preparing Resume, Group Discussion, and Interview Skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The student will be able to:

- equip with requisite professional and inter-personal skills.
- possess the ability to think critically on issues for informed decision making and know how to communicate effectively, through choice of appropriate language and speech, while dealing with others at the workplace.
- identify and introspect on individual strengths and weaknesses, will emerge with improved levels of self-awareness and self-worth, for greater efficacy at workplace.

SKILLS:

- ✓ *Communicate and understand the difference between soft skills and hard skills.*
- ✓ *Learn professionalism and Employability skills.*
- ✓ *Plan Career by drawing their SWOT, Setting the Goal, learn the importance of Time and Stress Management.*
- ✓ *Learn Vocabulary, Situational English, Group Discussion, Reading Comprehension and Listening Comprehension which are essential for all competitive examinations.*
- ✓ *Prepare Resume and learn how to face interview.*
- ✓ *Learn Gender sensitive language, Good manners, emotional intelligence and essential skills.*

ACTIVITIES:

- *Formal and informal communication.*
- *SWOT analysis.*
- *Stephen covey Time Management matrix.*
- *Stress Management techniques.*
- *Vocabulary flash cards.*
- *Situational Dialogues.*
- *Group Discussion.*
- *Resume preparation.*
- *Mock Interview.*
- *Reading comprehension activities.*
- *Listening comprehension Activity by watching the American accent video.*
- *Emotional intelligence, etiquette quiz.*

UNIT - 1 **P-8**

A) COMMUNICATION : Need for effective communication - The process of communication, Levels of communication, Flow of communication, Choice of diction and style with reference to setting (formal, semi-formal or informal); Communication networks, Barriers to communication, Miscommunication, Noise and ways to overcome the barriers.

B) SOFT SKILLS: Difference between soft and hard skills, Need for soft skills, Professionalism, Employability skills.

C) CAREER PLANNING: Job vs career, Goal setting, SWOT analysis, Planning and prioritization, Four quadrant time management system, Self-management, Stress-management.

ACTIVITY : Johari Window for SWOT analysis, Setting a SMART goal using the provided grid, Writing a statement of purpose (SOP).

UNIT - 2 **P-8**

A) VOCABULARY BUILDING: Word etymology, Roots, Prefixes and suffixes, Synonyms and antonyms, Collocations, One-word substitutes, Analogies, Idioms and phrases, Contextual guessing of unfamiliar words, Task-oriented learning (50 words).

ACTIVITY: Making a flash card (one per day by each student), Vocabulary exercises with hand-outs, Vocabulary quiz (evaluation will be a combination of the 50 words provided by the instructor and the flash cards made by the student (one per day).

B) FUNCTIONAL ENGLISH : Situational dialogues, Role plays (including small talk), Self introduction, Opening and closing a telephonic conversation, Making an appointment, Making a query, Offering/ Passing on information, Communicating with superiors, Expressing agreement/objection, Opening bank account (combination of prepared and impromptu situations given to each student).

C) GROUP DISCUSSION : Articulation and flow of oral presentation, Dynamics of group discussion, Intervention,Summarizing and conclusion, Voice modulation, Content generation, Key word approach (KWA), Social, Political, Economic, Legal and technical approach (SPELT), View point of affected part (VAP), Language relevance, Fluency and coherence.

ACTIVITY : Viewing a recorded video of GD and Mock sessions on different types of GD topics - Controversial, Knowledge, Case study (including topics on current affairs).

UNIT - 3 **P-4**

A) RESUME-WRITING : Structure and presentation, Defining career objective, Projecting one's strengths and skill-sets, Summarizing, Formats and styles and covering letter.

ACTIVITY : Appraising some samples of good and bad resumes, Preparing the resume, Writing an effective covering letter.

B) FACING INTERVIEWS : Interview process, Understanding employer expectations, Pre-interview planning, Opening strategies, Impressive self-introduction, Answering strategies, Other critical aspects such as body language, Grooming, Other types of interviews such as stress-based interviews, Tele-interviews, Video interviews, Frequently asked questions (FAQs) including behavioural and HR questions and the aspect looked at by corporate during interviews.

ACTIVITY: Writing responses and practicing through role plays and mock interviews on the FAQs including feedback.

UNIT - 4 **P-4**

A) READING COMPREHENSION : Reading as a skill, Techniques for speed reading, Understanding the tone, Skimming and scanning, Appreciating stylistics, Impediments for speed reading, Eye fixation, Sub-vocalization, Critical reading, Reading based on purpose, Reading for information, Reading for inference.

ACTIVITY : Reading comprehension exercises with texts drawn from diverse subject areas (Hand-outs), Newspaper activity with students divided into 4 groups, Each group looks at critical component of communication such as Listening, Speaking, Reading and writing enabling them to be better communicators as well as be more aware about the current affairs, Which help in group discussion.

B) LISTENING COMPREHENSION : Listening as a skill, Different types of listening, Active and passive listening, Top-down approach, Bottom-up approach, Understanding the non verbal cues of communication, Intonation and stress.

ACTIVITY : Narration of a story, Speech excerpts with different accents (Indian, British, American), listening comprehension exercises with audio and video excerpts.

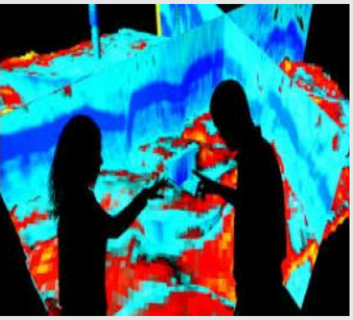
UNIT - 5 **P-6**

IMPACT OF LANGUAGE ON PERSONALITY : Gender sensitive language in MNCs, Cultural sensitivity, Social awareness, Emotional intelligence, Good manners, Self-grooming, Positive body language, Accepting and handling responsibility, Assertiveness, Problem solving, Negotiating skills, Networking and creating a good first impression, Seven essential skills for a team player, Attentive listening, Intelligent questioning, Gently persuading, Respecting other's views, Assisting others, Sharing, Participating actively.

ACTIVITY : Johari Window, Games and case studies.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the Corporate Personality", McGraw-Hill,2001.
2. Adrian Furnham, "Personality and Intelligence at Work", Psychology Press, 2008.
3. John Adair Kegan Page, "Leadership for Innovation", 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, "Effective Technical Communication", 1st edition, Tata McGraw-Hill, 2005.
5. Krishna Mohan and NP Singh, "Speaking English Effectively", 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect.
7. Dr. S.P. Dhanvel, "English and Soft Skills", Orient Blackswan, 2011.
8. Rajiv K. Mishra, "Personality Development", Rupa and Co, 2004.



16PL201 FUNDAMENTALS OF GEOLOGY

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This basic course in general geology is designed to train the students to understand the basics of geology, viz: formation of earth, layers of earth, diverse types of rocks, formation of sedimentary basins and the micro fossils and their relationship to oil and gas.

Course Outcomes:

The student will be able to:

- Discern the dimension of earth structure, composition, origin of earth, formation of earth. It deals essence of scientific studies dealing with the origin, age, structure of the earth and with the evolution, modification, and extinction of various surface and subsurface physical features.
- Understand the land forms as geomorphology, physiography and to gain a better perspective conforming to the present day thinking on the aspects of geology.
- Be impressed by the fact that the subject is not static and will more likely keep his mind open to innovative ideas.

SKILLS:

- Understand the origin of various kinds of igneous, sedimentary, metamorphic rocks that can be understood in terms of their tectonic setting.
- Gain the knowledge on fundamentals of sedimentary basins and paleontology and their significance to the petroleum industry.

UNIT - 1 **L-9**

Dimensions of earth structure, composition & origin of an earth, envelops of the earth- crust, mantle, core Internal dynamic process- Plate tectonics- Continental drift, Earthquake and Volcanoes, External dynamic process- weathering, erosion and deposition.

UNIT - 2 **L-9**

Fundamental concepts in Geomorphology-geomorphic processes distribution of landforms-drainage patterns –development, Landforms in relation to rocks types, paleochannels, buried channels.

UNIT - 3 **L- 9**

Geological work of rivers, wind, ocean, glaciers and the landforms created by them. Identification of different structural features encountered in oil exploration viz: joints, faults, folds, unconformities.

UNIT - 4 **L-9**

Origin of igneous, sedimentary and metamorphic rocks. Sedimentary structures-petrographic character of conglomerate, sandstone, shale, limestones. Introduction to sedimentary basins and deltaic systems; Topographic maps, Thematic maps, Topographic and Thematic profiles.

UNIT - 5 **L-9**

Paleontology: Introduction to Paleontology, Fossils and Fossilization. Micropaleontology - Palynology: Distribution of microfossils-Foraminifera, Radiolaria, Conodonts, Ostracodes, Diatoms; Importance of micro fossils in oil exploration.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours-20

1. Identification of Materials by visual inspection.
2. Identification of minerals in Hand Specimen.
3. Study of common rocks with reference to their structure, mineral composition and uses.
4. Location of observed outcrops on the Top sheet.
5. Measurement of the strike, dip and apparent and true thickness of the outcrops.
6. Preparation of the geological map of the area, structure contour maps and isopach maps for different stratigraphic levels.
7. Preparation of litho stratigraphic columns, litho stratigraphic correlation, geological cross sections.

ACTIVITIES:

- *Case study on identification of rocks.*
- *Minor Projects on geological graphs.*

8. Preparation of structural contour map and location of Oil Water Contact (OWC).

9. Study of physical properties of minerals.

10. Geological mapping and traversing.

11. Field Visit-I.

12. Field Visit-II.

TEXT BOOK:

1. Engineering Geology,Bell, F.G., 2nd Edition, ButterworthHeimann,2007.

2 Text book of Geology, Mukharjee, P.K., The World Press Pvt. Ltd., 2005.

REFERENCE BOOKS :

1. Elements of Mineralogy, Gribble, C. D., Rutley's, 27th Edition. CBS Publishers, 2005..

2. Principles of Physical Geology, David Duff, Homes, Nelson Thornes Ltd; 4th Revised edition, 1992..

3. Text Book of Physical Geology, Mahapatra, G.B., CBS Publishers, 2002.

4. Principles of Engineering Geology, Bangar, K.M., 2nd Edition, Standard Publishers, 2009.

16PL203 PETROLEUM GEOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
8	60	-	10	-	-

Course Description and Objectives:

This is a basic course in petroleum geology. The students will be exposed to different source, reservoir and cap-rocks, characterization of reservoir rocks, classification of reservoir pore space, permeability, migration and entrapment, temperature-pressure conditions for the generation of oil and gas from sediments.

Course Outcomes:

The student will be able to:

- Identify different source rocks from which hydrocarbons are generated.

SKILLS:

- Discern about origin of source rocks, formation of good source rocks, different characterization of reservoir rocks, classification, nomenclature and different source of reservoir rocks, pore space, porosity and its types

- Gain knowledge of how and why fluid hydrocarbons migrate from a source rock to reservoir rock, entrapment and accumulation of hydrocarbons

ACTIVITY:

- Do tectonic classification, stratigraphy evaluation and hydrocarbon accumulation of KG basin, Cambay basin and Mumbai off-shore.

UNIT - I **L-9, T-3**

Source Rocks: Definition of source rock, Organic rich sediments as source rocks, Nature and typeof source rocks - Claystone / shale, The process of diagenesis, catagenesis and metagenesis in the formation of source rocks, Evaluation of petroleum source rock potential, Limestone as source rocks, Subsurface pressure temperature conditions for the generation of oil and gas from the source sediments, Oil window.

UNIT - 2 **L-9, T-3**

Reservoir Rocks: Characteristics of Reservoir rocks, Classification and nomenclature: ClasticReservoir Rocks, Carbonate Reservoir Rocks, Unconventional, Fractured and Miscella-neous reservoir rocks, Marine and non-marine reservoir rocks, Concept of Shale oil.Reservoir pore space, porosity- primary and secondaryporosity, effective porosity, fracture porosity - permeability – effective and relative permeability relationship between porosity, permeability and texture. Cap rocks: Definition and characteristics of cap rocks.

UNIT - 3 **L-9, T-3**

Hydrocarbon migration: Geological framework of migration and accumulation, The concept ofhydrocarbon migration from source beds to the carrier beds, Carrier beds to the reservoir, Free-path ways for migration, Short distance and long distance migration, Evidence for migration, Oil and gas seepages.

UNIT - 4 **L-9, T-3**

Entrapment of hydrocarbons: Entrapment and accumulation of hydrocarbons, Classification andtypes of traps: Structural, stratigraphic and combination type of traps, Traps associated with salt domes.

UNIT - 5 **L-9, T-3**

Sedimentary Basins: Sedimentary basins -origin and classification, Types of basins and theirrelationship to hydrocarbon prospects, Tectonic classification, stratigraphic evolution and hydrocarbon accumulations of the following basins: Krishna-Godavari basin, Cambay basin and Mumbai off-shore.

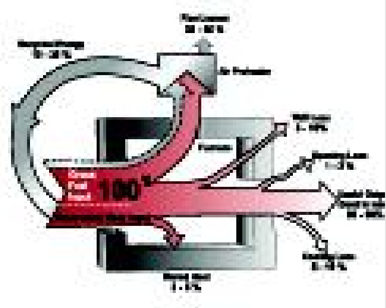
TEXT BOOK:

1. Geology of Petroleum, A.I. Levorsen, 2nd Edition. CBS, Publishers, 2006.

REFERENCE BOOKS:

1. Elements of Petroleum Geology, Richard, C. Selley, Elsevier, 1997
2. Sedimentary basins of India- ONGC bulleting.
3. Unconventional Petroleum Geology, Caineng Zou et al., Elsevier, 2013.

16CH201 CHEMICAL PROCESS CALCULATIONS



Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	50	-	5	5	5

Course Description and Objectives:

This course deals with fundamentals of material and energy balances involved in chemical processes. The objective of this course is to develop basic understanding pertaining to principles of chemical engineering processes and calculations.

Course Outcomes:

The student will be able to:

- use mole concepts and perform calculations involving concentrations.
- apply gas laws to solve problems related to ideal gas mixtures.
- carry out detailed material and energy balance for any chemical plant having different unit operations and unit processes.

SKILLS:

- ✓ *Material balance calculations for different chemical processes.*
- ✓ *Energy balance for any chemical plant.*

ACTIVITIES:

- o *Mini project on material and energy balance of a chemical process.*
- o *Estimation of physical properties.*

UNIT - 1 **L-9, T-3**

STOICHIOMETRIC RELATIONS : Basis of calculations, Methods of expressing composition of mixtures and solutions, Mole fraction and mole percent, Density and specific gravity, Baume and API gravity scales.

BEHAVIOR OF IDEAL GASES : Kinetic theory of gases, Application of ideal gas law, Gaseous mixtures, Gases in chemical reactions, Gas densities and specific gravities.

UNIT - 2 **L-9, T-3**

VAPOR PRESSURE : Liquefaction and liquid state, Vaporization, Boiling point, Effect of temperature on vapor pressure, Antonie equation, Vapor pressure plots, Vapor pressure of immiscible liquids and ideal solutions, Raoult's law, Non-volatile solutes, Basics of humidification.

UNIT - 3 **L-9, T-3**

MATERIAL BALANCE : Materials balance without reaction, Materials balance with reaction–recycle, purge, bypass.

UNIT - 4 **L-9, T-3**

THERMO PHYSICS : Energy, Energy balances, Heat capacity of gases, Liquid and mixture solutions, Kopp's rule, Latent heats, Heat of fusion and heat of vaporization, Trouton's rule, Kistyakowsky equation for non-polar liquids, Enthalpy and its evaluations.

UNIT - 5 **L-9, T-3**

THERMO CHEMISTRY : Calculation and applications of heat of reaction, Combustion and formation, Kirchoff's equation, Calculation of theoretical and actual flame temperatures, Combustion calculations.

TEXT BOOKS:

1. Hougen O.A., Watson K.M. and Ragatz .R. A., "Chemical Process Principles Part – I: Material and Energy Balance", John Wiley sons, 2nd edition, CBS Publishers & Distributors, 2004.
2. Bhatt B. I., and Vora S. M., "Stoichiometry", 4th edition, Tata McGraw-Hill, New Delhi 2004.

REFERENCE BOOKS:

1. Himmelblau D.H., "Basic Principles and Calculations in Chemical Engineers", 8th edition, Prentice Hall of India, 2011.
2. Richard M.F., and Ronald W.R., "Elementary Principles of Chemical Processes", 3rd edition, John Wiley, 2004.

16CH202 MOMENTUM TRANSFER

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	20

WA/RA	SSH/HSH	CS	SA	S	BS
20	45	-	5	5	5

Course Description and Objectives:

This course deals with fundamentals of fluid flow and its application to chemical process industries including pipe flow, fluid machinery. The objective of this course is to familiarize students with basic concepts of fluid statics, fluid dynamics, compressible and incompressible fluids, fluidization, transportation and metering of fluids.

Course Outcomes:

The student will be able to:

- understand basic principles of fluid mechanics.
- analyze fluid flow problems with the application of the momentum and energy equations.
- analyze pipe flows as well as fluid machinery.

SKILLS:

✓ *Application of fluid mechanics concepts to solve real life problems.*

✓ *Estimate* physical properties of fluids in motion and at rest.

✓ *Measurement of flowing fluids.*

✓ *Selection of pumps for engineering applications.*

ACTIVITIES:

- *Calibration of rotameter.*
- *Separation of immiscible liquids using decanter.*
- *Calibration of manometer.*
- *Design of Venturi meter.*
- *Design of Orifice meter.*

UNIT - 1 **L-10**

DEFINITIONS AND PRINCIPLES : Unit operations, Unit systems, Dimensional analysis, Basic concepts. Fluid Statics: Nature of fluids, Hydrostatic equilibrium, Manometers.

FLUID FLOW PHENOMENA : Laminar flow, Shear stress, Viscosity, Turbulence, Eddy viscosity, Flow in boundary layers.

UNIT - 2 **L-9**

BASIC EQUATIONS OF FLUID FLOW : Mass balance, Mass velocity, Momentum balance, Bernoulli equation, Mechanical energy balance equation, Correction factors, Pump work.

UNIT - 3 **L-9**

FLOW OF INCOMPRESSIBLE FLUIDS : Shear stress distribution in pipes, Relation between skin friction parameters, Laminar flow in pipes, Hagen-poiseuille equation, Laminar flow of non-Newtonian liquids, Velocity distribution for turbulent flow, Friction factor chart.

FLOW OF COMPRESSIBLE FLUIDS : Process of compressible flow, flow through variable area conduits, Adiabatic Frictional Flow, Isothermal Frictional Flow.

UNIT - 4 **L-8**

FLOW PAST IMMERSED BODIES : Drag, Drag Coefficient, Stagnation point, Friction in flow through beds of solids, Motion of particles through fluids, Terminal velocity, Motion of spherical particles. Fluidization: Conditions for fluidization, Minimum fluidization velocity.

UNIT - 5 **L-9**

TRANSPORTATION AND METERING OF FLUIDS : Pipes, Fittings, Valves, Joints, Pumps, Developed head and Power requirement in pumps, Suction lift and cavitation, Positive displacement pumps, Centrifugal pumps, Measurement of flowing fluids: Classification of measuring devices, Venturi meter, Orifice meter, Rotameter.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total Hours-30

1. Identification of laminar and turbulent flows.
2. Verification of Bernoulli's Equation.
3. Measurement of flowing fluid using Venturi meter.
4. Measurement of flowing fluid using Orifice meter.
5. Determination of friction loss in fluid flow through pipes.
6. Determination of friction loss in fluid flow through fittings.
7. Determination of pressure drop in packed bed.
8. Determination of pressure drop in fluidized bed.

9. Determination of characteristics of centrifugal pump.

10. Determination of characteristics of reciprocating pump.

TEXT BOOKS:

1. W.L. McCabe, J.C. Smith and P. Harriot, “Unit Operations of Chemical Engineering”, 7th edition, McGraw-Hill, 2005.

2. Chattopadhyay. P, “Unit Operations of Chemical Engineering Vol-1 “, 1st edition, Khanna Publishers, 2012.

REFERENCE BOOKS:

1. C. J. Geankoplis, “Transport Processes and Unit Operations”, 3rd edition, Prentice Hall of India, 1993.

2. A.S. Foust, “Principles of Unit Operations”, 2nd edition, John Wiley & Sons, 1981.

16PL204 SURVEYING AND OFFSHORE STRUCTURES

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	-	-	5	5

Course Description and Objectives:

Demonstrate the principles of surveying for the measurement of distance and angles.Explain the concepts of leveling and contouring. Introduce the concepts of advanced surveying and implementation in shoreline surveying. Demonstrate the principles of sea surveying.Introduce the concepts of wave and current data collection. Explain various stages of fixed offshore structure in view of the operation. Introduce the concept and types of compliant structures.

Course Outcomes:

The Student will be able to:

- The basic principles and significance of measurement of distance and direction.
- Horizontal and vertical angles.
- Shore line survey and basics of acoustics, application in the field.
- The basic principles of floatation and stability of floating structures.
- Stability criteria of neutrally and positively buoyant structures.

SKILLS:

- Principles, importance and measurement of angles using Theodolite.
- Concepts and terminology in contour mapping.
- Measurement and to plotting the contour maps.
- Basics of total station and GPS.

UNIT - 1 **L-9, T-3**

Distance and Direction: Objectives, Principles and classifications of Surveying, chain, tape,Electronic distance measurements, Meriadians Azimuths and Barings, declination, computation of angle.

Theodolite: Theodolite, description, uses and adjustments–temporary, Measurement ofhorizontal and vertical angles, Principles of Electronic Theodolite.

UNIT - 2 **L-9, T-3**

Leveling and Contouring: Concept & Terminology, Temporary-Method of levelling, Characteristics & Uses of contours, Methods of conducting contour surveys and their plotting.

UNIT - 3 **L-9, T-3**

Introduction to Advanced Surveying: Total Station and Global positioning system andDifferential GPS.

Hydrographic surveying: Introduction- Shoreline Surveys- Sounding Methods (Bathymetry).

UNIT - 4 **L-9, T-3**

Subsea surveying and Geomatics, Introduction to the principles of subsea surveying and geomatics is including bathymetry and seismic survey, positioning systems (surface positioning, visual positioning techniques) distance from shore & water depth, Generation of surface waves in oceans, Wave data collection and current data collection.Floating structures, basic hydrostatics, centre of gravity, center of buoyancy, displacement.

UNIT- 5 **L-9, T-3**

Functions of offshore structures, Fixed offshore structures, Types of fixed structures, fabrication, transportation, installation and operation of offshore structures, construction of offshore concrete structures, Definition of compliant structures, Types of complaint structures.

TEXT BOOKS :

1. Surveying (Vol – 1, 2) ; Higher Surveying, Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain , Vol 3, Laxmi Publications, 2005.
2. Surveying (Vol – 1 & 2), Duggal S K, Tata McGraw Hill, 2004.
3. Text book of Surveying, Venkataramaiah, C., Universities Press, 1996.

REFERENCE BOOKS :

1. Handbook of Offshore Engineering, Subrata K. Chakrabarti, Volume 1, Elsevier, 2005.
2. Ship Stability for Masters and Mates, Barrass, C. B. and D. R. Derret, 7th Edition, Butterworth-Heinemann, 2012.
3. Construction of Marine and Offshore Structure, Gerwick, Jr., C., 3rd Edition, CRC Press, 2007.

ACTIVITY:

- *Case study on measurement of distance and angles.*

16EL103 PROFESSIONAL COMMUNICATION LABORATORY

Hours Per Week :

L	T	P	C
-	-	2	1

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	30	-	-	-	-	-	-

Course Description and Objectives:

The Professional Communication Laboratory course is aimed at improving professional communication skills (LSRW – Listening, Speaking, Reading and Writing) of undergraduate students and preparing them for their profession as engineers and managers. This course will help students to understand professional communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Course Outcomes:

The student will be able to:

- be equipped to clear industry recognized certification such as BEC Vantage by the University of Cambridge.
- equip them to stand out both in the professional setting as well as for further pursuits in the academic world.
- since this certification looks at LSRW (Listening, Speaking, Reading and Writing) components in great detail, we hope to equip students to confidently and successfully attempt all the 4 critical components.

SKILLS:

✓ *Understand and use grammar rules in writing; sentences, paragraphs, paraphrasing.*

✓ *Write business emails, memos, letters, reports and proposals.*

✓ *Comprehend business articles, and documents.*

✓ *Use expressions in Professional context, and acquire presentation skills like one minute talk and pair discussion in professional context.*

✓ *Familiarize and comprehend British accent by listening to recorded speeches and discussions.*

UNIT - 1 **P-6**

BUSINESS ENGLISH VOCABULARY: Glossary of most commonly used words (formal and informal usage), Elements of technical writing - Sentence structure, Reducing verbosity, Arranging ideas logically, Building coherence, Paragraph level and document level, Topic sentence, Cohesive devices, Transitional words, Paraphrasing and précis-writing; Mechanics of writing - Stylistic elements, The rapporteur, The purpose, The reader's viewpoint (audience), Elementary rules of grammar, Choice of diction, Elementary principles of composition, Matters of form, Punctuation, Conventions of business communication, Language and professional tone, Weak links in business correspondence, Ethical concerns in business writing, Code of conduct (not sending illegal, Offensive, Disparaging personal remarks or comments) in written business communication.

UNIT - 2 **P-6**

BUSINESS CORRESPONDENCE: E-mail - Nature and scope, E-mail etiquette, Clear call for action, Common errors in composing e-mails, Office communication such as meeting agenda and minutes of the meeting, Notice, Circular and memo; Letter-Writing - Formal and informal letters, Structure of formal letters, Expressions of salutations, Different types of letters [Such as sales letter, Complaint letter, Response to the complaint letter (dispute resolution), Letter of permission, Letter of enquiring, claim letter, Letter of apology etc], Introductory and concluding paragraphs and clear call for action.

PROFESSIONAL PROPOSAL/REPORT: Differentiating proposals and reports, Drafting formal business proposals, Types of reports such as factual reports, Feasibility reports and survey reports, Parts ofa report (Such as title page, Declaration, Acknowledgements, Table of contents, Abstract, Introduction, Findings, Conclusion and recommendations, Citations, References and appendices).

UNIT - 3 **P-6**

SPEAKING: Speaking in business context, Assertiveness, Politeness, Making requests, Queries and questions, Negotiations, Asking for information, Offering suggestions, Conflict resolution, Contacting clients, Initiating, Addressing delegates (in public), Features of a good power point presentation (making the PPT), Delivering the presentation effectively, Telephone etiquettes, Delivering seminar/proposal/report effectively, Team meeting etiquettes (face to face and conference call), Making effective one minute presentations.

UNIT - 4 **P-6**

READING: Reading and comprehending business documents, Learning business register, Regularizing the habit of reading business news, Suitable vocabulary, Skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts.

UNIT - 5 **P-6**

LISTENING: Specific information in business context, Listening to telephonic conversations/messages and understanding the correct intended meaning, Understanding the questions asked in interviews or in professional settings, Summarizing speaker's opinion or suggestion, Enable active listening.

TEXT BOOKS:

1. Guy Brook Hart, "Cambridge English Business Bench Mark: Upper Intermediate", 2nd edition: CUP, 2014.

2. Cambridge: BEC VANTAGE: Practice Tests, CUP, 2002.

ONLINE REFERENCES:

1. http://www.cambridgeenglish.org/exams/business-certificates/business vantage/preparation/

2. https://www.youtube.com/watch?v=qxFtn9pGaTI.

ACTIVITIES:

- *Basic grammar practice, Framing paragraphs on topics allocated.*
- *Paraphrase an article or a video in your own words Finding topic sentences in newspaper articles.*
- *Find out new words from a professional viewpoint Understanding the meaning and its usage.*
- *Peruse samples of well prepared proposals and reports.*
- *Draft different proposals/reports on topics assigned.*
- *Watch videos/ listening to audios of business presentations.*
- *Classroom activities of team and individual presentations.*
- *Use PPTs, mock exercises for BEC speaking.*
- *Present (speaking) the written components completed in Unit 1.*
- *Hand-outs; matching the statements with texts.*
- *Find the missing appropriate sentence in the text from multiple choice, multiple choices.*
- *Use right vocabulary as per the given context and editing a paragraph.*

16PL202 PETROLEUM EXPLORATION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
25	50	-	-	5	5

Course Description and Objectives:

This course mainly deals with exploring and analyzing active processes of the earth through physical measurement .The objective of this course is to expose students to a broad spectrum of geophysics, including resourse exploration, environmental geophysics, seismology and tectonics.

Course Outcomes:

The student will be able to :

- understand the physics and geology that form the basis for geophysical observation and measurement.
- understand Earth structure and evolution.
- apply skills developed in fundamental courses to geophysical problems.

  quantitatively describe the behavior of natural systems and the principles of geophysical measurement with physics-based mathematical models.

SKILLS:

- *Identify the physical processes governing the behavior of common geophysical systems.*
- *Explain the principles of applying geophysical methods to societally relevant problems, including natural hazards, resource exploration and management, and environmental issues.*
- *Quantitatively describe the behavior of natural systems and the principles of geophysical measurement with physics-based mathematical models.*

UNIT- 1 **L-9, T-3**

Reflection Seismics: BasicPrinciple and Objective, Theory of seismic wave propagation, Types of seismic waves, Absorption and attenueation, reflection, refraction, diffraction and mode conversion of seismic waves.

Refraction Method: Basic principle, geometry of refracted wave path, methodology of refraction profiling, field surveys, recording instrument and energy source. Corrections applied to refraction data. Interpretation of refraction data for understanding basin configuration.

UNIT - 2 **L-9, T-3**

2-D and 3-D seismic data acquisition: Survey objective, geological plan, logistics in the area, recording technique, Seismic velocities, geometry of seismic wave path.Recording systems, geophones, cables and ground electronics. Common depth point technique.

4D seismic methods: Fundamental aspects.

UNIT - 3 **L-9, T-3**

Seismic Data Processing: Objective, concept of autocorrelation, cross correlation and convolution, understanding processing parameters such as deconvolution, NMO, velocity analysis, filtering, stacking and migrations, understanding the concept of time domain and frequency domain for seismic wave.

UNIT - 4 **L-9, T-3**

Seismic Data Analysis and Interpretation: Objective, understanding seismic data in terms of geological information, structural information, statigraphic information, seismic attributes, direct detection of hydrocarbons – AVO technique, inversion integrating geophysical data with geological understanding and identifying prospects for drilling.

UNIT - 5 **L-9, T-3**

Gravity Method: Basic principle and objective, recording instrument, recording technique, data analysis including various gravity corrections, gravity anomalies and geological features.

Magnetic Method: Basic principle and objective, recording instrument, data analysis including various magnetic corrections, magnetic anomalies and geological features.

Aeromagnetic Method: Recording technique and objective, operations advantage.

TEXT BOOK:

1. Fundamentals of Geophysics, Lowri, W ., Cambridge University Press. (1997).

REFERENCE BOOKS:

1. Introduction to Geophysical Prospecting, Dobrin M.B., New York, McGraw-Hill, Inc.
2. Basic Exploration Geophysics, Robinson, E.S. and Coruh C., John Willey and Sons, New York, 1998.
3. Applied Geophysics, Telford,W.M. ,Geldart L.P., Sheriff, R.E., Keys, D.A. (1990.
4. Seismic Interpretation: The Physical Aspect, Anstey N.A., Boston, IHRDC.
5. Seismic data processing: by Yilmaz .

ACTIVITIES:

- *Research, analyze, and synthesize solutions to an original and contemporary geophysics problem.*
- *Make their own observations with a variety of geophysical instruments, and reduce, model, and interpret their data and uncertainties.*

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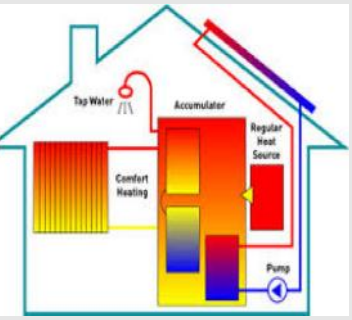


16PL205 PETROLEUM ENGINEERING THERMODYNAMICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	-	-	5	5

Course Description and Objectives:

This course deals with first, second and third laws of thermodynamics, volumetric properties, refrigeration and liquefaction processes. The objective of this course is to provide understanding in the theory and applications of classical thermodynamics, thermodynamic properties and equations of state.

Course Outcomes:

The student will be able to :

- apply fundamental concepts of thermodynamics to engineering applications.
- estimate thermodynamic properties of substances in gas and liquid states.
- determine thermodynamic efficiency of various energy related processes.

SKILLS:

- ✓ *Estimation of thermodynamic properties.*
- ✓ *Determination of heat engine and pump efficiency.*
- ✓ *Identification of reversible and irreversible processes.*
- ✓ *Selection of refrigeration process and refrigerant.*

UNIT - 1 **L-9, T-3**

Introduction : The scope of thermodynamics, defined quantities; temperature, volume, pressure,work, energy, heat, Joules Experiments, SI units.

The first law and other basic concepts : The first law of thermodynamics, thermodynamic stateand state functions, enthalpy, The steady-state steady flow process, Equilibrium, The reversible process, constant-V and constant- P processes, heat capacity.

UNIT - 2 **L-9, T-3**

Volumetric properties of pure fluids : The PVT behavior of pure substances, virial equations,the ideal gas, the applications of the virial equations, Cubic equations of state, generalized correlations for gases.

UNIT - 3 **L-9, T-3**

The second law of thermodynamics : Statements of the second law, heat engines, thermodynamictemperature scales, thermodynamic temperature and the ideal-gas scale, Entropy, Entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics. Mollier diagram and steam tables.

UNIT - 4 **L-9, T-3**

Thermodynamic properties of fluids : Property relations for homogeneous phases, Residualproperties, Generalized property correlations for gases.

Thermodynamics of flow processes; Principles of conservation of mass and energy for flowsystems, Analysis of expansion processes; turbines, throttling; compression processes – compressors and pumps; Calculation of ideal work and last work, Examples on hydrocarbons and natural gas.

UNIT - 5 **L-9**

Solution thermodynamics : Basic concepts of chemical potential, Phase equilibria, partialproperties, fugacity coefficient, residual and excess Gibbs free energy, Correlations for the estimation of fugacity coefficient, Residual and excess Gibbs energy in vapor liquid equilibria.

Phase Equilibria : Gamma/Phi formulation of VLE, VLE from Virial equations of state and cubicequations of state, Introduction to Vapor- Liquid–Liquid equilibrium (VLLE), Solid-Liquid equilibrium (SLE) and Solid-Vapor equilibrium (SVE), Equilibrium adsorption of gases on solids.

TEXT BOOK:

1. Introduction to Chemical Engineering Thermodynamics, Smith, J.M., H.C. Van Ness and M.M. Abbott, 6th Edition, 8th reprint, McGraw Hill, 2006.

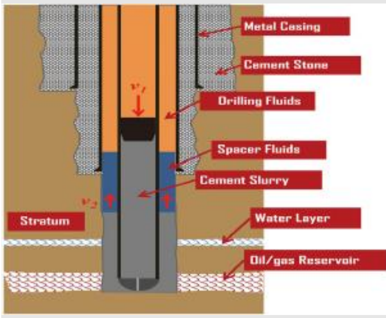
ACTIVITIES:

- *Case study on fundamental laws of thermo dynamics.*
- *Minor projects on evaluation of thermo dynamic properties.*

REFERENCE BOOKS:

1. Characterization and Properties of Petroleum Fractions, M. R. Riaze, ASTM, International, 2005.
2. Equation of State and PVT analysis, Tarek Ahmed, Gulf publishing company, 2007.
3. Engineering and Chemical Thermodynamics, Koretsky, M.D., John Wiley & Sons, 2004.
4. Introductory Chemical Engineering Thermodynamics, Richard Elliott,J. and Carl T.Lira, 2nd Edition, Prentice Hall, 2012.
5. Chemical, Biochemical and Engineering Thermodynamics, Stanley Sandler, 4th Edition, Wiley India Pvt Ltd, 2006.
6. Thermodynamics: Applications in Chemical Engineering and the Petroleum Industry, Vidal, J.,EditionTechnip, 2003.
7. Chemical and Process Thermodynamics, Kyle, B.G., 3rd Edition, PHI Learning, 2008.

16PL206 DRILLING FLUIDS AND CEMENTING TECHNOLOGY



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	20	20	45	-	10	-	-

Course Description and Objectives:

This course covers all drilling fluids technology concepts like drilling fluid selection, passing through the mud types, properties and hydraulics that are compatible with formation type & pore pressure, determination of drilling problems related to mud. Finally, drilling fluid separation and its environmental issue. The objective of this course is to provide the required practical knowledge and procedures for performing good cementing Job and also to achieve the successful Well construction Target.

Course Outcomes:

The student will be able to :

- understand the procedure to plan and design a basic well construction scheme.
- understand well control techniques.
- become acquainted with drilling rigs and drilling operations.

SKILLS:

- *Acquire a thorough knowledge of drilling fluids and rheology.*
- *Choose the right equipment for solid removal.*
- *Communicate efficiently with a drilling fluid specialist.*

ACTIVITIES:

- *Significance of waste management in drilling operations.*
- *Process used for controlling and disposing of drilled cuttings such as annular injection and offshore requirements*
- *Drilling fluids toxicity and testing.*
- *The international recommendations for handling non-aqueous fluids are also covered*

UNIT - 1 **L-9**

Drilling Fluids : Overview of drilling fluids, clay chemistry and its application to drilling fluids, types ofclays, hydration, flocculation, aggregation and dispersion. Classification, types and applications of drilling fluids: Water based, oil based, emulsion based, polymer based, surfactant based, foam based and aerated drilling fluids. Criteria of selection of drilling fluid additives and salinity of drilling fluids.

Mud Circulating System: Mud circulating pumps-agitation system-Shale Shaker-Desander-Desilter-Centrifuge.

UNIT - 2 **L-9**

Drilling Fluid Characteristics: Basic functions, properties, maintenance and treatments of drillingfluids. Drilling fluid requirement calculations. Role of formation pressure, mineralogy & petrology in designing drilling fluid. Rock texture and its relation with drilling fluids. Design of technology spe-cific drilling fluids for, environmentally sensitive areas, horizontal\ERD wells, HP-HT wells and depleted Reservoirs.

UNIT - 3 **L-9**

Cements: Cementing, cements & cement slurry: objectives of cementing, oil well cements. Clas-sification of cement, slurry design, slurry additives, factors influencing cement slurry design. Ce-menting equipment. Factors influencing cement rise behind casing and its bridging with rock and casing.

UNIT - 4 **L-9**

Cement formulation and testing: Testing and performance evaluation of cement and cement additives, slurries for casing cementation Formulation/Design of cement slurries for low temperature areas, loss prone areas, depleted reservoirs, and quality control of cementing process.

UNIT - 5 **L-9**

Cementing Methods: Primary cementing, stage cementing, liner cementing, plugging, squeeze cementing techniques in practice. Deep well cementing, squeeze jobs, prevention of gas channel-ing, HT-HP environments, analysis and techniques of evaluation of cement job. Characteristics of good quality cementation. Cementing Calculations.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 20

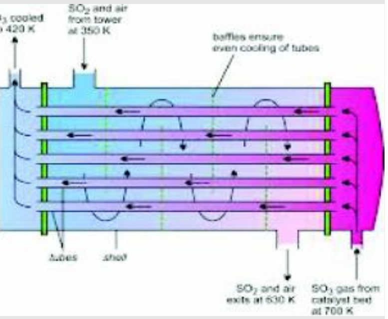
1. Measurement of mud weight
2. Measurement of mud density.
3. Measurement of mud plastic viscosity.
4. XRD studies of types of clay.
5. Measurement of gel strength.
6. Determination of filtration loss.
7. Determination of Sand content.
8. Determination of Oil, Water and Gas.
9. Determination of consistency of cement slurry (Field Visit).
10. Determination of chemical properties of water base mud.
11. Titeration of water base mud.

TEXT BOOKS:

1. ASME Shale Shaker Committee "Drilling Fluids Processing Handbook", 1st Edition 2004.
2. H. Rabia, "Well Engineering and Construction", paperback, 2001.
3. Erik B Nelson, Dominique Guillot, "Well cementing", 2nd edition, Sugar Land, 2006.

REFERENCE BOOK :

1. G. V. Chilingarian and P.Vorabutr, "Drilling and Drilling Fluids (Developments in Petroleum Science)", Elsevier Scientific Publishing Co., 1981.
2. MI-SWACO, "Engineering Drilling Fluid Manual".



16CH207 PROCESS HEAT TRANSFER

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	20

WA/RA	SSH/HSH	CS	SA	S	BS
25	50	-	5	5	5

Course Description and Objectives:

This course deals with the phenomena of heat transfer and methodologies applied for solving a wide variety of practical engineering problems. The objective of this course is to provide theoretical and practical knowledge in various modes of heat transfer and its application for designing of process equipments.

Course Outcomes:

The student will be able to :

- understand the basic laws of heat transfer.
- account for the consequence of heat transfer in thermal analyses of engineering systems.
- analyze problems involving steady state heat conduction in simple geometries.
- obtain numerical solutions for conduction and radiation heat transfer problems.
- understand the fundamentals of convective heat transfer process.
- evaluate heat transfer coefficients for natural and forced convection.
- understand the basic mechanism behind boiling and condensation processes.
- analyze heat exchanger performance by using the method of log mean temperature difference.
- calculate radiation heat transfer between black and gray surfaces.

SKILLS:

✓ *Estimate the rate of heat flow through a wall, cylinder or sphere*

✓ *Calculate the insulation thickness for a specified heat loss target.*

✓ *Determine heat transfer coefficient in simple geometries for forced and natural convection.*

✓ *Estimate area of heat exchanger required for specified conditions.*

✓ *Design of heat exchanger.*

✓ *Determine the emissivity of a given body.*

UNIT - 1 **L-9**

HEAT TRANSFER AND ITS APPLICATIONS : Nature of heat flow, Conduction, Convection, Radiation Heat transfer by conduction: Fourier's law of conduction, Thermal conductivity, Steady state conduction, Compound resistances in series, Heat flow through cylinder, Principles of heat flow in fluids: Heat exchange equipment, Counter current & parallel current flows, Energy balances, Rate of heat transfer, LMTD, Individual heat transfer coefficients, Overall heat transfer coefficient.

UNIT - 2 **L-9**

HEAT TRANSFER TO FLUIDS WITHOUT PHASE CHANGE : Regimes of heat transfer, Thermal boundary layer, Heat transfer by forced convection in laminar flow, Heat transfer by forced convection in turbulent flow, Analogy between transfer of momentum and heat, Reynolds analogy, Colburn analogy, Interpretation of dimensionless groups. Natural Convection: Dimensional analysis, Natural convection to vertical shapes and horizontal planes**.**

UNIT - 3 **L-9**

HEAT TRANSFER TO FLUIDS WITH PHASE CHANGE : Drop wise and film type condensation, Coefficients for film type condensation, Practical use of nusselt equations, Condensation of super heated vapors,Pool boiling of saturated liquid, Maximum flux and critical temperature drop.

UNIT - 4 **L-9**

RADIATION HEAT TRANSFER : Fundamental facts concerning radiation, Emission of radiation, Black body radiation, Laws of black body radiation, Absorption of radiation by opaque solids, Radiation between surfaces, Non black surfaces.

UNIT - 5 **L-9**

HEAT EXCHANGE EQUIPMENT : General design of heat exchange equipment, Heat exchangers, Condensers, Boilers. Evaporation: Liquid characteristics, Types of evaporators, Performance of tubular evaporators, Multiple effect evaporators.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 20

1. Estimation of natural convection heat transfer coefficient.
2. Determination of overall resistance in composite wall.
3. Estimation of emissivity of a test plate.
4. Verification of Stefan-Boltzmann's law of radiation.
5. Determination of heat transfer coefficients of double pipe heat exchanger.
6. Estimation of heat transfer coefficient in forced convection.
7. Determination of thermal conductivity of liquid sample.
8. Determination of thermal conductivity of solid sample.
9. Determination of critical heat flux points of nichrome wire.
10. Determination of overall heat transfer coefficient of a given coil.

ACTIVITIES:

- *Mix the heat.*
- *Feel the heat.*
- *Identification of heat exchangers.*
- *Fabrication of double pipe heat exchanger.*
- *Connecting shell and tube heat exchanger setup.*

TEXT BOOKS :

1. W. L. McCabe, J. C. Smith and P. Harriott, “Unit Operations of Chemical Engineering”, 6th edition, McGraw-Hill, Inc., 2005.

2. D. Q. Kern, “Process Heat Transfer”, 1st edition, Tata McGraw-Hill, 2002.

REFERENCE BOOKS :

1. J. P. Holman, “Heat Transfer”, 8th edition, McGraw-Hill, New York, 1997.

2. Y. V. C. Rao, “Heat Transfer”, 1st edition., University Press, 2001.

3. D. Pitts, E. Leighton and Sissom, “Schaum’s Outline of Heat Transfer”, 2nd edition., McGraw-Hill publications, 1998.

4. J.M. Coulson and J. F. Richardson, “Chemical Engineering,Vol-1”, Oxford, Pergamon Press,1968.

III Year B.Tech. Petroleum Engg. - I-Semester

L	T	P	To	C
4	0	-	4	4

PL303 PETROLEUM INSTURMENTATION

Course Description & Objectives:

The course provides insight into instruments that are used to measure physical properties in chemical process industries. The objective of this course is to familiarize student with the working principles of standard measurement devices used in engineering applications.

Course Outcomes:

1. Discuss principles involved in the measurement and control of industrial processes.

2. Understand instruments and devices used for designing process control systems.

UNIT - I

QUALITIES OF MEASUREMENT : Elements of Instruments, Static and dynamic characteristics, Response of first order instruments.

TEMPERATURE MEASUREMENTS : Expansion thermometer- Thermoelectric temperature measurements.

UNIT - II

TEMPERATURE MEASUREMENT : Resistance and radiation, Thermal coefficients of resistance, Industrial resistance thermometer bulbs and circuits, Radiation, Photoelectric and optical pyrometers.

COMPOSITION ANALYSIS : Spectroscopic analysis, Chromatography (GC, HPLC, GCMS/LCMS), Color measurement spectrometers.

UNIT - III

MEASUREMENT OF PRESSURE AND VACUUM : Liquid column manometers, Gauge pressure and vacuum measurement, Indicating elements for pressure gauges, Measurement of absolute pressure, Corrosive liquids, Static accuracy and response of pressure gauges.

UNIT - IV

MEASUREMENT OF HEAD AND LEVEL : Head, Density and specific gravity measurement, Direct measurement of liquid level, Pressure measurement in open vessels measurement of interface level, Density measurement.

UNIT- V

FLOW METERING : Head Flow and area flow meters, Open channel meters, Viscosity measurements, Quantity meters, Flow of dry materials. Recording, Indicating and signaling Instruments. PI Diagrams, Control center.

TEXT BOOKS :

1. Donald P. Eckman, "Industrial Instrumentation", 1st edition, Wiley Eastern, 2004.

2. Patranabis, "Principles of Industrial Instrumentation", 2nd edition, Tata McGraw-Hill, 2007.

REFERENCE BOOKS :

1. D.M.Considine, "Hand Book of Instrumentation", 2nd edition, McGraw-Hill, 1957.

2. Norman Anderson, "Instrumentation for Process Measurement and Control", 3rd edition, CRC Press, 1997.

III Year B.Tech. Petroleum Engg. - I-Semester	L	T	P	To	C
	4	0	-	4	4

PL305 WELL LOGGING & FORMATION EVALUATION

***Course Description & Objectives**:*

This course deals with the Modern logging techniques, Rock Properties, Open hole Logging Measurements, Analysis of Logs and Cores. The objective of this course is to understanding of the principles and applications of open hole well logging data.

Course Outcomes:

1. Scan a well log for quality control.
2. Define zones of interest on a log.
3. Implement basic log quality control and environmental corrections.
4. Determine Archie parameters and using to determine saturations design and supervise a basic logging operation.

UNIT - I

Direct Methods: Mud logging-coring–conventional and sidewall coring - Core analysis. **Concepts of well logging**: What is well logging? - Logging terminology-Borehole environment-Borehole temperature and pressure-Log header and depth scale-Major components of well logging unit and logging setup- Classification of well logging methods-Log presentation- Log quality control.

UNIT - II

Open hole logging: SP Logging- Origin of SP, uses of SP log-Calculation of salinity of formation water- Shaliness-Factors influence SP log.

Resistivity log: Single point resistance log (SPR)- Conventional resistivity logs- Response of potential and gradient logs over thin and thick conductive and resistive formations-Limitations of conventional resistivity tools. Focused resistivity log- Advantages of focused resistivity tools over conventional resistivity tools.

Micro resistivity log: Conventional and focused micro resistivity logs and their application. **Induction log**: Principle of induction tool and the advantages, Criteria for selection of inductionand lateral logging tool, Determination of true resistivity (Rt) of the formation-Resistivity index-Archie's equation.

UNIT - III

Gamma ray log: principle of radioactivity-Uses of gamma ray log-Determination of Shaliness offormation-API counts - Calibration of Gamma ray tool-Statistical fluctuation- Time constant.

Natural Spectral Gamma ray log: Principle and application.

Caliper log: Principle and application of caliper tool.

Density log: Principle of density tool-Environmental corrections-Porosity determination-Tool calibration, Litho density log.

Neutron log: Principle and application of neutron tool, Porosity determination.

Sonic log: Principle and application of sonic log-Bore hole compensation - Determination of primary and secondary porosity, determination of mechanical properties of rock, elastic constants, fractures etc.

UNIT - IV

Cased hole logging: Gamma ray spectral log-Neutron decay time log-Determination of fluid saturation behind casing-Cement bond log- Casing collar log-Depth control- Perforation technique- Free point locater and Plug setting-Casing inspection logs.

Well Velocity Survey: VSP Surveys.

Production logging: Solving production problems with the help of Fluid Density log-Temperature log and Flow meter logs.

UNIT - V

Advances in Well logging: Dip meter log-Formation tester-Cased hole resistivity logs-Nuclear magnetic resonance log & Scanner logs (Sonic scanner, MR scanner Rt scanner).

Calculating the dip of the formations, collection of fluid samples from wells for confirmation of log interpretation, and also recording resistivity in cased holes.

Interpretation: Quick look interpretation- Cross plots. Neutron- Density, Sonic-Density, Sonic-Neutron cross plots-Hingle plot-Mid plot–Correlation-Hydrocarbon reserve estimate.

TEXT BOOKS:

1. Formation Evaluation, Edward J. Lynch, Harper & Row, 1962

2. Well Logging and Formation Evaluation, Toby Darling, Elsevier, New York, 2005.

REFERENCE BOOK:

1. Well Logging & Reservoir Evaluation, Oberto Serra, Editions Technip, 2007.

III Year B.Tech. Petroleum Engg. - I-Semester

L	T	P	To	C
4	0	-	4	4

PL307 WELL COMPLETION, TESTING & SERVICES

***Course Description & Objectives**:*

1. Knowledge of subsurface equipment below well head.
2. Planning and designing of well completion after testing of the hydrocarbon zones available.
3. Knowledge of subsurface circulating equipment and packers.
4. Testing of multi zones in a well with DST/RFT with logging tools as well as surface testing equipment.

Course Outcomes:

The student will be able to:

1. Have the knowledge of various equipment used in & on wells.
2. Have the knowledge of DST/RFT to know the initial potential of the wells.
3. Plan and design the well completion depending of the casing policy and the number of objectives available in the well.
4. Plan for suitable safety valves in sub surface as well as on well head for the safe operation of the high pressure and high temperature wells.
5. Become a good work over engineer to repair and maintenance of a sick well.
6. Be a good CTU (Coil Tubing unit) operator whenever rigs less operation are required to be taken up.

UNIT - I

Well completion: Types of wells- Completion functions- Types of completion.

UNIT - II

Mechanical aspects of well testing- Cased hole logging equipment and application and perforation methods and perforation equipment.

UNIT - III

Packers: Function- Application- Proper selection- Packer setting – Packer loads - water / gas shut off, horizon separation etc.

UNIT - IV

Completion equipment (SSD, SSSV, mandrels, locks etc.)- Data acquisition in wells- Fiber optics- Permanent gauges- Memory gauges- Intelligent completion equipment.

UNIT - V

Tubing string design (dimension, materials and connections etc.) based on pressure, temperature, operating conditions- Media- Safety requirements.

Drill Stem Testing: General Procedure and considerations- Test tool components and arrangement-Analysis of Test data.

Text Books:

Well Completion and Servicing, D. Perrin, Micheal Caron, Georges Gaillot, Editions Technip, 1999.

2. Primer of Well Service, Workover and Completion, Petroleum Extension Service (PETEX), University of Texas at Austin, 1997.

3. Well Testing, John Lee, Society of Petroleum Engineers, 1982.

Reference Books:

1. Well Completion Design, Jonathan Bellarby, Elsevier, 2009.
2. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman, Inc., 1986.
3. Advanced Well Completion Engineering, Wan Renpu, Gulf Professional Publishing, 2011.

III Year B.Tech. Petroleum Engg. - I-Semester	L	T	P	To	C
	4	0	-	4	4

PL309 PETROLEUM REFINERY ENGINEERING

Course Description & Objectives:

To understand the properties and their significance of crude oils and petroleum fractions. To understand, design and analyze the various petroleum refinery processes including primary, secondary and upporting processes.To understand the process technologies for the petrochemical products.

Course Outcomes:

The student will be able to :

- For a given crude assay, how to handle and store the crude oil
- What will be the yield, quality of the product, estimation for the primary processes and treatmentconsiderations?
- Maximize the profitable products and minimize the quality giveaway
- Ability to process the opportunity crudes (e.g. Blending with other

crudes) to maximize the throughput and gross margin

- Application of suitable Hydro processing/treatment technologies to meet product qualities and to minimize the CAPEX & OPEX (capital and operating expenditure).
- Application of suitable thermal/catalytic conversion (cracking) processes for Vacuum gas oil upgradation and to produce desired fuel blend components and petrochemical feed stocks.

UNIT - I

Introduction: Overall refinery operations & Indian scenario.

Refinery feed stocks: Crude oil classification-Composition and properties-Composition of petroleum crude suitable for asphalt/coke manufacture – Evaluation of crude oils.

UNIT - II

Petroleum Products and their specifications: LPG- Gasoline- Diesel fuels- Jet and turbine fuels

–Lube oils-Heating oils – Residual fuel oils - Wax and Asphalt- Petroleum coke- All Product speci- fications-Product blending.

UNIT - III

Crude distillation: Atmospheric and Vacuum distillation units, Auxiliary equipment such as desalters, pipe-still heaters and heat exchanger trains etc.

Catalytic reforming and isomerization: Catalytic reforming processes (for petroleum and petrochemical feed stocks) – Isomerization Processes -Feed stocks-Feed preparation – Yields.

UNIT - IV

Thermal & Catalytic cracking processes: Visbreaking- Delayed Coking –Fluid Catalytic cracking and Hydrocracking - Feed stocks –– Catalysts - Process variables –Product Recoveries- Yield estimation.

Hydrotreating & Hydroprocessing: Naphtha, Kerosene, Diesel, VGO & Resid, Hydrotreating / Hydroprocessing – Feed stocks – Process description and Process variables

UNIT - V

Petrochemical Industry: – Indian Petrochemical Industry- Feed stocks – Process description and Process variables-Naphtha cracking-Gas cracking and Gas reforming. **Chemicals from gas reforming**: Methanol-Acetic acid- Ammonia and urea. **Chemicals from ethylene:** Ethylene oxide-Mono ethylene glycol-Ethyl benzene-Styrene.

Polymers: LDPE, HDPE & LLDPE and Polypropylene – PVC - Polystyrene.

TEXT BOOKS :

1. Petroleum Refining: Technology and Economics, J.H. Gary and G.E.Handwerk, 4thEdition, Marcel Dekkar, Inc., 2001
2. Petrochemical Process Technology, ID Mall, Macmillan India Ltd., 2007

REFERENCE BOOKS :

1. Petroleum Refining Engineering, WL Nelson, 4thEdition, McGraw Hill Company, 1958.
2. Fundamentals of Petroleum Chemical Technology, P Belov, Mir Publishers, 1970.
3. Handbook of Petrochemicals Production Processes, R.A. Meyers, TRW,Inc., 2005.
4. Modern Petroleum Refining Processes, B.K. BhaskaraRao, 5th Edition, Oxford & IBH Publishing, 2011.

III Year B.Tech. Petroleum Engg. - I-Semester	L	T	P	To	C
	0	0	3	3	2

PL315 PROCESS INSTRUMENTATION LAB

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 20

1. Temperature measurement using thermocouple.
2. Temperature measurement using RTD.
3. Specific gravity measurement of solid specimen.
4. Analysis of amino acids by thin layer chromatography.
5. Analysis of amino acids by paper chromatography.
6. Calibration of rotameter.
7. Viscosity measurement using redwood viscometer.
8. UV visible spectrometer.
9. Gas Chromatography.

10. High performance liquid chromatography.

11. Measurements and Calibration of pressure.

TEXT BOOKS:

1. Donald P. Eckman, “Industrial Instrumentation”, 1st edition, Wiley Eastern, 2004
2. Patranabis, “Principles of Industrial Instrumentation”, 2nd edition, Tata McGraw-Hill, 2007.

REFERENCE BOOKS :

1. D.M.Considine, “Hand Book of Instrumentation”, 2nd edition, McGraw-Hill, 1957.
2. Norman Anderson, “Instrumentation for Process Measurement and Control”, 3rd edition, CRC Press, 1997.

III Year B.Tech. Petroleum Engg. - I-Semester	L	T	P	To	C
	0	0	3	3	2

PL317 DRILLING TECHNOLOGY & WELL LOGGING LAB

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 20

1. Evaluation of porosity, saturation, shaliness etc. from logs. (3 practicals).
2. Experiments based on log interpretation, preparation and evaluation of log cross-section. (3 practicals).
3. Standard log interpretation methods.
4. Cross-plotting methods: neutron-density, sonic-density and sonic-neutron etc.
5. Clean sand interpretation.
6. Concept of invasion – Rxo, Tornado charts.

7. Shaly sand interpretation.
8. Interpretation of depositional environment (3 exercises)
9. Correlation using logs.
10. Use of any standard log interpretation software.
11. Field Visit.

TEXT BOOKS:

1. Formation Evaluation, Edward J. Lynch, Harper & Row, 1962.
2. Well Logging and Formation Evaluation, Toby Darling, Elsevier, New York, 2005.

REFERENCE BOOK:

1. Well Logging & Reservoir Evaluation, Oberto Serra, Editions Technip, 2007.

III Year B.Tech. Petroleum Engg. - I-Semester	L	T	P	To	C
	0	0	3	3	2

PL319 PETROLEUM ANALYSIS LAB

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 20

1. Measuring the density, specific gravity and API gravity Using Hydrometers.
2. Measuring the density, specific gravity and API gravity by pycnometer.
3. Measuring the absolute viscosity using Brookfield Viscometer.
4. Measuring the kinematic viscosity using U – tube Viscometer.
5. Determination of Flash point by pensky-Martens closed tester method.

6. Determination of cloud point and pour point of crude oil.
7. Determination of the water in crude oil by distillation.
8. Determination of the water and sediments in crude oil by the centrifuge method.
9. Determination of the total salts content of crude oil by conductivity method.
10. Determination of natural gas composition using GC chromatography.

III Year B.Tech. Petroleum Engg. - II-Semester	L	T	P	To	C
	4	0	-	4	4

PL302 PETROLEUM RESERVIOR ENGINEERING-I

Course Description & Objectives:

To impart knowledge in the basic concepts like PVT analysis for oil, Material balance applied to oil reservoir, Darcy's law and applications, well inflow estimation for stabilized flow conditions.

Course Outcomes:

The student will be able to :

- To make them suitable as reservoir engineers for petroleum industry.

UNIT - I

Some basic concepts in reservoir engineering : Calculation of hydrocarbon volumes- Fluid pressure regimes- Oil recovery and recovery factor-Volumetric gas reservoir engineering– Application of the real gas equation of state - Gas material balance and recovery factor-Hydrocarbon phase behavior.

UNIT - II

PVT analysis for oil: Definition of the basic PVT parameters–Collection of fluid samples -Determination of the basic parameters in the laboratory and conversion for field operating conditions - Alternative manner of expressing PVT lab analysis results - Complete PVT analysis.

UNIT - III

Material balance applied to oil reservoirs: General form -The material balance expressed as a linear equation- Reservoir drive mechanism- Solution gas drive- Gas cap drive- Natural water drive- Compaction drive under related pore compressibility phenomena.

UNIT - IV

Darcy's law and applications: Darcy's law and field potential- Sign convention- Units and units conversion- Real gas potential – Datum pressures- Radial steady state flow and well stimulation-Two phase flow- Effective and relative permeabilities.

UNIT - V

The basic differential equation for radial flow in a porous medium- Derivation of the basic radial differential equation – Conditions of solution – The linearization of the equation for fluids of small and constant compressibility. **Well inflow estimation for stabilized flow conditions:** Semi steady state solution–Steady statesolution – Example of the application of the stabilized inflow equations – Generalized form of inflow equation under semi steady state conditions.

TEXT BOOKS:

1. Fundamentals of Reservoir Engineering, L.P. Dake, Elsevier Science, 1978 (17th Impression 1998).
2. B. C. Craft – M. Hawkins Applied Petroleum Reservoir Engineering, Third Edition, Revised by Ronald E. Terry & J. Brandon Rogers, Prentice Hall, New York, 2014.

REFERENCE BOOKS:

1. Reservoir Engineering Handbook, Tarek Ahmed, 3rd Edition, Gulf Professional Publishing, 2006.
2. Petroleum Reservoir Engineering, James W Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill, 1960.
3. Rider, M. H., "The Geological Interpretation of Well Logs" John Wiley Publishing Company.
4. Stefan M. Luthi, 2001, Geological Well Logs: Their Use in Reservoir Modelling, Springer, 381 pp.

III Year B.Tech. Petroleum Engg. - II-Semester	L	T	P	To	C
	4	0	-	4	4

PL304 SURFACE PRODUCTION OPERATIONS

Course Description and Objectives:

This course covers the fundamentals and methodologies in the petroleum refining processes. The objective of this course is to train students on the concepts of petrochemicals, polymerization and the unit operations involved in it.

Course Outcomes:

The student will be able to:

- gain knowledge on the unit process involved in petroleum refining process.
- understand the production methods for manufacturing industrial polymers.
- familiarize with the various issues arising in petroleum refining operations.

UNIT - I

Production facilities: Various types of facilities Controlling the process-Basic systemconfiguration design & selection of facilities: Wellhead and manifold-Separation-Initial separation pressure- Stage Separation, Selection of Stages, Process flow sheets, P&IDs, monitoring well performance testing & optimization of flow.

UNIT - II

Two phase liquid and gas separation: Functional sections of a gas-liquid separator- Inlet diverter section- Liquid collection section- Gravity settling section- Mist extractor section- Equipment description of different separators-Scrubbers- Slug catchers- Selection considerations- Vessel internals- Mist extractors- Potential operating problems. **Three phase oil, gas and water separation:** Equipment description- Horizontal separators-Derivation of equation- Free-water knockout- Flow splitter- Horizontal three-phase separator with a liquid "Boot"-Vertical separator- Selection considerations-Vessel internals- Coalescing plates-Turbulent flow coalesces and potential operating problems.

UNIT - III

Crude oil treating: Equipment description of various treaters and heaters-Indirect and fired heaters- Heater sizing- Vertical heater-treaters- Coalescing media- Horizontal heater treaters-Electrostatic heater-treaters- Oil dehydrators- Emulsion treating theory Agitation- Emulsifying agents-Demulsifies- Field optimization- Emulsion treating methods- General considerations-Chemical addition- Amount of chemical- Bottle test considerations- Chemical selection.

Oil desalting systems: Oil desalting systems-Equipment description of desalters- Mixing equipment- Process description- Single stage desalting-Two stage desalting; Monitoring of oil quality.

UNIT - IV

Produced water treating systems: Characteristics of produced water-Sand and other suspended solids- Dissolved gases- Oil in water emulsions-Dissolved oil concentrations- Dispersed oil-Toxicants- Gravity separation-Coalescence- Dispersion- Flotation- Filtration- Equipment description-Retention time and performance considerations-Design of produced water treating systems.Disposal standards- Disposal methods-Offshore & Onshore operations.

UNIT - V

Storage facilities, measurements custody transfer marketing- transportation modes & dispatch. Gas dehydration compression measurements custody transfer marketing- transportation dispatch. Fire protection systems for tank farm pumping /compressor stations.Water injection facilities, Sources of water, Treatment system, Pumping, Chemical dosing, Identification wells, Patterns of injections well performance monitoring reservoir monitoring.

TEXT BOOK:

1. Petroleum and Gas Field Processing, H.K.Abdel-Aal and Mohamed Aggour and M.A. Fahim, Marcel Dekkar Inc., 2003.

REFERENCE BOOK:

1. Surface Production Operations, Ken Arnold & Maurice Stewart, Vol. 1 & 2, 3rd Edition, Gulf Professional Publishing, 2008.

III Year B.Tech. Petroleum Engg. - II-Semester	L	T	P	To	C
	4	0	-	4	4

PL306 PROCESS DYNAMICS & CONTROL

Course Description & Objectives:

To understand and be able to describe quantitatively the dynamic behavior of process systems. To learn the fundamental principles of control theory including different types of controllers and control strategies. To estimate the stability limits for a system, with or without control.

Course Outcomes:

The student will be able to :

- Describe a process, how it works and what the control objectives are.
- Describe processes with appropriate block diagrams.

- Numerically model a process.
- Identify the stability limits of a system.

UNIT - I

FIRST ORDER SYSTEM : Introduction to process dynamics and control, Response of first order systems, Physical examples of first order systems, Response of first order systems in series. Higher order systems, Second order systems and transportation lag.

UNIT - II

CONTROL SYSTEM : Controllers and final control elements, Block diagram of a chemical reactor, Control Systems, Closed loop transfer functions, Transient response of simple control systems.

UNIT - III

STABILITY CRITERIA : Stability, Routh array, Root locus, Application of Root locus to control systems.

UNIT - IV

FREQUENCY RESPONSE ANALYSIS : Introduction to frequency response, Control systems design by frequency response, Bode diagrams.

UNIT - V

ADVANCED CONTROL STRATEGIES : Advanced control strategies, Cascade control, Feed Forward control, Ratio control, Smith predictor, Dead time compensation, Internal mode control. Controller tuning, Process Identification, Different types of control valves and their characteristics.

TEXT BOOKS:

1. Donald R Coughanowr, "Process System Analysis and Control" 3rd edition, McGraw-Hill, 2011.

2. G. Stephanepolous, "Chemical Process Control", 1st edition, Prentice Hall of India, 1998.

REFERENCE BOOK:

1. Peter Harriott, "Process Control", Tata McGraw-Hill, 2008.

III Year B.Tech. Petroleum Engg. - II-Semester

L	T	P	To	C
4	0	-	4	4

PL308 PETROLEUM ECONOMIICS & ASSET MANAGEMENT

Course Description & Objectives:

Understand the importance of petroleum sector in the world economy, both the macro and micro-economic environment and as applicable to India.

Course Outcomes:

The student will be able to :

- To have an overview of the regulatory frame related to exploration as per NELP.
- Understand geopolitical risks and opportunities and hedging strategies to mitigate market and price risks.

UNIT - I

Macro-Economic Approach of Petroleum Industry: Political environment related to petroleum industry and issues related to government and corporate interests, Need for understanding petroleum economics required to make investment decisions; Introduction, Role and value of Oil & Gas, Evolution of national oil companies, Organization of petroleum exporting countries.

UNIT - II

Principles, Methods and Techniques of Petroleum Engineering Economics: Introduction,outline and key terminologies and generic issues of micro-economic analysis applicable to all sectors of the oil and gas supply chain, Capital budgeting and capital efficiency, Sources of revenue and cost and profitability analysis, Operating expenditures (opex) and their fixed, variable and marginal components, Economic indicators and yardsticks used to rank asset values (NPV, IRR, etc.).

UNIT - III

Managing and Mitigating Uncertainty and Risk: Risk, uncertainty and decision analysis, Analysis of alternative selections and replacements**,** Managing and Mitigating uncertainty and Risk-Break even and sensitivity analysis, Optimization Techniques, Geopolitical risks and opportunities and hedging strategies to mitigate market and price risks, Asset valuation process: fair market value, probability and risk.

UNIT - IV

Application and Project Evaluation: Project lifecycles, optimum economic life and multi-year cash flows, Oil fields exploration and drilling operations, Oil fields' estimation of oil reserves and evaluation of an oil property, Project financial analysis, Project development and Joint development utilization oil fields production operations, Oil transportation, Crude oil processing.

UNIT - V

Valuing Petroleum Assets, Portfolios and Companies: Asset valuation process: fair market value, probability and risk, Risk adjustments when valuing petroleum reserve categories, The portfolio approach to asset and corporate management, Portfolio characterization, balance and diversification.

Demand and Marketing of Petroleum Products: Crude oil fundamentals, Price of crude, Crudeoil prices in transactions, Internal Markets and Prices, Marketing and sale of Motor, Aviation, Lubricant, Asphalt and Propane;. Transportation: Fundamentals of transportation, Pipelines, Oil tankers, Downstream transportations, Distribution of petroleum products.

TEXT BOOKS:

1. Petroleum Economics and Engineering, Third Edition, Hussein K. Abdel-Aal, Mohammed A. Alsahlawi, CRC Press, 2013. (ISBN: ISBN; 1466506660, 9781466506664)
2. The Global Oil & Gas Industry: Management, Strategy and Finance, Andrew Inkpen &
   Michael H. Moffett, 2011. (ISBN-10: 1593702396, ISBN-13: 978-1593702397)

REFERENCE BOOK:

1. SPetroleum Economics, Jean Masseron, Technip; 4th revised Edition, 2000. (ISBN-10:2710805979; ISBN-13: 978-2710805977).

III Year B.Tech. Petroleum Engg. - II-Semester

L	T	P	To	C
4	0	-	4	4

PL350 FUNDAMENTALS OF LIQUEFIED NATURAL GAS

Course Description & Objectives:

To impart basic knowledge of LNG and it's prospective. To learn different liquefaction tech- nologies of LNG. To have knowledge on different functional units on receiving terminals.

Course Outcomes:

The student will be able to :

- To analyze transportation of LNG and regasification.
- To understand HSE of LNG industry.
- Have good knowledge on LNG process.

UNIT - I

Introduction: Overview of LNG industry: History of LNG industry – Base load LNG – Developing an LNG Project – World and Indian Scenario – Properties of LNG.

UNIT - II

Liquefaction Technologies: Propane precooled mixed refrigerant process – Description of Air products C3MR LNG process – Liquefaction – LNG flash and storage.

Cascade process: Description of Conoco Phillips Optimized Cascade (CPOC) process – Liquefaction – LNG flash and storage.

Other Liquefaction Processes: Description of Linde MFC LNG process- Precooling and Liquefied Petroleum Gas (LPG) recovery – Liquefaction and Subcooling- Trends in LNG train capacity – Strategy for grassroots plant- Offshore LNG production.

UNIT - III

Supporting Functional Units in LNG Plants: Gas pretreatment: Slug catcher – NGL stabilization column – Acid gas removal unit – Molecular sieve dehydrating unit – Mercury and sulfur removal unit – NGL recovery – Nitrogen rejection – Helium recovery.

UNIT - IV

Receiving Terminals: Receiving terminals in India – Main components and description of marine facilities – Storage capacity – Process descriptions.

Integration with adjacent facilities – Gas inter changeability – Nitrogen injection – Extraction of C2+ components.

UNIT - 5

LNG Shipping Industry & Major Equipment in LNG Industry: LNG Shipping Industry: LNG fleet – Types of LNG ships – Moss – Membrane – prismatic; Cargo measurement and calculations. Major equipment in LNG industry – Cryogenic heat exchangers: Spiral – Wound heat exchangers – Plate & fin heat exchangers – Cold boxes; Centrifugal compressors – Axial compressors – Reciprocating compressors;, LNG pumps and liquid expanders – Loading Arms and gas turbine.

TEXT BOOK:

1. LNG: Basics of Liquefied Natural Gas, 1st Edition, Stanley Huang, Hwa Chiu and Doug Elliot, PETEX, 2007.

REFERENCE BOOKS:

1. Marine Transportation of LNG (Liquefied) and Related Products, Richard G. Wooler, Gornell Marine Press, 1975.

2. Natural Gas: Production, Processing and Transport, AlexandreRojey, Editions OPHRYS, 1997.

3. Natural Gas Transportation, Storage and Use, Mark Fennell Amazon Digital Services, Inc., 2011.

III Year B.Tech. Petroleum Engg. - II-Semester	L	T	P	To	C
	0	0	3	3	2

PL310 PETROLEUM RESERVOIR ENGINEERING-I LAB

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total Hours-20

1. Determination of porosity using water saturation method.
2. Measurement of surface tension & interfacial tension with the ring Tensiometer. Equipment: Tensiometer.

3. Measurement of surface tension using capillary rise method.
4. Measurement of surface tension with the ring Stalagnometer.
5. Determination of fluid density using Pycnometer and hydrometer methods. Equipment: Pycnometer and hydrometer.
6. Liquid viscosity measurement using capillary tube viscometer (Ostwald type). Equipment: Capillary tube viscometer.
7. Liquid viscosity measurement using falling ball tube method.
8. Determination of capillary pressure of reservoir rock (core) using porous plate method. Equipment: Capillary pressure cell.
9. Absolute permeability measurement of water. Equipment: The Darcy apparatus.
10. Measurement of contact angle (between oil, water and solid surface) using imaging method. Equipment: The image system set-up.
11. Determination of relative permeability of oil-water using unsteady state method. Equipment: Relative permeability apparatus

TEXT BOOKS:

1. Fundamentals of Reservoir Engineering, L.P. Dake, Elsevier Science, 1978 (17th Impression 1998).
2. B. C. Craft – M. Hawkins Applied Petroleum Reservoir Engineering, Third Edition, Revised by Ronald E. Terry & J. Brandon Rogers, Prentice Hall, New York, 2014.

REFERENCE BOOKS:

1. Reservoir Engineering Handbook, Tarek Ahmed, 3rd Edition, Gulf Professional Publishing, 2006.
2. Petroleum Reservoir Engineering, James W Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill, 1960.
3. Rider, M. H., “The Geological Interpretation of Well Logs” John Wiley Publishing Company.
4. Stefan M. Luthi, 2001, Geological Well Logs: Their Use in Reservoir Modelling, Springer, 381 pp.

III Year B.Tech. Petroleum Engg. - II-Semester

L	T	P	To	C
0	0	3	3	2

PL312 PROCESS DYNAMICS & CONTROL LAB

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 20

1. Dynamics of 1st order systems [Thermometer].
2. Response of 2nd order system [Manometer].
3. Reponse of single tank system.
4. Response of interacting & non-interacting system for step input.
5. Response of interacting & non-interacting system for pulse input.
6. Control of pressure by using pressure control trainer.
7. Response of control valves.
8. Response of 1st and 2nd order system using Mat Lab.
9. Temperature control by using temperature control trainer.
10. Control of level by using level control trainer.

TEXT BOOKS:

1. Donald R Coughanowr, “Process System Analysis and Control” 3rd edition, McGraw-Hill, 2011.
2. G. Stephanepolous, “Chemical Process Control”, 1st edition, Prentice Hall of India, 1998.

REFERENCE BOOK:

1. Peter Harriott, “Process Control”, Tata McGraw-Hill, 2008.

AUTOMOBILE ENGINEERING

16AE246 BASIC AUTOMOBILE ENGINEERING

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course offers insight into the recent advancements in various automotive technologies as alternatives to the conventional ones. As an advanced level course, it provides the learner with the knowledge of innovative technologies that help trace, control and manage vehicle remotely. The objective of this course is to provide up to date technologies and innovations in automotive industry in various aspects of vehicle operation. It also includes advanced engine technologies that deliver superior efficiency and fuel economy with lower emissions.

Course Outcomes:

The student will be able to:

- ✓ understand and work with different vehicle power systems
- ✓ gain knowledge on latest technologies such as stratified charge
- ✓ combustion engines
- ✓ work with various vehicle and engine control systems that monitor fuel economy,
- ✓ emission measurement etc.
- ✓ understand and propose advanced road networks for safe and fast travel

SKILLS ACQUIRED:

- ✓ Analyze combustion process in IC engines and gas turbines
- ✓ Formulate chemical kinetic mechanisms
- ✓ Analyze effect of air fuel ratio on combustion efficiency
- ✓ Perform flame speed correlations and study its influence
- ✓ Differentiate burning of fuel in different engines
- ✓ Analyze combustion characteristics of different alternative fuels
- ✓ Identify different models for combustion analysis

UNIT – I

Introduction: Layout of automobile – introduction chassis and body components. Types of Automobile engines, cylinder arrangement – Power unit – Introduction to engine lubrication

UNIT-II

Cooling System : Cooling Requirements, Air Cooling, Liquid Cooling,Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan – water pump, thermostat, evaporative cooling

Fuel System: SI Engine and CI Engine: Fuel supply systems, Mechanical and electrical fuel pump – filters – carburettor – types – air filters – injection systems.

UNIT- III

Ignition System: Function of an ignition system, battery ignition system, constructional features of storage, battery, spark plug – Magneto coil ignition system, electronic ignition system.

Electrical System: Charging circuit, generator, starting system, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT – IV

Transmission System : Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, gear boxes, types, sliding mesh, constant mesh, synchro mesh gear boxes,. Propeller shaft universal joint, differential.
Suspension System: Objects and types suspension systems

UNIT – V

Braking System: Types of brake System. **Steering System** : Steering geometry – camber, castor, Steering gearbox – types,

.

TEXT BOOKS

- **A Text Book of Automobile Engineering**. R. K. Rajput, Firewall Media, 2007
- A Text Book Automobile Engineering-R.B Gupta, Satya Publications.

REFERENCES

- A Text Book of Automobile Engineering by S K Gupta, S. Chand publications.
- Automotive Mechanics / Heitner.
- Automotive Engineering / Newton Steeds & Garrett.
- Automotive Engines / Srinivasan.
- A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International.

16AE206 ADVANCED THEORY OF I.C. ENGINES

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
8	30	4	10	4	5

Course Description and Objectives:

The course aims to develop the students with the knowledge about the advanced theory and working of I.C engines and the phenomena of combustion and modeling.

Course Outcomes:

Upon the successful completion of the course, learners will be able to

a) explain the various working cycles of engine.
b) describe the various types of combustion in IC engines.
c) illustrate the engine combustion parameters.
d) describe the different types of modern engines.
e) explain the modern electronic engine management system (EMS) of IC engines.

SKILLS ACQUIRED:

1. Able to develop the basic knowledge of I.C. Engine working & how combustion takes places.
2. Able to gain knowledge about the fuel system used in I.C engine
3. Able to understand about Locomotive and marine engines.
4. Able to understand Photographic studies of combustion processes.

ACTIVITIES:

1. Develop project on modeling of engine piston
2. Develop project on different IC combustion analysis in IC engines.

UNIT – I

Introduction: Fuel air cycle and Actual cycle analysis, Properties of IC engine fuels, Refining process, chemical composition and molecular structure of fuels, octane number, cetane number. Knock rating of SI engine fuels.

UNIT – II

Combustion of Fuels: Combustion Stoichiometry of petrol, diesel, alcohol and hydrogen fuels – Chemical energy and heating values – Chemical equilibrium and maximum temperature – SI engine combustion – Flame velocity and area of flame front –performance number – CI engine combustion. Fuel spray characteristics – droplet size, penetration and atomization.

UNIT – III

Combustion Modeling: Basic concepts of engine simulation – Governing equations, thermodynamic models – SI engine and CI engine models.

UNIT – IV

Non-Conventional I.C. Engines: Adiabatic and L.H.R. engines – Variable compression ratio engine – Wankel rotary combustion engine – Free piston engine - MAN combustion chamber and multi fuel engines – Stratified charge and lean burn engines – Locomotive and marine engines.

UNIT – V

Combustion Analysis in I.C. Engines: Photographic studies of combustion processes –

P-E diagrams in SI and CI engines, Rate of heat release – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TEXT BOOKS:

1. Ganesan,V., Internal combustion engines, Tata McGraw Hill Publishing Co., 1994.
2. John,B., Heywood, Internal Combustion Engine Fundamentals, McGraw Hill Publishing Co., New York, 1990.

REFERENCES:

1. Ramalingam. K.K., Internal Combustion Engine, scitech publications, Chennai, 2003.
2. Ganesan,V., Compute Simulation of Spark Ignition engine process, Universities Press (India) Ltd., Hyderabad, 1996.
3. Benson, R.S., Whitehouse, N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979

16AE242 MODERN VEHICLE TECHNOLOGY

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course aims to equip students with the recent advancements in various automotive systems which have become indispensable for comfort, safety, navigation and engine management. If offers up to date technologies and innovations in automotive industry in various aspects of vehicle operation. It also includes driver and passenger information systems, entertainment systems, electronic engine management systems that ensure smooth running of the automobile.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

a. Know about the Modern Automobile accessories and engine management system
b. Gain knowledge about various suspension systems.
c. Understand the concept of automotive air-conditioning systems.
d. Know about various collision warning systems.
e. Know about passenger comfort and convenient systems.

SKILLS ACQUIRED:

- ✓ Able to identify various information systems
- ✓ Able to identify safety systems
- ✓ Able to understand the working of driver monitoring system, vehicle support systems, etc.
- ✓ Able to identify and propose various comfort systems.
- ✓ Able to understand requirements and characteristics of comfort suspension systems
- ✓ Able to understand working of adaptive cruise control, noise control and engine cut-off technologies
- ✓ Able to understand various electronic engine management systems.

ACTIVITIES:

- ✓ Identify driver assisting systems and testing
- ✓ Testing collision avoidance system and vehicle status monitoring systems
- ✓ Use GPS, geographical systems for navigation
- ✓ Working of air bags and testing of ABS, traction control, etc.
- ✓ Testing and understanding adaptive cruise control system
- ✓ Test cylinder cut-off technology and study its effect.
- ✓ Understand working of electronic engine management system
- ✓ Understand the working of electronic fuel injection systems.

UNIT - I

Driver Information Systems: Introduction, driver support systems – driver information, driver perception, driver convenience, driver monitoring. Vehicle support systems – general vehicle control, collision avoidance, vehicle status monitoring.

UNIT - II

Driver Assisting Systems: Global positioning systems, geographical information systems, navigation systems, automotive vision system, road recognition, driver assistance systems.

UNIT - III

Safety Systems: Active and passive safety systems, Airbags, seat belt tightening system, collision warning systems, child lock, anti lock braking systems, traction control, Electronic Stability Programme. Crash worthiness of vehicle, vehicle crash testing, testing with dummies.Security Systems:Anti theft technologies, smart card system, number plate coding.

UNIT - IV

Comfort Systems:

Active suspension systems, requirement and characteristics, different types, power steering, collapsible and tiltable steering column, power windows, biometric systems.

Adaptive Control Systems: Adaptive cruise control, adaptive noise control, anti spin regulation, cylinder cut- off technology.

UNIT - V

Electronic Engine Management: The Feedback control carburettor, single point and multipoint injection system, working of electronic fuel injector, different types of electronic fuel injection systems like L, K, KE, LU, LH and Motronic, ME & MH systems.

TEXT BOOKS:

1. LjuboVlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.
2. Ronald K Jurgen, "Navigation and Intelligent Transportation Systems – Progress in Technology", Automotive Electronics Series, SAE, USA, 1998.

REFERENCES:

1. William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn,1998.
2. Bechhold, "Understanding Automotive Electronics", SAE, 1998. Robert Bosch, "Automotive Hand Book", 5th ed., SAE, 2000.

16AE305 TWO AND THREE WHEELERS TECHNOLOGY

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description & Objectives:

To develop the basic knowledge of the students in constructional details of two and three wheelers. To develop the skills of the students in the operating principles.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand the working of two and four stroke engines.
2. Understand the functioning of clutch and gear box.
3. Know the wheels, tyres, suspensions and braking systems.
4. Familiarize the latest models of two wheelers.
5. Understand the operations of three wheelers and latest models of three wheelers.

SKILLS ACQUIRED:

- ✓ Able to understand working of two wheelers.
- ✓ Able to understand working of three wheelers.
- ✓ Able to understand the faults in two and three wheelers.
- ✓ Able to understand the changes in design.

ACTIVITIES:

- ✓ Ability to Assembly and Dismantling of three wheeler Gear Box.
- ✓ Ability to Assembly and Dismantling of two wheeler Gear Box and clutch assembly.

UNIT I: Power Unit :

Two stroke SI engine, four stroke SI engine; merits and demerits. Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes; merits and demerits, scavenging pumps. Rotary valve engine. Fuelsystem. Lubrication system. Magneto coil and battery coil spark ignition system, electronic ignition system. Starting system; Kick starter system.

UNIT II: Chassis and Sub-Systems :

Mainframe and its types. Chassis and shaft drive, Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar.

UNIT III: Brakes, Wheels and Tyres :

Drum brakes, disc brakes, front and rear brake links, layouts. Spoked wheel, cast wheel, disc wheel, disc types. Tyres and tubes.

UNIT IV: Two Wheelers:

Case study of major Indian models of motorcycles, scooters and mopeds.TVS mopeds and motorcycles, Hero Honda motorcycles, Bajaji Scooters and motorcycles, Yamaha, Enfield motorcycles. Servicing and maintenance.

UNIT V: Three Wheelers :

Case study of Indian models.Auto rickshaws, pickup van, delivery van and trailer. Maintenance:& Fault tracing.

TEXT BOOKS:

1. Irving P.E. - Motor Cycle Engineering - Temple Press Book, London – 1992.
2. The Cycle Motor Manual - Temple Press Limited, London - 1990

REFERENCES:

1. Encyclopedia of Motorcycling - 20 volume Marshall, Cavensih, UK - 1989
2. Brayant R.V, Vespa - Maintenance and Repair Series – S.Chand& Co., New Delhi - 1986.
3. Raymond Broad Lambretta - A Practical Guide to maintenance and repair – S. Chand & Co., New Delhi - 1987.

16AE344 VEHICLE MAINTENANCE

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course is to make the students have a complete knowledge on the vehicle maintenance procedures and acquire skills in handling various situations where the vehicle is likely to breakdown. It also provides basic knowledge on the various maintenance schedules and work shop records. The objectives are to develop the skills of the students in the Maintenance of vehicles and to serve as a pre-requisite course for other courses in PG programs, specialized studies and research.

Course Outcomes:

Upon completion of this course, the student should be able to:

- ✓ Know the various forms and records of work shop.
- ✓ Understand the functioning of engines and its trouble shooting.
- ✓ Know the Chassis and suspension maintenance.
- ✓ Maintain the Electrical equipment and trouble shooting.
- ✓ Troubleshoot the fuel block, Radiator boiling and lubrication system.

SKILLS ACQUIRED:

- ✓ Able to identify requirements to formulate a maintenance schedule
- ✓ Able to prepare check lists, inspection schedules etc.
- ✓ Able to establish different maintenance procedures and schedules for different systems of an automobile

ACTIVITIES:

- ✓ Identify requirements to prepare different maintenance schedules.
- ✓ Understand and differentiate between different schedules.
- ✓ Prepare different preventive maintenance schedules for different vehicular systems.

UNIT - I

Maintenance of Records and Schedules: Importance of maintenance, preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists. Inspection schedule, maintenance of records, log sheets and other forms, safety precautions in maintenance.

UNIT - II

Engine Maintenance: Dismantling of engine components and cleaning, cleaning methods, visual and dimensional inspections, minor and major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance overhauling, engine tune up.

UNIT - III

Chassis & Body Maintenance: Chassis-Mechanical and automobile clutch and gear box, servicing and maintenance, maintenance servicing of propeller shaft and differential system. Maintenance servicing of suspension systems. Brake systems, types and servicing techniques. Steering systems, overhauling and maintenance. Wheel alignment, computerized alignment and wheel balancing. Body-Vehicle body maintenance, minor and major repairs. Door locks and window glass actuating system maintenance.

UNIT - IV

Electrical System Maintenance: Testing methods for checking electrical components, checking battery, starter motor, charging systems, DC generator and alternator, ignitions system, lighting systems. Fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

UNIT - V

Maintenance of Fuel System, Cooling Systems, & Lubrication System: Steering and Servicing and maintenance of fuel system of different types of vehicles, calibration and tuning of engine for optimum fuel supply. Cooling systems, water pump, radiator, thermostat, anticorrosion and antifreeze additives. Lubrication maintenance, lubricating oil changing, greasing of parts.

TEXT BOOKS:

1. John Doke “Fleet Management”, McGraw-Hill Co. 1984..

REFERENCES:

1. James D Halderman - Advanced Engine Performance Diagnosis – PHI - 1998.
2. Service Manuals from Different Vehicle Manufacturers.

BIOINFORMATICS

16BT254 ELEMENTS OF BIOINFORMATICS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Bioinformatics is the science of storing, extracting, organizing, analyzing, interpreting and using information. The approaches to the discipline of bioinformatics incorporate expertise from the biological sciences, computer science and mathematics. This elective in bioinformatics is designed for students interested in molecular biology and genetics, information technologies and computer science. Bioinformaticists are involved in the analysis of the human genome, identification of targets for drug discovery, development of new algorithms and analysis methods, the study of structural and functional relationships, and molecular evolution.

Course Outcomes:

- knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics
- existing software effectively to extract information from large databases and to use this information in computer modeling
- problem-solving skills, including the ability to develop new algorithms and analysis methods
- an understanding of the intersection of life and information sciences, the core of shared concepts, language and skills the ability to speak the language of structure-function relationships, information theory, gene expression, and database queries.

SKILLS ACQUIRED:

- ✓ Design, conduct and interpret scientific research on bioinformatics.
- ✓ Conduct statistical analysis of biological data pertaining to genomics and proteomics.
- ✓ Apply a scientific approach to problems involving molecular phylogeny.

ACTIVITIES:

- ✓ Retrieval of FASTA format from databases.
- ✓ Perform BLAST and FASTA software analysis for both nucleic acids and amino acid sequences.
- ✓ Perform pair wise and multiple sequence alignments.
- ✓ Construct phylogenetic trees using software tools such as PHYLIP and PAUP.

UNIT - I

Basics of Bioinformatics: Introduction to bioinformatics; Concepts related to Molecular Biology; Scope of Bioinformatics.

UNIT - II

Biological Databases and its Types: Introduction to Databases; Need for Biological Databases; Nucleic acid Databases (NCBI, DDBJ & EMBL); Protein Database(SWISSPROT, PIR); Structure databases (PDB, CATH); Other Databases of Patterns/Motifs/System Biology(Gene and protein network databases)

UNIT - III

Sequence Analysis: Various file formats for molecular Biology experiment(plain sequence format, EMBL, Fasta, FastQ, GCG, Genbank, IG); Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues; Scoring matrices: (PAM and BLOSUM), Sequence based Database Search.

UNIT - IV

DNA sequencing, Assembly and Sequence alignment and Visualization: First Generation Sequencing; Alignments; Local alignment and Global alignment; Pairwise alignment (BLAST and FASTA) and Multiple Sequence alignment (Clustal W); 3D structure Viewers (Rasmol Pymol).

UNIT - V

Phylogeny and Applications of Bioinformatics: Phylogeny: Phylogenetic analysis, Definition and description of phylogenetic trees and various types of trees, Method of construction of Phylogenetic trees [distance based method (UPGMA, NJ), Maximum Parsimony and Maximum Likelihood method]; Different fields: Structural Bioinformatics, Cheminformatics, Immunoinformatics; Drug discovery: Drug discovery Process, Role of Bioinformatics in Drug Design, Drugbank.

Text Books:

1. Introduction to Bioinformatics by Aurther M lesk.
2. David W Mount, Bioinformatics: Sequence and Genome Analysis, 2nd Edition, cold Spring Harbor Press.
3. Bioinformatics and Functional Genomics (2nd edition) by Jonathan Pevsner, Wiley-Liss, ISBN#978-0-470-08585-1.

16BT364 COMPARATIVE GENOMICS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course deals with genomes of various organisms and their comparisons. The main objective of this course is to find genomic information and resources also to provide students adequate knowledge in annotating genes.

Course Outcomes:

The students will be able to:

- ✓ To understand the basic concepts of Comparative genomics.
- ✓ Acquire adequate insights into the human genome project.
- ✓ Learn the utility of phylogenetic trees in evolutionary thinking.
- ✓ Understand the fundamentals of bacterial and vertebrate evolution.

SKILLS ACQUIRED:

- ✓ Alignment of biological sequences of whole genome.
- ✓ Phylogenetic analysis to evaluate evolutionary relationship between different species or genus.
- ✓ Comparison of whole genome sequences of different species to assign functional properties of genes.
- ✓ Gene prediction and annotation

ACTIVITIES:

- ✓ Sequence alignment with tools like BLAST and FASTA.
- ✓ Construction of phylogenetic trees.
- ✓ Annotation of a gene with unknown function by comparative genomics.

UNIT - I

Introduction to comparative genomics: What is "comparative genomics"? Timeline of comparative genomics developments. Databases for genomics resources: NCBI. The history of the Human Genome Project.

UNIT - II

Obtaining and Assembling Sequences: Hierarchical shotgun sequencing, Large-scale sequencing methods: cloning and BAC library creation. Introduction to evolutionary thinking: Phylogenetic analyses: tree terminology and parsimony.

UNIT - III

Gene Identification and Annotation: Databases and tools for annotating sequence. Modifying search strategies; searching different databases, Inferring gene function from relatedness to other genes, Finding Open Reading Frames (ORFs).

UNIT - IV

Genome Comparisons I: Organelles: Phylogenetic analyses: introduction to programs, Mitochondrial Genomes: Size, content, and gene order, The minimal genome, Survey of bacterial genomes.

UNIT - V

Genome Comparisons II: Bacteria and Vertebrates : Microbial genes in the human genome: lateral transfer or geneloss?. Phylogenetic analyses to determine relationships and interpret character evolution in Bacteria. Vertebrate evolution based on genome comparisons. Human and chimpanzee genome comparisons

Reference Books:

1. Jonathan Pevsner. Bioinformatics and Functional genomics. Second Edition. A John Wiley and Sons., Publication.
2. Paul G. Higgs and Teresa K. Attwood. Bioinformatics & Molecular Evolution. BLACKWELL PUBLISHING
3. David. W. Mount. Bioinformatics: Sequence and Genome analysis. Cold Spring Harbor Laboratory Press.

Research Publications as Source of Information:

1. Pennisi, E. 2001. The Human Genome. Science 291:1177-1180.
2. Roberts, L. 2001. Controversial from the start. Science 291:1182-1188.
3. Baltimore, D. 2001. Our genome unveiled. Nature 409:814-816.
4. Wolfsberg, T. G., J. McEntyre, and G. D. Schuler. 2001. Guide to the draft human genome. Nature 409:824-826.
5. Birney, E., A. Bateman, M. E. Clamp, and T. J. Hubbard. 2001. Mining the draft human genome. Nature 409:827-828.
6. Rokas, A., B. L. Williams, N. King, and S. B. Carroll. 2003. Genome-scale approaches to resolving incongruence in molecular phylogenies. Nature 425:798-804

16BT365 ALGORITHMS IN BIOINFORMATICS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

The course aims to familiarize with the Computational Problems in Biology useful for aligning sequences, phylogeny tree construction, sequencing technologies etc. The overall objective of the course is train the students to improvise the understanding of algorithms used in Bioinformatics and also make students to write novel algorithms to improvise speed and accuracy in biological problem solving.

Course Outcomes:

Students will be able to:

1. Understand the details of the algorithms commonly used in bioinformatics.
2. Identify which type of algorithm is best suited to describe a given biological problem.
3. Develop bioinformatics prediction algorithms describing a given biological problem.
4. Implement and develop prediction tools on a detailed level using the following algorithms: Dynamic programming, Sequence clustering, Weight matrices.

SKILLS ACQUIRED:

- ✓ Develops logical thinking to analyse biological problems
- ✓ Integration of computational programme to fetch answers for biosystems
- ✓ Dynamic programming skills will be implemented to develop robust programmes.

ACTIVITIES:

- ✓ Constructing a programme to identify ORF
- ✓ Develop a programme for phylogenetic tree analysis
- ✓ Constructing a programme to find structure- function relationship of a protein.

UNIT – I

INTRODUCTION: Algorithms and Complexity, Biological algorithms versus computer algorithms, Iterative versus Recursive Algorithms, Big-O Notations, and Algorithm design techniques.

UNIT - II

GREEDY ALGORITHMS: Exhaustive Search, Mapping Algorithms, Greedy Algorithms, Approximation Algorithms

UNIT - III

DYNAMIC PROGRAMMING ALGORITHMS: DNA Sequence comparison, Global Sequence Alignment, Scoring Alignment, Local Sequence Alignment, Alignment with Gap Penalties, Multiple Alignment.

UNIT - IV

GRAPH ALGORITHMS: DNA Sequencing, Fragment assembly in DNA Sequencing, Protein Sequencing and Identification.

UNIT - V

CLUSTERING AND TREES: Gene expression analysis, Evolutionary Trees, Character-based tree reconstruction - Small and large Parsimony Problem.

Text Books:

1. Neil C. Jones and Pavel A. Pevzner, An Introduction to Bioinformatics Algorithms, 2004.

Reference Books:

1. Pavel A. Pevzner, Computational Molecular Biology: An Algorithmic Approach, 2000.
2. Wing-Kin Sung, Algorithms in Bioinformatics: A Practical Introduction, 2009.

16BT456 MOLECULAR MODELING AND DRUG DESIGN

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course provides an overall understanding about the critical relationship among bimolecular structure, function and force field models. The main objective of this course is to train students to utilize basic modeling techniques to explore biological phenomena at the molecular level.

Course Outcomes:

- ✓ Upon successful completion of this course, the students will be able to:
- ✓ Students will be introduced to the principles and practice of molecular modeling and modern drug discovery.
- ✓ They will gain an awareness of rational drug design ,based on understanding the three-dimensional structures and photochemical properties of drugs and receptors will be created.
- ✓ They will be able to perform monto carlo simulation.
- ✓ They will be able to predict the stru
- ✓ cture of protein by Threading
- ✓ They will acquire fundamental principles of chemiinformatics

SKILLS ACQUIRED:

- ✓ Navigate molecular graphics.
- ✓ Estimate energy minimization upon docking.
- ✓ Perform linking of enzymes to other molecules or substrates for commercial applications.
- ✓ Simulate 3D structures of proteins and enzymes.
- ✓ Rational prediction of on-target and off-target effects

ACTIVITIES:

- ✓ Visualize tertiary protein using CN3D tool.
- ✓ Retrieve protein structures.
- ✓ Predict basic secondary structure.
- ✓ CADD-computer assisted drug design.
- ✓ Perform structure and ligand based drug design.

UNIT - I

Introduction to Molecular Modelling: Introduction Useful Concepts in Molecular Modelling: Coordinate Systems. Potential Energy Surfaces. Molecular Graphics. Surfaces. Computer Hardware and Software.

UNIT - II

Force Fields: Force Fields. Bond Stretching. Angle Bending. Introduction to Nonbonded Interactions. Electrostatic Interactions. Van der Waals Interactions. Hydrogen Bonding in Molecular Mechanics. Force Field Models for the Simulation of Liquid Water.

UNIT - III

Energy Minimisation and Computer Simulation : Energy Minimisation and Related Methods for Exploring the Energy Surface. Non Derivative method, 1^{st} and 2^{nd} order minimization methods. Computer Simulation Methods. Simple Thermodynamic Properties and Phase Space. Boundaries. Analyzing the Results of a Simulation and Estimating Errors. GROMACS.

UNIT - IV

Molecular Dynamics & Monte Carlo Simulation : Molecular Dynamics Simulation Methods. Molecular Dynamics Using Simple Models. Molecular Dynamics with Continuous Potentials. Molecular Dynamics at Constant Temperature and Pressure. Metropolis Method. Monte Carlo Simulation of Molecules.

UNIT - V

Structure Prediction and Drug Design: Protein Structure Prediction Introduction to Comparative Modeling. Constructing and Evaluating a Comparative Model. Molecular Docking (AUTODOCK). Drug design: Structure based, De Novo Ligand design.

Text Books

1. A.R. Leach Molecular modeling Principles and Application, Longmann, 2000.

Reference Books

1. J. M. Haile, Molecular Dynamics Simulation Elementary Methods. John Wiley and Sons, 1997.
2. Satya Prakash Gupta, QSAR and Molecular Modeling, Springer - Anamaya Publishers, 2008.

BIOTECHNOLOGY

16BT253 ALGAL BIOTECHNOLOGY

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Course Outcomes:

The students will be able to:

- ✓ Acquaint with principles, technical requirement, scientific and commercial applications in algal biotechnology.
- ✓ Be familiar with sterile algal media preparation
- ✓ Gain knowledge of how algae can be cultivated for industrial applications
- ✓ Support methodologies in culture of algae for food, feed and nutraceutical purpose
- ✓ Be motivated to set goals towards pursing gradate school and higher level positions such as algal biotechnologists, and key scientist in algal biotechnology research institutes and industries.

SKILLS ACQUIRED:

- ✓ Maintenance of the sterility of the algal culture laboratory
- ✓ Preparation of media composition
- ✓ Grow algae for biomass production
- ✓ Analyze high value compounds in algal biomass.

ACTIVITIES:

- ✓ Measuring the growth of algae.
- ✓ Analyze biomass yield and pigments such as chlorophylls and carotenoids in micro algal culture.
- ✓ Visit to algal biotechnology company to understand the commercial algal cultivation systems.

UNIT - I

Introduction of algae; classification of algae; role of algal biotechnology in India, and its importance in various industries

UNIT - II

Overview of *Spirulina*, *Dunaliella; Haematococcus,* and *Chlorella;* Chemical composition (protein; amino acids, lipids, vitamins, pigments, and phycobiliproteins) of *Spirulina*, *Dunaliella; Haematococcus,* and *Chlorella.*

UNIT - III

Basic algal culture techniques: Isolation and purification techniques; factors (pH, temperature, light intensity, photoperiod, nutrients, mixing, etc) effects on algal growth.

UNIT - IV

Basic algal cultivation; culture of algae in raceway ponds and photobioreactors; strain selection; types of raceway ponds; types of photobioreactors; advantages of raceway and photobioreactors; downstream processing of algae; types of harvesting methods, cell disruption method; product isolation and purification methods.

UNIT - V

Commercial applications of algae (*Spirulina, Haematococcus and Dunaliella*) in nutraceutical and pharmaceutical industry; general characteristics of algae; Nutritional value, Pharmaceutical properties.

Text Books:

1. Richmond A and Hu Q (2013) Handbook of Microalgal Culture: Applied Phycology and Biotechnology, John Wiley & Songs, Pages: 736; ISBN 1118567196, 9781118567197.
2. Se-Kwon Kim (2015) Handbook of Marine Microalgae: Biotechnology Advances, Academic Press.

Reference books:

1. Andersen RA (2005). Algal Culturing Techniques. Physiological Society of America. Elsevier Academic Press, USA.
2. Becker, E.W (1994) Microalgae-Biotechnology and Microbiology. Cambridge University Press.
3. Venkataraman LV and EW Becker (1985). Biotechnology and Utilization of Algae – The Indian Experience. Dept. Science and Technology, New Delhi and Central Food Research Institute, Mysore, India.

16BT362 PLANT BIOTECHNOLOGY

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

It is dedicated to research plant tissue culture and cell culture mediated production of different plants through Micropropogation and transgenic production. Plant biotechnology in food Industry, nutritional composition; secondary metabolite pathway engineering with special focus on caffeine in coffee plants; elicitation of secondary metabolites in plants for augmenting food value metabolites such as flavor compounds; biomolecules of nutritional and nutraceutical importance from under utilized fruits. This course is completely based on the outcome of plant research. It studies regeneration and multiplication of endangered plants, Development of transgenic plants for biotic and abiotic stress. Applications of the molecular markers in plant biotechnology, Development of food formulations; value added products from plant sources.

Course Outcomes:

- ✓ Acquaint with principles, technical requirement, scientific and commercialization of Plant tissue culture.
- ✓ It gives the detailed description on plant tissue culture technique
- ✓ It gains the knowledge in development of transgenic plants and its applications
- ✓ The methodologies for the elicitation of secondary metabolites in plants for augmenting food value metabolites such as flavor compounds
- ✓ It will motivate the students to select for the research in molecular marker technology.

SKILLS ACQUIRED:

- ✓ Micro propagation and organogenesis of plants.
- ✓ Gene constructs and Gene transfer by prokaryotic and eukaryotic vectors.
- ✓ Plant Breeding.

ACTIVITIES:

- ✓ Handling of plant tissue culture techniques
- ✓ Standardization and Development. transgenic plants.
- ✓ Isolation of secondary metabolite from food additive and flavored plants.

UNIT – I

Introduction of plant biotechnology in Agriculture; Pest resistant plants; herbicide resistance; disease and stress resistant plants; transgenic crops with improved quality traits. Role of plant biotechnology in food industry-secondary metabolites in plants for augmenting food value metabolites; edible vaccines and value added products from plant sources e.g. *Coffee, Stevia, Vanilla, Annatto and beetroot*.

UNIT – II

Biotechnological approaches for plant development**.** Micro propagation and organogenesis of plants. Composition of plant tissue culture media; media preparation for plants; growth factors on plant tissue culture. Hormone requirement; hormones effects on plant growth. Plant tissue culture techniques: Somatic embryogenesis; protoplast fusion and Somaclonal variation

UNIT – III

Plant transformation technology; Gene constructs and Gene transfer by prokaryotic and eukaryotic vectors. Agrobacterium-mediated transformation and Gene gun methods for transgenic production, Selection of transgenics - marker and reporter genes. Gene silencing: RNAi and its applications for crop.

UNIT – IV

Molecular biological confirmation by Gel electrophoresis; PCR; Restriction Mapping; DNA Sequencing, Southern, Northern and Western blotting. Tools and techniques of molecular markers in genetic engineering, restriction endonucleases, DNA Fingerprinting (RAPD), SSRs, ESTS and TILLING technique.

UNIT – V

Principles of Plant Breeding: Introduction to plant breeding. Basic features of plant breeding and Objectives of plant breeding. Plant Breeding Methodologies; Sources of Plant genetics resources and conservation strategies. Breeding for nutritional improvement, Nutritional quality, Improved protein content and Improved oil quality.

Text Books:

1. Adrian S, Nigel WS, Mark RF (2008). Plant Biotechnology: The genetic manipulation of Plants, Oxford University Press.
2. Halford N (2006) Plant Biotechnology - Current and future applications of genetically modified crops, John Wiley and Sons, England.
3. Butenko RG (2000) Plant Cell Culture, University Press of Pacific.
4. Slater A, Scott and MR Flower, (2008) Plant Biotechnology: The genetic manipulation of plants, Oxford University Press.

References:

1. Buchanan B, Gruissem G and Jones R (2000) Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, USA.
2. Copping LG and P. Rodgers Biotechnology and Its Applications to Agriculture, British Crop Projection.
3. Davies PJ (2004) Plant Hormones, Kluwer Academic Publishers, Netherlands.
4. Dixion RA and RA Gonzales, (1994) Plant cell culture – A practical approach, Second edition, IRL Press (New York); Oxford University Press.
5. Kung SD, and CJ Arntzen (1989) Plant Biotechnology, Ist Edition, Butterworth-Heinemann, Elsevier
6. Swaminathan MS (1991) Biotechnology in Agriculture-A Dialogue, India

16BT363 MEAT, POULTRY, FISH AND DAIRY TECHNOLOGY

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course deals with the technology involved in the processing and storage of the various food products originating from meat, fish, poultry and dairy. The safety issues associated with these products will also be emphasised. Furthermore this course provides background information with respect to: (1) **Product development** of added value products (2) Selection of meaningful parameters for **Sensory evaluation** (3) Appropriate **utilization of ingredients** from other commodities such as Dairy and Grain products in meat (fish, poultry and egg) products and (4) Understanding of product and process **food microbiology**.

Course Outcomes:

The students will be able to:

- ✓ **Develop** Process Flow Diagrams for products studied, and thereby describe the process and in particular be able to give a technical justification for the steps in the process
- ✓ **Discuss and associate** raw material characteristics, formulations, handling and processing procedures with quality, yield and cost of product produced and in most cases safety
- ✓ **Analyse** the processes studied and identify the control points for quality and in most cases safety. For these control points you should be able to recommend appropriate parameters (and limits)
- ✓ **Critically evaluate** processes for their effectiveness with respect to product quality, yield

SKILLS ACQUIRED:

- ✓ Mechanical deboning of meat
- ✓ Preservation and processing of poultry products
- ✓ Handling of fresh water fish.

ACTIVITIES:

- ✓ Proximate analysis of meat, poultry, fish samples.
- ✓ Estimation of protein from meat, poultry, fish samples.
- ✓ Visit to fish processing units to understand various processing methods.

UNIT – I

Meat: Sources of meat and meat products in India; Chemical composition and microscopic structure of meat; Effect of feed, breed and management on meat production and quality; Slaughtering of animals and poultry, inspection and grading of meat; Mechanical deboning, meat tenderization; Meat plant sanitation and safety; by product utilization.

UNIT – II

Poultry: Classification, composition, preservation methods and processing; Structure, composition, nutritive value and functional properties of eggs and its preservation by different methods; Processing of egg products; Factors affecting egg quality and measures of egg quality.

UNIT – III

Fishery: Types of fish – composition & structure; post-mortem changes in fish; Handling of fresh water fish; Canning, smoking, freezing and dehydration of fish; Preparation of fish products, fish sausage and home makings; Fish processing industries in India.

UNIT – IV

Milk Processing: Milk processing flow sheet – Filtration / clarification; Storage of milk; Pasteurization – types of pasteurization process; Manufacture of dairy products: Cream, Butter, Ghee, Milk powder & Cheese

UNIT – V

Manufacture of Ice Cream and other dairy products: Manufacture of Ice cream – Chemistry and technology – Microbiology of ice cream – Quality aspects; Manufacture of paneer, Toned Milk, Sweetened condensed milk, Khoa; Fermented dairy products – Yoghurt, curd, butter milk.

Text Books:

1. Lawrie, R.A. 1975. Meat Science, 2nd Edn. Pergamon Press, Oxford UK.
2. Vijaya Khader, 2001, "A Textbook of Food Science and Technology", ICAR, New Delhi.
3. Modern Dairy Products, Lampert LH; 1970, Chemical Publishing Company.
4. Developments in Dairy Chemistry – Vol 1 &2; Fox PF; Applied Science Pub Ltd.
5. Milk & Milk Processing; Herrington BL; 1948, McGraw-Hill Book Company.
6. Portsmouth, J.I. 1979, Commercial Rabit Meat Production. 2nd Edn. Saiga Survey, England.

16BT455 NANO TECHNOLOGY IN AGRICULTURAL AND FOOD INDUSTRIES

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

It refers to the science of integration between biology and nanotechnology. This usually uses biological systems to devise technical aspects for the development of novel products. Nanobiotechnology as defined in broad terms an interdisciplinary field, that includes fields such as diverse as molecular biology and molecular bio-chemistry. Nanobiotechnology basically relies on the idea of producing products that can integrate into the organisms system whereby effectively carry out the function it was meant for. Ideally two main strategies are being employed in this study on nanobiotechnology: top-down and bottom-up. Whereas in one molecular components are being integrated into an assembly, other forms the basis of forming nano scale particles from larger molecules.

This course combines physical laws, chemical procedures and biological principles on the nano-scale and enrich the students with important applications in a range of fields like medical diagnosis, drug delivery, detection of bio-macromolecules in complicated biochemical systems etc.

Course Outcomes:

- ✓ This course will give a general description about Nanomaterials based on their dimensionality.
- ✓ It gives the information about importance of reduction in materials dimensionality, and its relationship with materials properties.
- ✓ This course will give a general description about Nanomaterials based on their dimensionality.
- ✓ Imparts an understanding of approaches for Nanomaterial fabrication & Nanotechnology tools.
- ✓ Imparts an understanding of approaches for Nanomaterial fabrication & Nanotechnology tools.
- ✓ Gives an insight into the use of Nanotechnology in biomedical, microelectronics and optical applications.

SKILLS ACQUIRED:

- ✓ Prepare nanoparticles from organic oils.
- ✓ Charaterize nanoparticles by analytical and imaging systems.
- ✓ Evaluate safety of nanoparticles on cell lines.

ACTIVITIES:

- ✓ Synthesis and characterization of Nano particles
- ✓ Applications and modeling of Nanobiosensors
- ✓ Toxicity effects through different models

UNIT – I

Introduction: Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concepts.

UNIT – II

Nano Particles : Introduction, Types of Nanoparticles. Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Toxic effects of Nanomaterials, Importance of Nanobiotechnology and its role in plants and microbial production, Nanobiotechnology role in functional foods, food production and Safety Assessment of Nano-materials in Foods.

UNIT – III

Nanobiosensor, Nano tubes and Nanowires and Nanofluids. Nanocrystals in biological detection, Electrochemical DNA sensors, Nano-Biodevices and Systems. Atomic Force Microscopy, Significance of Nanoparticles Nanofabrications- MEMS/NEMS. High through put DNA sequencing with nanocarbon tubules.

UNIT – IV

Nanomedicine : In-vivo drug delivery system. Artificial neurons, Applications in cancer biology, Synthetic retinyl chips based on bacteriorhodopsins. Future nanomachine and High Nanosurgical devices.

UNIT – V

Ethical Issues in Nanotechnology: Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology With special Reference to Nanomedicine and its Application in Nonmedical Contexts. Nanotechnology and Future Socio - economic Challenges.

Text Books:

1. Christof M. Niemeyer, Chad A. Mirkin - Nanobiotechnology: Concepts, Applications and Perspectives. 1st Ed. Wiley-VCH, 2006.
2. Jian-Qin Liu, Katsunori Shimohara - Biomolecular Computation by Nanobiotechnology, 1st Ed., Artech House, 2007.
3. Nanobiotechnology - II more concepts and applications. (2007) - Chad A Mirkinand Christof M. Niemeyer (Eds), Wiley VCH.

Reference Books:

1. Ralph S. Greco - Nanoscale Technology in Biological Systems. 1st Ed. CRC Press. 2005.
2. Hari Singh Nalwa - Handbook of Nanostructural Biomaterials and Their Applications in Nanobiotechnology. 1st Ed.American Scientific Publishers, 2005.
3. Concepts,Applications and Perspectives (2004), Christof M.Niemeyer (Editor), Chad A. Mirkin (Editor), Wiley VCH.
4. Nanotechnology in Biology and Medicine: Methods, Devices, and Applications.

BIOMEDICAL ENGINEERING

16BM208 BASIC CLINICAL SCIENCES

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Clinical sciences gives a perceptive to students on various aspects of clinical diseases and the measurable parameters for diagnosis and gives a view on instruments for treatment and other assistive devices.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the clinical significance of diseases.
- ✓ Know basic hospital instruments in various departments and critical units.

SKILLS ACQUIRED:

- ✓ Gain knowledge on basic diseases.
- ✓ Know the diagnosis or treatment methodology.

ACTIVITIES:

- ✓ Make a prototype of de-firillator
- ✓ Make a model of diseased Kidney
- ✓ Model a diseased colon.

UNIT - I

NEPHROLOGY: Principles of dialysis; Haemodialysis, Acetate dialysis, Bicarbonate dialysis. Peritonial dialysis, chronic ambulatory peritoneal dialysis, Haemoperfusion, Sequential ultra-filtra-tion. Hemofiltration, Adequacy of dialysis, Clearance, dialysance, Components of dialyzing system, Dialysate, composition of dialysate, Types of dialyzers, controls and monitoring devices for dialyzers. Clinical significance. Renal transplantation: Basic principles.

UNIT - II

NEUROLOGY: NEUROLOGY: Diseases of nervous system, spinal cord lesions, motor nervous disease, prolapsed intervertebral disc, Neuropathies, Myasthenia gravis, Diseases of muscle.

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UNIT - III

CARDIOLOGY: Electro cardiography: Source of ECG potentials: Dipole theory, conduction system, Normal and abnormal ECG's. Diagnostic applications, interpretation of ECG, Basic Introduction to Cardiac assistive devices, Heart lung machine.

GASTROENTEROLOGY: Anatomy and Physiology and G.I.T diseases: Stomach (ulcers), Liver (jaun-dice), Gall Bladder (gall stone). Disease diagnosis and treatment. Juices-Gastric, Bile, Pancreatic, Intestinal, including their functions and clinically significant symptoms-signs, diseases, instruments used in Gastroenterology.

UNIT - IV

GENERAL SURGERY:

Surgical Patient, Clinically significant Investigations. Preoperative care, Post-operative care and. Consent by patient. Study of operation of surgical equipments, Laparoscopy, Endoscopy and Intuba-tion tubes.

UNIT - V

PATHOLOGY& BLOOD BANK: Blood Bank: Blood groups. ESR. Electrolyte-estimation of normal val-ues. HIV test-ELISA, Dot Method. Cross matching of blood. Cell counter. Normal blood coagulation factors. Normal bilurubin.

TEXT BOOKS:

1. Strauss, Maurice B. & Louis G.Welt. Diseases of kidney, vol. 1 & 2 Little Brown.1997.
2. James G. Mcleod, Physiological Approach to Clinical Neurology, Butterworth-Heinemann Ltd, 3rd edition.

REFERENCES:

1. D. Goldstein, mehmet Oz, Cardiac Assist Devices, Blackwell Future,2002.
2. Robert F Rushmer, Cardio vascular Dynamics.WB Saunders, 1976.
3. T.L Dent. W.E. Stodel, J.G.turcotte, Surgical Endoscopy, year book Medical Pub,1985.
4. Jones DB,Wu JS, Soper NJ, Laproscopic surgery: Principles and Procedures2nd ed, Marcel Dekker, 2004.

16BM303 BIOMEDICAL INSTRUMENTATION

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	46	6	12	3	2

Course Description and Objectives:

This course includes the basic and advanced principles, concepts, and operations of medical sensors and devices, the origin and nature of measurable physiological signals and also including design of electronic instrumentation. this course aimed at to impart the knowledge of realistic design and experimentation with amplifiers for bio potential measurements and therapeutic instrumentation such as pacemakers, defibrillators and prosthetic devices.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ construct instrumentation systems.
- ✓ acquire and process different physiological signals.
- ✓ use the display devices and recorders are also considered.
- ✓ gain the knowledge about analytical instruments and their working features long with their medical applications.

SKILLS ACQUIRED:

- ✓ Study of biomedical instrumentation and their parameters.
- ✓ Study of different display devices.
- ✓ Determination of bio potentials and how they are interpreted.
- ✓ Extraction of biological signals and feeding them to instruments to make meaning out of it.

ACTIVITIES:

- ✓ Analyze ECG signals via simulators.
- ✓ Differentiate abnormalities using bio amplifiers
- ✓ Build and test circuits.
- ✓ Analyze Medical chemicals using spectrophotometers, flame photometers.

UNIT - I

Introduction to Medical Instrumentation: Block diagram of a medical instrumentation system; Bio-signals: Origin and characteristics of Bio potentials-ECG, EEG, EGG, EMG, ENG, EOG, and ERG; Problems encountered with measurements from human beings; Generalized medical instrument specifications, Electrode-Electrolyte Interface, Half-cell potential, Offset Voltage; Types of Electrodes- External, Internal and Microelectrodes; Mathematical Treatment of Electrodes- Equivalent circuits and Applications.

UNIT - II

Medical Display Devices and Recorders: Display Devices- Basic requirements for the dis-play and recording of Bio-signals, Types of medical display devices; Medical recorders: Classification of recorders, PMMC writing systems; General features of ink-jet, Thermo-sensitive and optical recorders; Oscilloscopes: Basic description, Cathode Ray Oscilloscope (CRO), Dual beam oscilloscope, Analog storage oscilloscope, Digital storage oscilloscope, Medical, Multibeam and Non-fade display systems; Liquid crystal displays- Introduction, Passive-matrix and active, matrix addressed LCDs.

UNIT - III

Cardiac Instrumentation: Electrocardiography, Block diagram, Circuits, electrodes and their placement; Lead configuration and general ECG waveforms; ECG monitors: Single channel and multi-channel ECG systems, Holter monitors, Stress test systems; Blood Pressure measurement- Introduction to blood pressure, Direct and indirect methods of Blood Pressure measurements; Blood Flow measurement: Introduction to hemodynamics, Electromagnetic and Ultrasonic techniques of Blood flow measurement; Heart sounds- Origin of Heart Sounds, Types of microphones for heart sound measurement, Contact and non-contact type of measurement, Phonocardiography.

UNIT - IV

Neuro-Muscular Instrumentation: Electroencephalography- EEG-Block diagram and circuits, Electrodes and their placement, Lead configuration and general EEG graphs; Evoked potentials and their measurement, Filters for EEG rhythm analysis, Electromyography: Introduction to EMG signals, EMG-Block diagram and Circuits-Electrodes and their placement; Nerve conduction velocity determination using EMG, Stimulators for EMG recording.

UNIT - V

Medical Analytical Instrumentation: Methods of chemical analysis, Absorption Photometry, emission photometry, Flurometry, Colorimeter, Spectrophotometer, Flame photometer, Mass spectrophotometer, Electrophoresis, chromatography, Blood gas analyzer, Semi and fully automated analyzers.

TEXT BOOKS:

1. Webster J.G., “Medical Instrumentation Application and Design”, 4th edition, Houghton Mifflin, 2009.
2. Khandpur R.S.“Hand Book of Biomedical Instrumentation”, 3rd edition, Mc GrawHill, 2003.

REFERENCES:

1. Carr and Brown, “Introduction to Bio medical equipment technology”, 4th edition, Pearson, 2000.
2. Khandpur R.S.,”Hand Book of Analytical Instrumentation”, 2nd edition, Tata McGraw Hill, 2010.
3. John Enderle, Susan M. Blanchard, and Joseph Bronzino, “Introduction to Biomedical Engineering”, 2nd edition, 2005.

16BM342 ASSIST DEVICES

Hours Per Week:

L	T	P	C
3	-	-	3

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

This course imparts knowledge of the various mechanical techniques that will help failing heart. The objectives of this course is to learn the functioning of the unit which does the clearance of urea from the blood and know the various orthotic devices and prosthetic devices to overcome orthopedic problems.

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Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Explain the functioning and usage of electromechanical units which will restore normal functional ability of particular organ that is defective temporarily
- ✓ Understand the tests to assess the hearing loss and development of electronic devices to compensate for the loss.
- ✓ Understand electrical stimulation techniques used in clinical applications.

SKILLS ACQUIRED:

- ✓ Know the devices used for artificial functioning of organ system.
- ✓ Gain knowledge on Filtration techniques involved in the kidneys.
- ✓ Determine the criticality involved in the hearing loss.
- ✓ Know the learning processes a patient can go through if the he's put under assist devices.

ACTIVITIES:

- ✓ Analyze the principle of external counter pulsation techniques.
- ✓ Analyze implantation of prosthetic heart valves.
- ✓ Test process involved in the audiological process.
- ✓ Ascertain the need for implants for knee and selection of materials on them.

UNIT - I

Cardiac Assist Devices: Principle of External counter pulsation techniques, Intra aortic balloon pump, Auxiliary ventricle and schematic for temporary bypass of left ventricle, Prosthetic heart valves.

UNIT - II

Hemodialysers: Artificial kidney, Dialysis action, Hemodialyser unit, Membrane dialysis, Portable dialyser monitoring and functional parameters.

UNIT - III

Hearing Aids: Common tests – Audiograms, Air conduction, Bone conduction, Masking techniques, SISI, hearing aids – Principles, Drawbacks in the conventional unit, DSP based hearing aids.

UNIT - IV

Prosthetic and Orthodic Devices: Hand and arm replacement – different types of models, externally powered limb prosthesis, feedback in orthodic system, functional electrical stimulation, sensory assist devices.

UNIT - V

Recent Trends: Transcutaneous electrical nerve stimulator, Bio-feedback,etc..

TEXT BOOKS:

1. Levine S.N. (ed), "Advances in Bio-medical Engineering and Medical physics", Vol. I, II, IV Journal, Inter university publications, New York, 1968.
2. Kolff W.J, "Artificial Organs", 1st edition, John Wiley and sons, New York, 1976
3. Albert M.Cook and Webster J.G, "Therapeutic Medical Devices", 1st edition, Prentice Hall Inc., New Jersey,1982.

REFERENCES:

1. D.S. Sunder, "Rehabilitation Medicine", 3rd Edition, Jaypee Medical Publication, 2010.

16BM343 TISSUE ENGINEERING

Hours Per Week:

L	T	P	C
48	-	-	3

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	30	6	12	3	2

Course Description and Objectives:

This course focuses on the analysis Introduction of Tissue Engineering Cell cycle and differentiation Basics about stem cells and its applications; Different synthetic and biomaterials in tissue replacements and Application of Tissue Engineering

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Explain cell migration mechanisms.
- ✓ Explain the different types of medicinal delivery systems
- ✓ Apply principles in regenerative medicine and engineering.

SKILLS ACQUIRED:

- ✓ Know the objectives of tissue engineering.
- ✓ Determine for cell culture.
- ✓ Study the application principles in tissue engineering.

ACTIVITIES:

- ✓ Determine biomaterials and suitable polymers for tissue engineers.
- ✓ Analyze the mechanism for artificial organs growing.

UNIT - I

Fundamentals of Tissue Engineering: Tissue exchange and tissue development - Objectives of tissue engineering - Laboratory set up for tissue engineering, Cell cycle and differentiation, Cell adhesion - Cell adhesion molecules, Cell migration, Cell aggregation and Tissue equivalent.

UNIT - II

Stem Cells: Definition of stem cells, Types of stem cells, Differentiation, Dedifferentiation maturation, Proliferation, Pluripotency and immortalization, Sources of stem cells-Hematopoietic, Fetal, Cord blood, Placenta, Bone marrow, Primordial germ cells, Cancer stem cells, Induced pluripotent stem cells.

UNIT - III

Components of Tissue Engineering: Cell and Drug delivery systems, Transplantation, Implantation, Synthetic components, Nanotechnology in tissue engineering, Imaging methods-SEM, TEM, Fluorescent and Confocal microscopy.

UNIT – IV

Materials in Tissue Engineering: Biological materials, Degradable and non-degradable, Extra cellular matrix, Decellularization, Polymers- Synthetic and natural, Cell interaction with polymers, Applications of polymer.

UNIT – V

Application of Tissue Engineering: Replacement Engineering, Artificial organs– Cartilage, Skin blood, Pancreas, Kidney and Liver, Regenerative engineering- Nerve regeneration, Cardiac tissue regeneration, Muscle regeneration.

Text Books:

1. W. Mark Saltzman, “Tissue Engineering – Engineering principles for design of replacement organs and tissue”, 1st edition, Oxford University Press Inc New York, 2004.
2. CS Potten, “Stem cells”, 1st edition, Elsevier, 1997.

References:

1. Gray E. Wnek, Gray L Browlin, “Encyclopedia of Biomaterials and Biomedical engineering”, 2nd edition, Marcel Dekker Inc New York, 2004
2. R. Lanza, J. Gearhart et al (Eds), “Essential of Stem Cell Biology”, Elsevier Academic press, 2006
3. R. Lanza, I. Weissman, J. Thomson, and R. Pedersen, “Handbook of Stem Cells, Two Volume, Volume 12: Volume 1. Embryonic Stem Cells; Volume 2. Adult & Fetal Stem Cells”, Academic Press, 2004.

16BM401 DIAGNOSTIC AND THEREPEUTIC EQUIPMENTS-II

Hours Per Week:

L	T	P	C
3	-	-	3

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	6	12	3	2

Course Description and Objectives:

This course explains the concepts about human-instrument system and problems encountered in obtaining measurements from a living body. It also deals with basics of measuring the parameters in respiratory system, learn measurement techniques of sensory responses and understand different types and uses of diathermy units. It also gives knowledge of ultrasound imaging techniques and diagnosis..

Course Outcomes:

Upon successful completion of this course, the students will be able to:

1. know the importance of patient safety against electrical hazard
2. explain about measurements of parameters related to respiratory system
3. describe the measurement techniques of sensory responses
4. analyze different types and uses of diathermy units
5. discuss ultrasound imaging techniques and its usefulness in diagnosis
6. outline the importance of patient safety against electrical hazard

SKILLS ACQUIRED:

- ✓ outline the importance of patient safety against electrical hazard.
- ✓ Determine diagnostic techniques used in health care.
- ✓ Will know the principles in transmission of bio signals in telemetry.
- ✓ Understand procedures for safely carrying out therapeutic process

ACTIVITIES:

- ✓ Analysis of principles behind holter monitoring, defibrillators and other monitoring systems.
- ✓ To develop new therapeutic equipment in hospital management.
- ✓ Understand sources of leakage current and method of monitoring it.
- ✓ Analyse the criticality of an instrument and trouble shoot it economically.

UNIT - I

Respiratory Measurement Ststem: Instrumentation for measuring the mechanics of breathing,Spiro meter - Lung Volume and vital capacity, Measurements of residual volume, pneumotachometer, Airway resistance measurement, Whole body plethysmography, Intra-Alveolar and Thoracic pressure measurements, Apnea Monitor; Types of Ventilators – Pressure, Volume, Time controlled; Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators.

UNIT - II

Sensory Measurement: Psycho Physiological Measurements for testing and sensory Responses, Electro occulograph, Electro retinograph, Audiometer-Pure tone, Speech; EGG (Electrogastrograph), galvanic skin resistance (GSR).

UNIT - III

Diathermy: IR and UV lamp and its application, Short wave diathermy, Ultrasonic diathermy, Microwave diathermy, Electro surgery machine - Current waveforms, Tissue Responses, Electro surgical current level, Hazards and safety procedures.

UNIT – IV

Ultrasonic Technique: Diagnosis, Tissue Reaction, Basic principles of Echo technique, Display techniques A, B and M mode, B Scan, Application of ultrasound as diagnostic tool, Echocardiogram, Echoencephalogram, Abdomen, Obstetrics and Gynecology, Ophthalmology.

UNIT – V

Patient Safety: Physiological effects of electricity, important susceptibility parameters, Macro shock, Micro shock hazards, Patient’s electrical environment, Isolated Power system, Conductive surfaces, Electrical safety codes and standards, Basic Approaches to Protection against shock, Protection equipment design, Electrical safety analyzer, Testing the Electric system.

TEXT BOOKS:

1. Khandpur R.S, “Handbook of Biomedical Instrumentation”, 2nd edition, Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, 2nd edition, Prentice Hall of India, New Delhi, 2007
2. John G. Webster, “Medical Instrumentation Application and Design”, 4th edition, John Willey and Sons, 2009.
3. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, 4th edition, Pearson Education, 2004.

16BM308 MEDICAL IMAGING TECHNIQUES

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	46	6	12	3	2

Course Description and Objectives:

This course studies the image reconstruction techniques, quality assurance test for radiography, method of recording sectionalimage, functioning of radioisotopic imaging equipment and the MRI, image acquisition and reconstruction, it also explains the 3-D image display techniques. This course aimed at imparting knowledge of operation and medical applications of the major medical imaging techniques.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

1. explain the basic principles of the major medical imaging techniques
2. explain the mode of operation and medical applications of the major medical imaging techniques
3. understand the advantages and disadvantages of the major imaging techniques, includ-ing potential hazards for patients.

SKILLS ACQUIRED:

- ✓ Study the physics behind medical imaging.
- ✓ Determine the basis for an image is formation.
- ✓ Know the image formation in MRI.
- ✓ Grasp the knowledge of CT and importance of a medical department.
- ✓ Image acquisition and processing of images for required model.

ACTIVITIES:

- ✓ Know the processes involved in different image acquisition techniques.
- ✓ Attain knowl-edge on particle interaction with biological tissue.
- ✓ Calculate dose limits and differentiate between controlled areas and radiation hazards.

UNIT - I

Basic Medical Imaging Modalities: X-ray, CT , Ultrasound, MRI, PET-CT, SPECT-CT, Gamma Cam-era, Catheterization Lab. Aspects of light imaging, convolutions and transforms, photometry lenses and depth of field, Image perception and 3D Imaging, Image acquisition, Display, Image processing operations, scanning & segmentation.

UNIT - II

Basic Concepts of CT : Non Spiral CT technology, Concepts of Spiral CT Scanner ,Multi Slice spiral technology , Various Peripheral devices. Applications: Multiplanar Reconstruction, Maximum Intensity Projection, 3D, CT Angio, Osteo , Dental, Perfusion (Body & Neuro), Virtual Endoscopy, Cardiac CT (Calcium scoring, Coronary Angiography, Lesion Quantification).

UNIT - III

Magnetic Resonance Imaging: Permanent & Super conducting magnets, Signal generation and detection, signal characteristics, signal localization, Fourier transforms in MRI, Imaging Reconstruction. Image artifacts. Coil technology, Parallel acquisition techniques, Various peripheral devices. Applications: Functional Imaging, Perfusion & Diffusion imaging (Echo planar imaging), Multi direction diffusion tensor imaging, Single & Multi Voxel Spectroscopy, MR Angiography, MRCP, Cardiac MRI (Myocardium viability, Valve function etc.,) Flow Quantification.

UNIT – IV

Ultrasound Scanner: Principles of Ultrasound, Basic Ultrasound instrumentation, Imaging techniques A mode, B Mode, 2B, B/M, 4B , Gated Mode, 3D, 4D, M-Mode, Echocardiography) Image recording devices, Image artifact, Biological effects.

UNIT – V

Gamma Camera: Physics of Gamma camera, basic Instrumentation, Imaging techniques, SPECT & Whole Body studies; Applications of Gamma camera in Cardiology, Nephrology, Neurology etc., PET : Fundamentals of PET scanner & PET- CT , Crystal technology, Cyclotron principle, Hot Lab equipments, Applications of PET ; Cardiology, Neurology & Cardiology.

Text Books:

- ✓ Hykes, Heorick, Starchman, Ultrasound physics and Instrumentation MOSBY year book, 2nd Ed., 1992.
- ✓ Stewart C. Bushong, Magnetic Resonance Imaging- physical and biological principles, MOSBY, 2nd Ed.,1995
- ✓ Zhi-Pei Laing and Paul C. Lauterbur, Principles of Magnetic Resonance imaging –A signal processing perspective, Metin Akay (Editor), IEEE press, New York, 2000

COMPUTER SCIENCE ENGINEERING

16CS246 LINUX/UNIX AND SHELL PROGRAMMING

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Student explore to Unix/Linux operating system utilities like file processing, process management, disk management, networking and ability to write the shell program for specific task.

Course Outcomes:

- Installing several Linux distributions on direct hardware setup and virtual hardware setup
- Managing files and directives
- Knowing process attributes and basic level of process management
- Able to write shell script for given operating system task

SKILLS ACQUIRED:

- ✓ File and process manipulation
- ✓ Design and develop shell script programs.

UNIT – I

Introducing the Unix and Linux Operating System: A Brief History of Unix, Linux and Unix, Installing Linux, Introducing Unix/Linux shells, Logging into Unix/Linux, Basic commands: date, cal, who, clear, man, whatis.

UNIT – II

Understanding Unix/Linux File System: Exploring the Root Hierarchy, Using paths, Pathnames, and Prompts, pwd, Navigating the file system, cd, ls, mkdir, cp, rm, chmod, Usage of Vi editor.

UNIT – III

Unix/Linux file Processing: Input/output redirection, manipulating files- cat, touch, mv, find, paste, cut, sort, join, Advanced file processing: Selection commands-pipe, comm., diff, head, tail, wc, uniq, grep, sed.

UNIT – IV

Introduction to shell script programming: The program development lifecycle, variables, shell operators, redirection operators, more about wild card characters, shell logic structure, sequential logic, decision logic.

UNIT – V

Shell Script looping logic, the while loop, case logic, using shell functions, exploring the unix/Linux utilities- df, du, finger, ps, uname, ifconfig, ping, netstar, Installing application and packages in Linux.

Text Book:

1. Michael Palmer, "Guide to Unix using Linux", Cengage Learning, 4^{th} Edition, 2008.

Reference Books:

1. Sumitabha Das, "Unix Concepts and Applications", 4^{th} Edition. TMH, 2006.
2. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming", 1^{st} Edition, Cengage Learning India, 2003.

16CS351 R-PROGRAMMING

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

- ✓ Be familiar with the use of the R interactive environment
- ✓ Expand R by installing R packages
- ✓ Understand the different data types, data structures.
- ✓ Use control statements, user-defined functions, Loop constructs
- ✓ Be able to expand their knowledge of R on their own.

Course Outcomes:

At the end of this course, students will be able to:

- ✓ Motivation for learning a programming language.
- ✓ Learn to Install Rstudio and work on R interface.
- ✓ Learn the basics of R programming including objects, classes, vectors, attributes etc.
- ✓ Write functions including generic functions using various methods and loops.
- ✓ Select and modify values as required.
- ✓ Cover the concepts of R Notation, S3 System and Closures.
- ✓ Access online resources for R and import new function packages into the R workspace.
- ✓ Become proficient in writing a fundamental program and perform analytics with R.

ACTIVITIES:

- ✓ Store, retrieve, and change data values in your computer's memory
- ✓ Use R programming tools such as if else statements, for loops, and S3 classes
- ✓ Learn how to write lightning-fast vectorized R code.
- ✓ Take advantage of R's package system and debugging tools
- ✓ Practice and apply R programming concepts as you learn them.

UNIT – I

INTRODUCTION: Install R & Rstudio, Opening R, The R User Interface, Objects, Functions, Sample with Replacements, Writing Your Own Functions, The Function Constructor, Arguments, Scripts. R Objects**:** Atomic Vectors, Attributes, Matrices, Arrays.

UNIT – II

R Objects & R Notations: Class, Coercion, Lists, Data Frames, Loading Data, Saving Data. R Notation**:** Selecting Values, Deal a Card, Shuffle the Deck, Dollar Signs and Double Brackets.

UNIT - III

Modifying Values & Programs: Changing Values in Place, Logical Subsetting: Logical Tests, Boolean Operators, Missing Information: na.rm, is.na, Programs: Strategy, Sequential Steps, Parallel Cases, if Statements, Else Statements, Lookup Tables, Code Comments.

UNIT – IV

S3 & Loops: The S3 System, Attributes, Generic Functions, Methods: Classes S3 and Debugging, S4 and R5.Loops: Expected Values, expand.grid, for Loops, while Loops, repeat Loops.

UNIT – V

R Packages & Loading and Saving Data in R: R Packages: Installing Packages, Loading Packages. Loading and Saving Data in R: Data Sets in Base R, Working Directory

TEXT BOOK:

1. Garrett Grolemund "Hands-on Programming with R", 1st Edition, 2014.
2. Roger D. Peng "R Programming for Data Science"

REFERENCE BOOKS:

1. R Cookbook, Paul Teetor, O'Reilly.
2. R in Action, Rob Kabacoff, Manning
3. The R Book, Michael J. Crawley, WILEY, 2012.

LABORATORY EXPERIMENTS :

List of Experiments:

1. Installation of R software and R studio IDE
2. R Notations, Basic Operations
3. Programs which demonstrates R Objects: Data and Object types, Sub setting rules Atomic Vectors.
4. Experiment to Factor the data
5. A program to perform basic matrix operations such as addition, subtraction, dot product, multiplication Matrices,
6. Row binding and column binding operations using Arrays,
7. Converting matrices in to Data Frames
8. Control Structures: Logical Operators, If Statements, If-else Statements.
9. Programs which demonstrates Loops: For Loop, While Loop.
10. Writing user defined Functions for basic operations such as factorial, prime number etc.

16CS353 STATISTICS USING PYTHON

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

- The job of a data scientist is to glean knowledge from complex and noisy datasets.
- Reasoning about uncertainty is inherent in the analysis of noisy data. Probability and Statistics provide the mathematical foundation for such reasoning.
- After acquiring data and getting them into a form to work with, you ultimately want to make clear, succinct conclusions from them, on the principles of statistical inference.
- In this course, student will start building the foundation to think statistically, to speak the language of data, to understand what they are telling.
- In this course, you will do just that, expanding and honing your hacker stats toolbox to perform the two key tasks in statistical inference, parameter estimation and hypothesis testing.

UNIT – I

- **Pandas:** Data Structures for Statistics-Data Handling- Grouping-
- **Statsmodels:** Tools for Statistical Modeling
- **Seaborn:** Data Visualization-General Routines
- **Data Input**
- Input from Text Files-Visual Inspection-Reading ASCII-Data into Python-
- Input from MS Excel
- Input from Other Formats- Matlab
- **Display of Statistical Data**
- Data types - Categorical-Numerical
- Plotting in Python-Functional and Object-Oriented Approaches to Plotting-Interactive Plots-Displaying Statistical Datasets-Univariate Data-Bivariate and Multivariate Plots.

UNIT – II

Distributions and Hypothesis Tests

- **Discrete Distributions** - Bernoulli Distribution - Binomial Distribution - Poisson Distribution
- **Normal Distribution**-Examples of Normal Distributions-Central Limit Theorem-Distributions and Hypothesis Tests
- **Continuous Distributions** Derived from the Normal Distribution-t-Distribution-Chi-Square Distribution-F-Distribution
- **Exponential Distribution-Uniform Distribution**
- **Hypothesis Tests**
- **Typical Analysis Procedure** - Data Screening and Outliers - Normality Check-Transformation-**Hypothesis Concept, Errors, p-Value, and Sample Size**-Generalization - The Interpretation of the p-Value -Types of Error-Sample Size-
- **Sensitivity and Specificity** -Related Calculations

UNIT – III

- **Tests of Means of Numerical Data**-Distribution of a Sample Mean -One Sample t-Test for a Mean Value-Wilcoxon Signed Rank Sum Test-Comparison of Two Groups -Paired t-Test--t-Test between Independent Groups.
- **Comparison of Multiple Groups**-
- Analysis of Variance (ANOVA)-Multiple Comparisons-Kruskal–Wallis Test
- **Two-Way ANOVA**
- **Selecting the Right Test for Comparing Groups-Typical Tests-Hypothetical** Examples
- **Tests on Categorical Data** -One Proportion - Confidence Intervals-Explanation-
- **Frequency Tables** – One - Way Chi-Square Test – Chi - Square Contingency Test

Unit – IV

Statistical Modeling

- **Linear Regression Models**-Linear Correlation- Correlation Coefficient-Rank Correlation
- **General Linear Regression Model**-Example : Simple Linear Regression-Example : Quadratic Fit-Coefficient of Determination
- **Patsy: The FormulaLanguage**- Design Matrix
- **Linear Regression Analysis with Python**-Examples : Line Fit with Confidence Intervals-Noisy Quadratic Polynomial
- **Model Results of Linear Regression Models**-Example: Tobacco and Alcohol in the UK-Definitions for Regression with Intercept-The R^2 Value- R^2 : The Adjusted R^2 Value-Model Coefficients and Their Interpretation-Analysis of Residuals-Outliers-Regression Using Sklearn.

Unit – V

- **Multivariate Data Analysis**
- **Visualizing-Multivariate Correlations**- Scatterplot Matrix-Correlation Matrix
- **Multilinear Regression**
- **Tests on Discrete Data**
- Comparing Groups of Ranked Data -Logistic Regression
- Generalized Linear Models : Exponential-Family of Distributions- Linear Predictor and Link Function-Ordinal Logistic Regression-Problem Definition-Optimization-Code-Performance
- **Bayesian Statistics**: Bayesian vs Frequentist Interpretation -Bayesian Example - The Bayesian Approach in the Age of Computers - Example: Analysis of the Challenger Disaster with a Markov-Chain–Monte-Carlo Simulation

Text Book:

1. An Introduction to Statistics with Python With Applications in the Life Sciences, Thomas Haslwanter - Springer- ISSN 1431-8784 - ISBN 978-3-319-28315-9 Springer International Publishing Switzerland 2016.

16CS446 DATA SCIENCE USING PYTHON

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Through this Data Science with Python course, students will learn how to process, clean, visualize and analyze data by using Python, one of the most popular data science tools. Students will learn cutting edge Machine Learning techniques in Python. Post the course learners will become an in-demand Data Scientists

Course Outcomes:

Students are able to:

- ✓ Learn how to analyze large amounts of data to bring out insights
- ✓ Get knowledge on relevant examples and cases make the learning more effective and easier
- ✓ Gain hands-on knowledge through the problem solving based approach of the course along with working on the skill set at the end of the course

SKILLS ACQUIRED:

- ✓ Learn to apply data science methods and techniques, and acquire analysis skills.
- ✓ Basic data manipulation & data cleaning using Python and pandas Regular Expressions

UNIT – I

Introduction to data science, Python basics, Data processing using arrays, file input/output with arrays.

UNIT – II

Introduction to pandas data structure, computing descriptive statistics, essential functionality, Handling missing data.

UNIT – III

Reading and writing data with text format, Binary data formats, interacting with HTML and web API's.

UNIT – IV

Combing and merging data sets, data transformation and string manipulation.

UNIT – V

Date and time data types and tools, Time series basics, Time zone handling.

Test Book:

1. Wes McKinney, "Python for data analysis", O'Reilly Media, October 2012: First Edition.

Reference Books:

1. Joel Grus Data Science from Scratch O'Reilly Media Inc., April 2015
2. Cathy O'Neil and Rachel Schutt "Doing Data Science", O' Reilly Media Inc., October 2013

16CS247 FUNDAMENTALS OF DATABASE SYSTEMS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course presents an introduction to database management systems with an emphasis on how to organize, maintain and retrieve data efficiently and effectively from a database. It concentrates on requirements gathering and conceptual, logical, physical database design. The objective of the course is to make the student to understand database management concepts such as database design, transaction processing and query optimization **Course Outcomes:**

Students are able to:

The student will be able to:

- ✓ Understand the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- ✓ Design Entity Relationship(ER) models to represent simple database application scenarios.
- ✓ Convert the ER-model to relational tables, populate relational database and formulate SQL queries.
- ✓ Construct simple queries using Structured Query Language (SQL).
- ✓ Improve the database design by normalization.
- ✓ Familiarize with basic database storage structures and access techniques.

SKILLS ACQUIRED:

- ✓ Design a conceptual database using ER-Model.
- ✓ Convert ER- Model to RDBMS.
- ✓ Formulate database queries using Structured Query Language (SQL).
- ✓ Build and run DDL and DML commands.
- ✓ Design and implement normalized databases.
- ✓ Construct B+ Trees.

ACTIVITIES:

- ✓ Design of ER diagram for the development of web applications.
- ✓ Transformation of ER diagram into a relational schema.
- ✓ Creation of relations with entity and referential integrity constraints for a given relational schema
- ✓ Formulation of queries using SQL.
- ✓ Design of relational database using normalization techniques.
- ✓ Development of relational schema for enterprise level web applications.

UNIT – I

Introduction to Databases: Advantages of using the DBMS approach, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, DBMS Structure.

UNIT – II

Conceptual Designed Database Design: High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the Company Database, ER Diagrams, Naming Conventions and Design Issues.

UNIT – III

Relational Datamodeland SQL: Relational Database Design Using ER-to-Relational Mapping, Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE and UPDATE Statements in SQL, Relational Algebra.

UNIT – IV

Database Design Theory and Normalization: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Properties of Relational Decompositions.

UNIT – V

Transaction Processing, Concurrency Control and Recovery: Transaction and System Concepts, Desirable Properties of Transactions, Two-Phase Locking Techniques, Single level and Multilevel indexes, Dynamic Multilevel Indexes Using B+ Trees.

LABORATORY EXPERIMENTS

Course Outcomes:

The student will be able to:

- ✓ Understand, analyze, and apply common SQL Statements including DDL, DML and DCL
- ✓ Statements to perform different operations.
- ✓ Design and implement a database for a given problem.

LIST OF EXPERIMENTS

1. ER Design tool (ex. TOAD)
2. MYSQL RDBMS
3. DDL Commands
4. DML Commands
5. DCL and TCL Commands
6. Database design of any Enterprise application with key constraints
7. Nested Queries and Join Queries.
8. Views.
9. Design and development of database using MYSQL.

TEXTBOOK:

1. Ramez Elmasri and Shamkant B Navathe, "Fundamentals of Data base Systems", 6^{th} edition, Pearson Education, 2010.

REFERENCEBOOKS :

1. Raghu Rama Krishnan and Johannes Gehrke, "Database Management Systems", 3^{rd} edition, Tata McGraw Hill, 2013.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", 6^{th} edition, Tata McGraw Hill, 2010.
3. Peter Rob and Carlos Coronel, "Database System Design, Implementation and Management", 7^{th} edition, Cengage Learning, 2007.

16CS245 ADVANCE DATABASES

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course presents an introduction to Distributed database systems with an emphasis on how to organize, maintain and retrieve data efficiently and effectively from a database. It concentrates on data fragmentation, allocation, transparencies and efficiency of distributed database design. The objective of the course is to make the student to understand distributed database systems concepts such as distributed database design, distributed transaction processing and distributed query optimization.

Course Outcomes:

The student will be able to:

- ✓ Understand the basic concepts of distributed database systems, fragmentation, allocation and replication, database design, relational algebra and SQL.
- ✓ Design of distributed database of any enterprise application scenarios.
- ✓ Familiarize with basic distributed query processing and optimization techniques.

SKILLS ACQUIRED:

- ✓ Design a distributed database.
- ✓ Performing various Fragmentations of distributed databases
- ✓ Applying Distributed query processing techniques
- ✓ Familiarize the distributed recovery protocols

ACTIVITIES:

- ✓ Familiarize with basic distributed query processing and optimization techniques.
- ✓ Design of distributed database of any enterprise application scenarios.
- ✓ Development of distributed database for enterprise level web applications.
- ✓ Application of distributed recovery protocols.
- ✓ Application of distributed query processing.

UNIT - I

Review of Database Systems : Evolution of Distributed Database System, Overview of Parallel Processing Systems, Parallel Database Design.
Overview of Computer Networking: Introduction to Networking, Types of Computer Networks, Communication Schemes, Network Topologies, the OSI Model.
Distributed Database concepts: Fundamentals of Distributed databases, Features of a Distributed DBMS, Advantages and Disadvantages of Distributed DBMS, An example of Distributed DBMS, Homogeneous and Heterogeneous Distributed DBMSs, Functions of Distributed DBMS, Components of Distributed DBMS.

UNIT – II

Distributed Database Design: Distributed Database design concepts, Objectives of Data Distribution, Data Fragmentation, The Allocation of Fragments, Transparencies in Distributed Database design.
Distributed DBMS Architecture: Introduction, Client/Server System, Peer to Peer Distributed System, Multi Database System (MDBS)

UNIT - III

Distribution Transaction Management--- Basic concepts of Transaction management, ACID Properties of Transaction, Objectives of Distributed Transaction Management, A Model for Transaction Management in a Distributed System, Classifications of transaction.

UNIT – IV

Distributed concurrency control: Objectives of Distributed concurrency control, concurrency control Anomalies, Distributed Serializability, Classification of Concurrency control Techniques, Locking based concurrency control Protocols.
Distributed Recovery Management: Introduction to recovery Management, Failures in a Distributed Database System, Steps followed after a failure, Local recovery Protocols, Distributed Recovery Protocol.

UNIT - V

Overview of Query Processing and Optimization.
Distributed Query Processing : Concepts of query processing, Objectives of distributed query processing, Phases in Distributed Query Processing, Join Strategies in Fragmented Relations.
Data Warehousing and Data Mining : Concepts of Data Warehousing, Data Warehousing Architecture, Introduction to Data Mining, Data Mining Techniques.

Text Books:

1. Chhanda Ray, “Distributed Database Systems”, 1st edition, Pearson Education India, 2009.

Reference Text Books:

1. Ramez Elmasri and Shamkant B Navathe,“Fundamentals of Database Systems”, 6th edition, Pearson Education, 2010.
2. Stefano Ceri, Giuseppe Pelagatti, “Distributed databases: principles and systems”, McGraw Hill Education, 1984.

16CS354 FUNDAMENTALS OF DATA MINING TECHNIQUES

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course introduces the concepts and techniques of knowledge discovery and data mining. It also focuses on issues relating to the feasibility, usefulness, effectiveness and scalability of techniques for the discovery of patterns hidden in *large data sets*. The objective of this course is to apply the techniques of clustering, classification, association finding, feature selection and visualization of real world data

Course Outcomes:

The student will be able to:

- ✓ describe various kinds of data sets used for analysis
- ✓ illustrate various methods used for data cleaning
- ✓ apply data mining techniques for crucial decision making
- ✓ identify the necessity of correlation analysis for association mining
- ✓ examine various clustering techniques in data mining

SKILLS ACQUIRED:

- ✓ Perform in depth analysis of information requirements for solving problems;
- ✓ Manage large databases;
- ✓ Deploy knowledge in decision support systems or intelligent systems, both in academic and in industrial environments.
- ✓ Design data warehouse for an organization.

UNIT – I

Introduction DataWarehousing and Mining : Why Data Mining, What is Data Mining, Kinds of Data, Kinds of Patterns, and Technologies used, Kinds of applications adopted, Major issues in Data Mining.

UNIT – II

About Data & Data Preprocessing : Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity. Data Preprocessing, An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT – III

Mining Concepts : Mining Frequent Patterns, Associations, and Correlations, Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods

UNIT – IV

Classification : Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy. Advanced Classification - Classification by Back propagation, Support Vector Machines.

UNIT – V

Cluster Analysis :
Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering.

Text Book:

1. Jiawei Han Micheline Kamber – “Data Mining Concepts & Techniques”, Third Edition, Morgan Kaufmann Publishers, 2012.

Reference Books :

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, First Edition, 2012.
2. Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit”, first edition John Wiley and Sons Inc., 2002.

16CS447 INTRODUCTION TO BIGDATA ANALYTICS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

The main objectives of this course is to enable the students with basic data analytic skills like regression analysis, classification techniques, clustering techniques, association rule mining. Further, this course also enables the students how to scale the above algorithms with different data environments like massive amount of data, streaming data, distributed data and provides hands on experience on real world problems using above theoretical background

Course Outcomes:

- ✓ Necessary theory background for processing analytics.
- ✓ Processing analytics on small scale data.
- ✓ Mining from massive datasets.
- ✓ Mining from distributed datasets.

SKILLS ACQUIRED:

- ✓ Develop programming and analytics for various statistical problems using R.
- ✓ Design classification models for various standard and user Datasets.
- ✓ Develop clustering techniques and association rules for large standard and user
- ✓ Datasets.
- ✓ Analyse large scale data using MAPREDUCE programming which includes JAVA and HADOOP frameworks.

ACTIVITIES:

- ✓ Familiarize with basic distributed query processing and optimization techniques.
- ✓ Design of distributed database of any enterprise application scenarios.
- ✓ Development of distributed database for enterprise level web applications.
- ✓ Application of distributed recovery protocols.
- ✓ Application of distributed query processing.

UNIT – I

Introduction to Big Data : Introduction to BigData Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability – Analytic Processes and Tools - Analysis vs Reporting - - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT – II

Data Analysis : Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning.

UNIT – III

Advanced Learning and treaming: Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data – Fuzzy c-Means- Stochastic Search Methods. Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams

UNIT – IV

Frequent Itemsets and Clustering : Mining Frequent Itemsets - Market Based Model – AprioriAlgorithm, FP-Growth, Dynamic Item set Algorithm – Clustering Techniques – Hierarchical – KMeans, K-medoid, CURE- Clustering High Dimensional Data – CLIQUE– Clustering in Non-Euclidean Space – Clustering for Streams and Parallelism.

UNIT – V

Frameworks and Visualization : Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications.

Text Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

Reference:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & Sons, 2012.
2. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
3. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
4. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

16CS352 JAVA PROGRAMMING

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course intended to develop software that covers the principles of object oriented programming which includes defining class, creating objects, usage of abstraction, encapsulation, inheritance and polymorphism. Further, it offers concepts of multi-threading and exception handling.

Course Outcomes:

· The student will be able to:

- ✓ Distinguish between procedures oriented and object oriented concepts of programming.
- ✓ Understand OOP concepts and features of Java language.
- ✓ Apply Object Oriented concepts in problem solving.

SKILLS ACQUIRED:

- ✓ Data hiding and abstraction
- ✓ Code reusability
- ✓ Create new packages and interfaces
- ✓ Develop multi-threaded applications
- ✓ Runtime error handling
- ✓ Parallel programming

.

ACTIVITIES:

- ✓ Implementing the concept of encapsulation.
- ✓ Design a sample program which exhibits inheritance
- ✓ Developing a program which implements polymorphism
- ✓ Implementing a program for multithreading

UNIT – I

Introduction: Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP principles, Encapsulation, Inheritance and polymorphism, Compiling and running of simple Java program, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting.

UNIT – II

Classes and Objects: Concepts of classes and objects, Class fundamentals, Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, This key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and inner classes.

UNIT – III

Inheritance: Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance.

UNIT – IV

Packages and Interfaces: The object class, Defining, Creating and accessing a package, Understanding classpath, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and extending interfaces.

UNIT – V

Exception Handling, Multi Threading: Concepts of exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and finally keywords, Built-in exceptions, Creating own exception, Sub classes, Concepts of multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication.

Text Books:

1. Herbert Schildt, "The Complete Reference Java J2SE", 9th edition, TMH Publishing Company Ltd, New Delhi, 2008.

Reference Books:

1. Cay Horstmann, "Big Java", 2nd edition, John Wiley and Sons, 2006.

2. O'Reilly, "Head First JAVA", 2nd edition, O'Reilly Media Inc, 2005

3. Herbert Schildt, "A Beginner's Guide", 6th edition, McGraw Hill Education, 2014.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

1. Develop a program to read an integer and print all prime numbers upto that integer.
2. Develop a program that checks whether a given string is a palindrome or not.
3. Develop a program toArrange given list of names in the ascending order.
4. Develop a program for addition of two matrics.
5. Develop a program for finding largest number in an array.
6. Develop a program to demonstrate class,object and constructor
7. Develop a program to demonstrate static keyword.
8. Develop a program to demonstrate inheritence
9. Develop a program to demonstrate polymorphism
10. Develop a program for creating a package and usage of user define package
11. Develop a program to demonstrate exception handling.
12. Develop a program to demonstrate multi threading.

16CS355 INTERNET TECHNOLOGIES

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers. Students will be able to use a variety of strategies and tools to create websites and also integrate with IDE's for fast development of web applications.

Course Outcomes:

- ✓ Students are able to develop a dynamic webpage by the use of java script and DHTML.
- ✓ Students will be able to write a well formed / valid XML document.
- ✓ Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- ✓ Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
- ✓ Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

SKILLS ACQUIRED:

- ✓ Perform client side validation using Java script.
- ✓ Store and retrieve data using JDBC.
- ✓ Generate dynamic contents using Servlets.
- ✓ Generate dynamic contents using JSPs.
- ✓ Overcome problems in Servlets and JSP using Struts Programs.
- ✓ Develop a working system of web application or web site.

UNIT – I

Tier Architecture & **HTML :** Client/Server Architecture**,** J2EE Multi Tier Architecture. HTML Common tags- Block Level and Inline Elements, Lists, Tables, Images, Forms, Frames; Cascading Style sheets, CSS Properties;

UNIT – II

Java Script & XML : Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script. The Need for XML, SGML and XML, Well-Formed XML, Valid XML, Displaying XML, XML Application Languages, Document type definition, XML Schema.

UNIT – III

JDBC : Data Base, Database Schema, A Brief Overview Of The JDBC Process, JDBC Driver Types, JDBC Packages, Database Connection, Associating The JDBCODBC Bridge With Database, Creating, Inserting, Updating And Deleting Data In Database Tables, Result Set, Metadata.

UNIT – IV

Web Servers and Servlets : Tomcat web server, Introduction to Servlets: Servlets, the Advantage of Servlets over "Traditional" CGI, Basic Servlet Structure, Simple Servlet Generating Plain Text, Compiling and Installing the Servlet, Invoking the Servlet, Lifecycle of a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Context Parameters, Handling Http Request & Responses, Using Cookies-Session Tracking, Servlet with JDBC.

UNIT – V

JSP : The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods , Sharing Data Between JSP pages, Users Passing Control and Data between Pages, JSP application design with JDBC, JSP Application Design with MVC.

TEXT BOOKS:

1. Jon Duckett, "Beginning Web Programming with HTML, XHTML, and CSS", WROX, 2nd edition, 2008.
2. Marty Hall and Larry Brown, "Core Servlets and Java Server pages Vol. II", 2nd edition, Pearson, 2007.
3. K K Breitman, M A Casanova and W Truszkowski, "Semantic Web: Concepts, Technologies and Applications", Springer, 2009.

REFERENCE BOOKS:

1. Robert W Sebesta, "Programming the World Wide Web", 4th edition, Pearson, 2006
2. Paul J Deitel, Harvey M Deitel and Abbey Deitel, "Internet and World Wide Web – How to program", 5th edition, Deitel, 2009.

16CS448 PYTHON PROGRAMMING

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course is aimed at offering the fundamental concepts of Python scripting language to the students. It starts with the basics of python programming and deal with lists, dictionaries, functions, exceptions and files. The objective of this course is to enable the students to develop the applications using the concepts of python.

Course Outcomes:

· Student will be able to

- ✓ Understand the basic terminology used in computer programming to write, compile and debug programs in python language
- ✓ Use different data types to design programs involving decisions, loops, and functions.
- ✓ Handle the exceptions which are raised during the execution of python scripts.
- ✓ Understand the usage of files and classes.

SKILLS ACQUIRED:

- ✓ Identify suitable data types of an application
- ✓ Apply control statements for decision making problems.
- ✓ Design an application to perform various operations using class
- ✓ Create a list of data and perform operations on data and result is stored on file

ACTIVITIES:

- ✓ Implement of data types such as scalars, arrays, lists using Python.
- ✓ Develop functions using Python.
- ✓ Copy the content of one file into another.
- ✓ Perform operations such as display, calculate percentage, add, delete and modify student data.
- ✓ Implement matrix operations.

UNIT – I

Introduction: History of Python Features of Python, Python Installation on Windows & LINUX, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT – II

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations.

Control Flow: if, elif, else, for, while, break, continue, pass

UNIT – III

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – IV

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. **Modules:** Creating modules, import statement, from. Import statement, name spacing,

Error and Exceptions Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions.

UNIT – V

Files: Opening and Closing files, reading and writing, tell (), seek(), rename ()

Object Oriented Programming OOP in Python: Classes, Methods, Constructor Method, Inheritance, Overriding Methods.

Text Books

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly (files)

Reference Books

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage

LIST OF EXPERIMENTS:

Exercise 1 – Basics

a) Running instructions in Interactive interpreter and a Python Script

b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 – Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

c) Read two integers and perform all arithmetic operations on those two numbers.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . 1/10

c) Write a program using a for loop that loops over a sequence. What is sequence ?

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow – Continued

a) Find the sum of all the primes up to given range.

b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. By Starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

c) By considering the terms in the Fibonacci sequence whose values do not exceed one lakh, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

c) Create a dictionary of student data and search for a student.

Exercise - 6 DS - Continued

a) Write a program combine lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

c) Handle divide by zero exception.

Exercise - 8 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

   Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

   If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints

b) Write a program to perform addition of two square matrices

c) Write a program to perform multiplication of two square matrices

Exercise - 12 OOP

a) Class variables and instance variable

   i) Robot, (ii) ATM Machine, (iii) Create a class called Student and perform operations such as display, calculate percentage, add, delete and modify student data.

CIVIL ENGINEERING

16CE281 RENEWABLE ENERGY RESOURCES

Hours Per Week:

L	T	P	C
3	1	0	4

Total Hours:

L	T	P
45	15	-

Course Description and Objectives:
The main objective of this course is to make the student aware of the various renewable energy resources that leads for sustainable use of energy and directly leads to sustainable development for sustainable cities

Course Outcomes:

- ✓ Knowledge of Various types of energy resources.
- ✓ Efficient use of energy resources
- ✓ Uses of renewable energy

SKILLS ACQUIRED:

- ✓ Use of solar radiation to produce electricity
- ✓ Use of wind energy to produce electricity
- ✓ Collection and conversion of bio waste into bio gas

ACTIVITIES:

- ✓ Prepare a Solar Plate model for LED lighting
- ✓ Prepare a model of wind mill and produce some electricity
- ✓ Collect and convert the bio waste into bio gas
- ✓ Write a technical report on any Thermal and Hydel power plants in India.
- ✓ Write a technical report on Geo thermal energy.

UNIT – I

Principles of Solar Radiation: Role and Potential of New and Renewable source, the solar energy option, Environmental impact of solar power, Physics of the Sun, The solar constant, Extraterrestrial and Terrestrial solar radiation, solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT – II

Solar Energy Collection & Applications: Flat Plate Collectors and Concentrating Collectors, Classification of concentrating collectors, Orientation and Thermal analysis, advanced collectors, Solar ponds, Solar Energy Applications - solar heating/cooling techniques, solar distillation and drying, Photovoltaic Energy Conversion.

UNIT – III

Wind Energy: Sources and potentials, Horizontal and Vertical axis wind mills - Types, Blade Design, Performance characteristics, Betz criteria, Induction Generators for Wind power Generation, MHD Generation.

UNIT – IV

BIO-Mass & DEC: Principles of Bio-Conversion, Anaerobic/aerobic digestion, Types of Bio-gas Digesters, gas yield, Combustion characteristics of bio-gas, Utilization for cooking, Economic aspects. Direct Energy Conversion, Need for DEC, Principles of DEC, Carnot Cycle and Limitations.

UNIT – V

Harnessing Geothermal Energy & Ocean Energy: Resources of Geothermal Energy, Types of wells, Methods of harnessing the energy, potential in India, Ocean Thermal Energy Conversion, Principles, Utilization, Setting of OTEC plants, Thermodynamic cycles, Tidal and Wave energy: Potential and Conversion Techniques, Mini-Hydel Power plants.

Text Books :

1. Non-Conventional Energy Sources by G.D.Rai, Khanna Publishers.
2. Renewable Energy Resources by Twidell and Wier, CRC Press (Taylor and Francis).
3. Non- Conventional energy resources by B.H.Khan, Tata Mc Graw-Hill, 2006.

Reference Books :

1. Renewable Energy Resources by Tiwari and Ghosal, Narosa.
2. Renewable Energy Technologies by Ramesh and Kumar, Narosa.
3. Non-Conventional Energy Systems by K Mittal, Wheeler Publishing House.
4. Renewable Energy Sources and Emerging Technologies by D.P.Kothari, K.C.Singhal, PHI.

16CE385 ENVIRONMENTAL POLLUTION AND CONTROL

Hours Per Week:

L	T	P	C
3	1	0	4

Total Hours:

L	T	P
45	15	-

Course Description and objectives:

The course has been designed to improve the understanding about different pollution control strategies and the skills of application of remediation techniques to combat pollution in four environmental compartments i.e. air, water, noise and soil. The course will also be dealing about the sources of pollution in air, soil, water, solid-waste and noise and the impacts these sources on the environment and health. In addition, the students will be given the training to develop the particular skills required in pollution related structured research

Course Outcomes:

Students will be able to:

- ✓ Recognize, evaluate, and control factors in the workplace and the environment that cause health and environmental hazards and utilize quantitative knowledge and skills and modern tools and
- ✓ Technologies to access, analyze, plan, control and implement environmental management systems

SKILLS ACQUIRED:

- ✓ Estimate the Ambient Air Quality Standards
- ✓ Estimate the Water Quality Standards
- ✓ Estimate the Soil Quality Standards
- ✓ Estimate the Noise Quality Standards
- ✓ Find out Control Measures of Pollution

ACTIVITIES:

1. Classify different types of air pollutants and its effect on environment in your local area and suggest necessary steps to control
2. Classify different types of water pollutants and its effect on environment in your local area and suggest necessary steps to control
3. Classify different types of soil pollutants and its effect on environment in your local area and suggest Necessary steps to control
4. Classify different types of e -wastes and its effect on environment in your local area and suggest Necessary steps to control

Introduction to Environmental Pollution: Definition and sources of pollution; Types of Pollutants and their classification. Different types of pollution and their global, regional and local aspects. Air Pollution: Types and sources of air pollutants; Aerosols; Characterization of aerosols Effects of pollutants on human beings, plants, animals and materials. Air quality management.

UNIT II

Water Pollution: Sources of pollution of surface and ground water, Water pollution parameters – physical, chemical and biological; Types of water pollutants; Effects of water pollution on water bodies - eutrophication, aquatic life, vegetation and human health; Control of water pollution.

UNIT III

Soil Pollution: Sources, effects and control of soil pollution. Pollution and residual toxicity from the application of insecticides, pesticides and fertilizers.Municipal solid waste Definition - Sources and types of solid waste- composition and its determinants of Solid waste-factors influencing generation-quantity assessment of solid wastes-methods of sampling and characterization. Collection transfer, control and management of Municipal Solid Waste, Landfills.

UNIT IV

Noise Pollution: Noise pollution – source, measurement, effects and control; Thermal pollution: Definition and sources, Chemical and biological effects of thermal pollution, Effect on marine life, bacteria and water quality and other aquatic biota; Thermal pollution from power plants and their control.

UNIT V:

Electronic waste (E-waste): Sources and types, constituents of E-wastes, recycling of ewaste and its environmental consequences, Management of e-wastes, Basel convention. Radiation Pollution: Radioactive decay; Interaction of radiation with matter; Biological impact and health hazards associated with radiation, Protection against ionizing isotopes; Radioactive waste disposal.

TEXT BOOKS

1. Environmental Pollution B.K. Sharma S.H. Kaur Goel Publishing House
2. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008

REFERENCE BOOKS

1. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001.
2. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998

16CE391 PRINCIPLES OF INDUSTRIAL WASTE TREATMENT

Hours Per Week:

L	T	P	C
3	1	0	4

Total Hours:

L	T	P
45	15	-

Course Description and objectives:

The course has been designed to improve the understanding about different industrial waste water treatment technologies. In addition, the students will be able to describe the physical, chemical, and biological processes necessary for designing and managing primary, secondary, tertiary and advanced wastewater treatment processes and solids handling systems

Course Outcomes:

Students will be able to:

- ✓ To understand and apply the fundamental principles of industrial wastewater treatment and management
- ✓ To know the chemical, physical, and biological processes necessary for designing and managing modern wastewater treatment plants.

SKILLS ACQUIRED:

- ✓ Designing treatment technology for waste water from various industries
- ✓ Estimate the Water Quality Standards of various industries
- ✓ Demonstrate a basic understanding of water and wastewater treatment principles, and associated operations and maintenance considerations

ACTIVITIES:

1. Visit any Industry and estimate the characteristics of wastes.
2. Estimate the effect of Industrial waste in your area and plan effluent treatment plant.
3. Design any oxidation pond in your area.
4. Discuss about waste reduction techniques
5. Visit any dairy near your area and estimate the waste and propose treatment method.

UNIT–I

Principles of Industrial Waste Treatment: Introduction, Principles of industrial waste management, sources of pollution, physical, chemical, organic and biological properties, effects of waste water on self purification capacity of streams, land environment and human health, characteristics of treatment plant effluents, Effect of waste water

UNIT–II

Principles of biological waste treatment: Facilities Microbiological growth rate kinetic equations, sludge production, oxygen requirements, and continuous flow treatment models. Aerobic treatment studies in continuous and semi-continuous reactors. Anaerobic treatment, studies, Nitrogen and Phosphorus removal.

UNIT–III

Process designs of the following units w.r.t. Industrial Wastes; Activated sludge process; trickling filter; sludge digestion units; Aerated lagoons; Stabilization ponds (oxidation ponds); oxidation ditches (Pasveer); Rotating Biological contactor; Anaerobic filter.

UNIT– IV

Principles of Industrial waste Treatment: Waste reduction pretreatment of wastes, collection and segregation of wastes, reduction in volume and strength neutralization; equalization; proportioning.

UNIT–V

Manufacturing processes, flow sheets; Characteristics and treatment of wastes and disposal methods of the following industries – Sugar, Dairy, Distillery, Paper, Tannery, Textile, Sheet, Fertilizer, Oil refinery and Petrochemicals. Wastes from food processing, hospitality Industries and Hospitals. Legislation framework and regulation in India; EPA, NGT and Case Studies

TEXTBOOKS:

1. Industrial Waste Management, M.N. Rao and A.K. Datta
2. Metcalf and Eddy; A waste water Engineering Treatment, disposal and Reuse –Tata Mc. Graw-Hill Co., 3rd edition, 1995.

REFERENCES:

1. Standard methods for examination of Water and waste water, APHA, American Water work Association, Water pollution control federation, New York.
2. Waste and waste water technology, Mark, JH. John Wiley and Sons, New York.

16CE482 ENVIRONMENTALIMPACT ASSESSMENT

Hours Per Week:

L	T	P	C
3	1	0	4

Total Hours:

L	T	P
45	15	-

Course Description and Objective:

The course is designed to know the various environmental aspects like assessment of soil, surface water environment, impact of air pollution, which are essential to consider before establishment of any civil engineering projects at a particular location. It also deals with different legislative acts and environment audits regarding selection of location of the project.

Course Outcomes: ·

- ✓ Identify the environmental attributes to be considered for the EIA study · Formulate objectives of the EIA studies ·
- ✓ Identify the methodology to prepare rapid EIA · Prepare EIA reports and environmental management plans

SKILLS ACQUIRED:

- ✓ Knowledge of Environmental Impact Assessment and Methods to assess.
- ✓ Assessment of Environmental Pollution Impact on soil and groundwater
- ✓ Assessment of Air pollution Impact
- ✓ Knowledge of Environmental Audit and Environmental legislation
- ✓ Knowledge of pollution, water, air and wild life protection act.

ACTIVITIES:

1. Write a technical report on EIA and its methodologies with examples
2. Write a technical report to assess soil and ground water impact.
3. Write a technical report to assess air pollution
4. Write a brief report on Water and Air pollution act.
5. Write a brief report on Wild life protection act.

UNIT – I

Basic concepts of EIA : Initial Environmental Examination; Elements of EIA; Factors affecting EIA; Impact evaluation and analysis; Preparation of Environmental Base map; Classification of Environmental parameters. EIA Methodologies; Introduction; criteria for the selection of EIA Methodology; EIA Methods: Ad-hoc methods, Matrix methods, Network method, Environmental media quality index method; Overlay methods; Cost/benefit Analysis.

UNIT – II

Impact of Developmental Activities and Land Use: Introduction and Methodology for the assessment of soil and ground water; Delineation of study area; Identification of activities. Procurement of relevant soil quality; Impact prediction; Assessment of Impact significance; Identification and Incorporation of mitigation measures.

UNIT – III

EIA in surface water, Air and Biological Environment: Methodology for the assessment of Impacts on surface water environment; Air pollution sources; Generalized approach for assessment of Air pollution Impact. Assessment of Impact of Development activities on vegetation and wildlife; Environmental Impact of Deforestation; Causes and effects of deforestation. Coastal regulations and Use of R.S and GIS

UNIT – IV

Environmental Audit and Environmental legislation : Objectives of Environmental Audit; Types of Environmental Audit; audit protocol; stages of Environmental Audit; On-site activities; Evaluation of Audit data and preparation of Audit report.

UNIT – V

Post Audit activities; The Environmental Pollution Act, The Water Act; The Air (Prevention and Control of Pollution) Act; Wild life protection Act. Case Studies and preparation of Environmental Impact Assessment statement for various industries.

TEXT BOOK:

1. Y. Anjaneyulu; “Environmental Impact Assessment Methodologies”, Vol.-I, 2nd ed., B.S. Publication, Sultan Bazar, Hyderabad, 2007.

REFERENCEBOOKS:

1. J. Glynn and Gary W. Hein Ke, “Environmental Science and Engineering”, Vol-I, 3rd ed., Prentice Hall Publishers,1998.
2. K. Dhameja, S.K. Kataria, “Environmental Science and Engineering”, Vol-II, 2nd ed., Suresh & Sons Publications, New Delhi, 2001.
3. Dr. H.S. Bhatia, “Environmental Pollution and Control”, Vol-I, 4th ed., Galgotia Publications Pvt. Ltd., 1998.

ELECTRONICS & COMUNICATION ENGINEERING

16EC270 - EMBEDDED LINUX

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	38	5	15	3	-

Course Description and Objectives :

This course offers fundamental concepts of Linux programming, compiling, libraries and other basic tools for testing and debugging. The objective of this course to provide the studnet with the concepts of kernel programming and developing embedded applications with Linux.

Course Outcomes :

The student will be able to :

- ✓ Use GNU-C Programming tool chain in Linux.
- ✓ Understand Linux kernel and scheduling concepts of Linux operating systems.
- ✓ Build embedded system applications using Linux operating systems.
- ✓ Use testing and debugging tools in Linux.

SKILLS ACQUIRED:

- ✓ Operate Linux with command line interface.
- ✓ Identify tools required to build a kernel.
- ✓ Identify tools required for testing and application development.
- ✓ Recognize how a process is scheduled.
- ✓ Identify Inter process communication in Linux.
- ✓ Test the application with GNU tools.

ACTIVITIES:

- ✓ Choose a kernel for a Cell-phone/Laptop for various embedded applications.
- ✓ Test the code coverage of given application program.
- ✓ Build a kernel with given target board specifications.
- ✓ Build a library of for arithmetic operations.
- ✓ Demonstrate interprocess communication with IPC mechanisms.

UNIT - I

INTRODUCTION: U/Linux History, GNU/Linux Architecture, Free Software Development; GNU Tools-I-The GNU Compiler Tool chain

UNIT - II

GNU TOOLS-II: Building Software with GNU *make,* Building and Using Libraries, Coverage Testing with GNU *gcov,* Profiling with GNU *gprof.*

UNIT - III

LINUX KERNEL: Introduction to the Linux Kernel, Getting Started with the Kernel, Process Management, Process Scheduling.

UNIT - IV

APPLICATION DEVELOPMENT: File Handling in GNU/Linux, Programming with Pipes, Introduction to Sockets Programming, GNU/Linux Process Model, POSIX Threads (Pthreads) Programming, IPC with Message Queues, Synchronization with Semaphores, Shared Memory Programming, Other Application Development Topics

UNIT - V

GNU/LINUX SHELLS AND SCRIPTING: GNU/Linux Commands, Bourne-Again Shell (bash); Debugging and Testing- Software Unit Testing Frameworks, Debugging with GDB.

TEXT BOOKS :

1. M. TIM Jones "GNU/LINUX Application Programming", 2nd edition, Charles River Media (Cengage Learning), 2008.
2. Robert Love and Addison-Wesely, "Linux Kernel Development", 3rd Edition, Addison-Wesly, 2010.

REFERENCE BOOKS :

1. W. Richard Stevens, "Unix Network Programming", 2nd edition, Pearson Eduction, 1999.
2. Alessandro Rubini and Jonathan Corbet, "Linux Device Drivers", 2nd edition, O Reilly and Associates, Inc, 2001.

16EC271 - EMBEDDED SYSTEMS AND RTOS

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

The learner will obtain a good exposure of Embedded Systems and Real Time Operating Systems(RTOS) and will get a knowledge of how to design an embedded system with RTOS.

Course Outcomes:

The student will be able to :

- ✓ Understand the fundamentals of embedded systems from both hardware and software perspective.
- ✓ Understand the design process of embedded system via descriptive and formalized procedures.
- ✓ Explain various embedded system applications and design requirements.
- ✓ Generate product specification for embedded system.
- ✓ Understand the basic concepts of RTOS.
- ✓ Understand the necessity of networked embedded systems for real time applications.
- ✓ Understand how to Design embedded system through examples.

SKILLS ACQUIRED:

- ✓ Able to analyze design requirements.
- ✓ Able to design new hardware and software for different applications.
- ✓ Able to choose RTOS platform for the application
- ✓ Able to design Scheduling algorithms for Embedded systems with RTOS
- ✓ Able to choose necessary networking for the embedded system

ACTIVITIES:

- ✓ Design an architecture for networked household security system
- ✓ Design testing procedure for networked household security system
- ✓ Identify the hardware components necessary for a live traffic control system
- ✓ Design a I^2C bus basedembedded system for patient monitoring system
- ✓ Design CAN bus based networked real-time embedded system for automation in automobile industry

UNIT - I

INTRODUCTION TO EMBEDDED SYSTEMS: Basic concepts; Categories, Specialities, Recent trends in embedded systems; Architecture of Embedded Systems: Hardware architecture, Software architecture, Application software, Communication software, Process of generating executable image, Development /testing tools.

UNIT - II

PROCESS OF EMBEDDED SYSTEM DEVELOPMENT: Requirements, Specification, Architecture design, Designing hardware and software components, System Integration, Formalisms for system design, Structural description, Behavioural description, Program Design and Analysis: Components for Embedded programs, Models of Programs, Assembly, Linking and Loading, Compilation techniques.

UNIT - III

PROCESSES AND OPERATING SYSTEMS: Multiple tasks and multiple processes, Multirate systems, RTOS basics: Architecture of Kernel, Tasks and Task Scheduler - Task States, Content Switching, Scheduling Algorithms, Rate Monotonic Analysis, Task, Management Function Calls. Interrupt Service Routines, Semaphores, mutex, mailboxes, message queues, event registers, pipes, signals, timers, memory management, Priority Inversion Problem.

UNIT - IV

REAL TIME OPERATING SYSTEMS: POSIX, Windows CE, Networks and Multiprocessors: Categories of Multiprocessors, Distributed embedded systems-Network abstractions, CAN bus, Distributed computing in cars and airplanes, I^2C bus, Ethernet, Internet, MPSoCs and shared memory multiprocessors.

UNIT - V

DESIGN EXAMPLES: Model train controller, Audio Player, Digital still camera, Engine Control unit, Video accelerator.

TEXT BOOKS:

1. Dr.K.V.K.K.Prasad, Embedded Real time Systems, Dreamtech Press, 2003.
2. Marilynwolf , “Computers as Components: Principles of EmbeddedComputer systems design”, Morgan Kaufmann Publishers, 2000.

REFERENCES :

1. Raj Kamal. Embedded Systems Architecture, Programming and Design. 2nd Edition, McGrawHill, 2012.
2. Arnold S. Berger, An introduction to Processes, Tools and Techniques,CMP books, 2005.
3. Wang K.C., Embedded and Real-Time Operating Systems, Springer, 2017.
4. Frank Vahid and Tony Givargis, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & Sons, Student edition, 2006.
5. http://esd.cs.ucr.edu/

16EC370 MICROCONTROLLERS FOR EMBEDDED SYSTEMS

Hours Per Week:

L	T	P	C
3	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objectives :

The learner will obtain a good exposure of Embedded Systems covering the hardwarecomponents and software aspects and will get a good knowledge of ARM processors and LPC2148 chip and their programming and interfacing.

Course Outcomes :

The student will be able to :

- ✓ Understand the fundamentals of embedded systems from both hardware and software perspective
- ✓ Understand the design process of embedded system
- ✓ Explain various embedded system applications and design requirements
- ✓ Identify the microcontroller for the embedded system
- ✓ Explain architecture of LPC 2148 controller,ARM CORTEX-M3, their subsystems, bus arrangement andmemory and I/O maps.
- ✓ Develop Assembly level and C language levelprograms for specified aims.
- ✓ Discuss specifications of peripheral interfaces in LPC 2148 like I/O ports, PWM generation block.

SKILLS ACQUIRED:

- ✓ Able to analyze design requirements.
- ✓ Able to design new hardware and software for different applications.
- ✓ Able to design systems using LPC 2148 and ARM Cortex-M3.
- ✓ Able to develop programs using Embedded-C for LPC 2148.

ACTIVITIES:

1. Interface a ADC-LPC 2148.
2. Interface LEDs to ARM7 controller.
3. Interface a stepper motor to ARM 7 controller.
4. Interface as even segment display

UNIT - I

INTRODUCTION TO EMBEDDED SYSTEMS: Basic concepts; Categories, Specialities, Recent trends in embedded systems; Architecture of Embedded Systems: Hardware architecture, Software architecture, Application software, Communication software, Process of generating executable image, Development /testing tools, Process of Embedded System Development: The development process, Requirements engineering, Design

UNIT - II

TYPES, SELECTION AND APPLICATIONS OF MICROCONTROLLERS: Microcontrollers, Types of Microcontrollers, Examples of Popular Microcontrollers, Selection of Microcontroller, Applications, Overview of 8051 microcontroller, ARM processor fundamentals.

UNIT - III

LPC 2148 CONTROLLER ARCHITECTURE: General Description – Features – Block diagram –Overall pin description (functional) - Architectural Overview On-chip Flash program memory –Onchip SRAM –Memory Map - Interrupt Controller – General Purpose I/O (GPIO) – ADC and DAC –UARTs - USB Controller - Timers and Counters – Watchdog Timer – Real-time CLK.

UNIT - IV

ARM CORTEX-M3: ARM Cortex-M3 Processor –Architecture- Instruction Set Development, TheThumb-2 Technology.

UNIT - V

OVERVIEW OF C: Programming in C, Arrays, Structures, Pointers, Loops and Decisions, Functions, EMBEDDED C: Header files for Project and Port, Example: Restructuring the Hello, Embedded World example. LPC 2148 PROGRAMMING: Programming of LPC 2148 GPIO ports - Generation of PWM signals -Simple programs.

TEXT BOOK :

1. Dr.K.V.K.K.Prasad, Embedded Real time Systems, Dreamtech Press, 2003.
2. Raj Kamal. Embedded Systems Architecture, Programming and Design. 2nd Edition, McGrawHill, 2012.
3. Michael J Pont, “Embedded C”, Pearson Education, 2007.
4. The indefinite guide to ARM CORTEX-M3.

REFERENCE BOOKS :

1. Arnold S. Berger, An introduction to Processes, Tools and Techniques,CMP books, 2005
2. Wang K.C., Embedded and Real-Time Operating Systems, Springer, 2017.
3. Frank Vahid and Tony Givargis, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley & Sons, Student edition, 2006.

4. Marilyn wolf , “Computers as Components: Principles of Embedded Computer systems design”, Morgan Kaufmann Publishers,2000.
5. ARM system developers guide, Andrew N Sloss, Dominic Symes and Chris Wright,Elsevier,Morgan Kaufman publishers, 2008.
6. ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000,Addison Wesley Professional.

ONLINE MATERIALS :

1. www.nxp.com/documents/data sheets/LPC2148.pdf
2. www.microbuilder.en/LPC2148.aspx
3. NPTEL-http://nptel.ac.in/courses/108102045.
4. http://esd.cs.ucr.edu.

17ES004 DESIGN OF IOT SYSTEM (IOT)

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS

Course Description and Objectives:

Students will be able to design & develop IOT Devices.

Course Outcomes:

Upon successful completion of this course student should be able to:

- ✓ Able to programs for IoT applications
- ✓ Able to design the framework necessary for IoT applications
- ✓ Able to develop prototypes for IoT devices and app

SKILLS ACQUIRED:

- ✓ Able to understand IoT Concepts
- ✓ Able to design the different IoT system applications.

ACTIVITIES:

- ✓ design various simple IoT Applications

UNIT – I

Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages,
IoT Physical Servers and Cloud Offerings: introduction to cloud sotrage models and communication APIs, Python Web Application Framework - Django, SkyNet IoT Messaging Platform.

UNIT – II

D**esign Principles for Connected Devices:** Design Principles for Connected Devices, Calm and Ambient Technology, Magic as Metaphor, Privacy, Web Thinking for Connected Devices, Affordances

UNIT – III

Thinking about Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Open Source versus Closed Source, Tapping into the Community
Prototyping Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Beagle Bone Black, Electric Imp, Other Notable Platforms

UNIT – IV

Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols
Techniques for Writing Embedded Code: Memory Management, Performance and Battery Life, Libraries, Debugging

UNIT – V

Case Studies Illustratign IoT Design: Introduction, Home automation-smart lighting-home intrusion detection, Cities-smart parking, Environment-Air pollution monitoring, Agriculture-smart irrigation, productivity appliances-IoT printer,Data Analytics for IoT: Introduction.

TEXTBOOKS:

1. Vijay Madisetti, Arshdeep Bahga,” Internet of Things A Hands-On- Approach”,2014,
2. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013,
3. Microsensors, MEMS, and Smart Devices, Julian W. Gardner, Vijay K. Varadan Osama O. Awadelkarim, 2001, John Wiley & Sons Ltd.

REFERENCE BOOKS:

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1 st Edition, Apress Publications, 2013
2. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

INTERNET OF THINGS (LAB)

Course Learning Outcomes:

- ✓ To be able to understand importance of Python Programming and its usage.
- ✓ To be able to understand and work with Raspberry Pi and Arduino

LIST OF EXPERIMENTS

1. Familiarization with Python programming, use of various functions
2. Create python code to understand the tendency of users on social media platform
3. Storing the local data to cloud using Python
4. Sending Messages over internet using python
5. Familiarization with raspberry pi board
6. Python Programming for the Raspberry Pi and interfacing with web
7. Familiarization with Arduino board
8. Python Programming for Arduino and interfacing with web
9. Controlling lights remotely using Raspberry Pi
10. Detecting the movement of objects and sending caution signals remotely using Raspberry Pi

ELECTRICAL & ELECTRONICS ENGINEERING

16EE253 SOLAR PV TECHNOLOGY-I

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course is aimed at familiarizing the students with the characteristics of solar radiation, its global distribution, and measurement of solar radiation. In this subject students will learn the fundamentals, characteristics, parameters and manufacturing of solar PV cells.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the characteristics and world distribution of solar radiation.
- ✓ Analyze the solar radiation and measurement techniques.
- ✓ Calculate the methods of calculation of solar radiation availability at a given location.
- ✓ Understand the effect of irradiation and temperature on solar cells.
- ✓ Understand the manufacturing processes of the solar cells.

SKILLS ACQUIRED:

- ✓ Able to understand the spectral energy distribution of solar radiation.
- ✓ Able to understand the principle of solar power generation.
- ✓ Able to understand different sun-earth angles.
- ✓ Able to draw the I-V characteristics of a PV cell
- ✓ Able to understand the Production process of solar cells.

ACTIVITIES:

1. Measurement of Beam radiation.
2. Measurement of Diffused radiation.
3. Obtain the Variation of declination angle for each day of a year.
4. Measurement of current – voltage characteristics of a solar panel.
5. Draw the process flow diagrams of manufacturing techniques of solar cells.
6. Design a solar cap.
7. Design a solar fan.

UNIT - I

SOLAR RADIATION AND MEASUREMENT: World energy resources - Indian energy scenario, Global solar resources. Solar radiation on the earth surface – Extraterrestrial and Terrestrial radiation, spectral energy distribution of solar radiation, solar radiation measuring instruments, Local apparent time.

UNIT - II

SOLAR RADIATION GEOMETRY AND CALCULATIONS: Solar radiation geometry - latitude and longitude sun-earth angles, calculation of angle of incidence, solar radiation on horizontal and tilted surface, Solar day length, Angstroms equation and constants.

UNIT - III

SOLAR CELL FUNDAMENTALS: Photovoltaic effect - Principle of direct solar energy conversion into electricity in a solar cell, Semiconductor properties, p-n junction, energy levels, basic equations, Solar cell structure.

UNIT - IV

PARAMETERS OF SOLAR CELL: Open circuit voltage, Short circuit current, series and shunt resistances, Single diode model of solar cell, I-V characteristics of a PV cell, cell efficiency, fill factor, effect of irradiation and temperature.

UNIT - V

MANUFACTURING OF PV CELLS: Commercial solar cells - Production process of single crystalline silicon cells, multi crystalline silicon cells, amorphous silicon, cadmium telluride, copper indium gallium diselenide cells, introduction to multi junction solar cell.

TEXT BOOKS:

1. Chetan Singh Solanki., Solar Photovoltaic: “Fundamentals, Technologies and Application”, PHI Learning Pvt., Ltd., 2009.

REFERENCES:

1. Chetan Singh Solanki., “Solar Photovoltaic Technology and Systems: A Manual for Technicians” PHI Learning Pvt., Ltd., 2013.
2. Sukhatme .S.P, Nayak .J.K, “Solar Energy”, Tata McGraw Hill Education Private Limited, New Delhi, 2010.
3. Jha .A.R, “Solar Cell Technology and Applications”, CRC Press, 2010.
4. John R. Balfour, Michael L. Shaw, Sharlave Jarosek., “Introduction to Photovoltaics”, Jones & Bartlett Publishers, Burlington, 2011.
5. Luque .A. L and Andreev .V.M, “Concentrator Photovoltaic”, Springer, 2007.
6. Partain .L.D, Fraas L.M., “Solar Cells and Their Applications”, 2nd ed., Wiley, 2010.
7. G.D. Rai, “Non Conventional Energy Sources”, 4th edition, Khanna Publishers, New Delhi, 2011.

16EE357 SOLAR PV TECHNOLOGY-II

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course is aimed at familiarizing the students with the design aspects of solar cell, series and parallel connection of solar cells, I-V characteristics of a PV module. In this subject students will learn the sun tracking mechanisms, emerging solar cell technologies and PV system applications.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the design of solar cells.
- ✓ Analyze the effect of irradiation and temperature on solar panels.
- ✓ Understand the prospects of photovoltaic technology for sustainable power generation.
- ✓ Understand the various applications of solar modules.

SKILLS ACQUIRED:

- ✓ Able to understanding the design aspects of solar cells.
- ✓ Able to analyze the I-V characteristics of a PV module.
- ✓ Able to acquire a skill of understanding different emerging technologies of solar cells.
- ✓ Able to get a skill of understanding the various applications of PV systems.

ACTIVITIES:

1. Series and Parallel Connection of PV modules.
2. Obtain the I-V characteristics of two solar panels connected in series.
3. Obtain the I-V characteristics of two solar panels connected in parallel.
4. Design a solar charger.
5. Design a solar lamp.
6. Design of Solar Tracker.
7. Design of a solar water pump.

UNIT - I

DESIGN ASPECTS OF SOLAR CELLS: Design of solar cells, Design for high I_{sc}, Design for high V_{oc}, Design for high Fill factor, solar simulator: I-V measurement, Quantum efficiency measurement.

UNIT - II

SOLAR PV MODULE: Series and parallel connection of solar cells, solar pv module, solar pv array, parts of solar pv modules, manufacturing process, Ratings and I-V characteristics of a PV module, efficiency, fill factor, effect of irradiation and temperature, Hot spots.

UNIT - III

MAXIMUM POWER POINT TRACKING: Sun tracking – single and dual axis tracking, P-V curves, maximum voltage and current in pv cell, concept of MPPT technique and introduction to algorithms.

UNIT - IV

BATTERY ENERGY STORAGE: Fundamental concept of batteries - Measuring of battery performance, Charging and discharging of a battery, Storage density, Energy density and safety issues; Types of batteries – Lead Acid, Nickel, Cadmium, Zinc Manganese dioxide; Introduction to modern batteries - Zinc-Air, Nickel hydride and lithium batteries.

UNIT - V

PV SYSTEM APPLICATIONS: Building-integrated photovoltaic units, grid-interacting central power stations, standalone devices for remote and rural areas, solar lamps, solar street lights, solar water pumps solar cars, aircraft, space solar power satellites.

EMERGING SOLAR CELL TECHNOLOGIES: Thin film solar cell technologies, Organic solar cells, Dye-synthesized solar cells, GaAs solar cells, Thermo Photovoltaics, Concentrated Photovoltaics

TEXT BOOKS:

1. Chetan Singh Solanki., Solar Photovoltaic: “Fundamentals, Technologies and Application”, PHI Learning Pvt., Ltd., 2009.

REFERENCES:

1. Chetan Singh Solanki., “Solar Photovoltaic Technology and Systems: A Manual for Technicians” PHI Learning Pvt., Ltd., 2013.
2. Sukhatme .S.P, Nayak .J.K, “Solar Energy”, Tata McGraw Hill Education Private Limited, New Delhi, 2010.
3. Jha .A.R, “Solar Cell Technology and Applications”, CRC Press, 2010.
4. John R. Balfour, Michael L. Shaw, Sharlave Jarosek., “Introduction to Photovoltaics”, Jones & Bartlett Publishers, Burlington, 2011.
5. Luque .A. L and Andreev .V.M, “Concentrator Photovoltaic”, Springer, 2007.
6. Partain .L.D, Fraas L.M., “Solar Cells and Their Applications”, 2nd ed., Wiley, 2010.
7. G.D. Rai, “Non Conventional Energy Sources”, 4th edition, Khanna Publishers, New Delhi, 2011.

16EE358 DESIGN AND ECONOMICS OF SOLAR PV SYSTEMS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course is aimed at familiarizing the students with the classification of PV systems, components of PV systems and design of photovoltaic systems. In this subject students will earn the knowledge of financial and economic analysis.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the components of solar PV systems.
- ✓ Understand the design concepts of solar PV systems.
- ✓ Understand the socio-economic and environmental merits of photovoltaic systems for a variety of applications.
- ✓ Analyze the economic analysis of solar PV system.

SKILLS ACQUIRED:

- ✓ Classify the different solar PV systems.
- ✓ Understand the different components of solar PV systems.
- ✓ Understand the concept to design PV systems for various applications.
- ✓ Analyze the concepts and methods of energy economics to solar energy systems.
- ✓ Understand the Life cycle costing of solar systems.

ACTIVITIES:

1. Design a PV system for an Apartment.
2. Design a solar water pumping systems for an agricultural application.
3. Efficiency measurement of Standalone Solar PV System.
4. Life cycle Analysis of a solar PV plant.

UNIT - I **L-10, T-3**

CLASSIFICATION OF PV SYSTEMS: Classification - Central Power Station System, Distributed PV System, Stand alone PV system, Grid Interactive PV System, small system for consumer applications, Hybrid solar PV system.

UNIT - II **L-08, T-3**

COMPONENTS OF PV SYSTEMS: System components - PV arrays, inverters, batteries, charge controls, net power meters. PV array installation, operation, costs, reliability.

UNIT - III **L-08, T-3**

DESIGN OF PV SYSTEMS: Design of solar PV systems. Case study of design of solar PV lantern, stand alone PV system - Home lighting and other appliances, solar water pumping systems.

UNIT - IV **L-09, T-3**

FINANCIAL AND ECONOMIC PERFORMANCE: Introduction to financial and economic performance - Merits and limitations for solar energy projects - time value of money, benefits/cost ratios, discount rate, standard and discount payback period, depreciation and net present benefit.

UNIT - V **L-10, T-3**

ECONOMIC ANALYSIS: Energy economics-basic concepts, unit cost of power generation from different sources, payback period, NPV, IRR and benefit cost analysis. Direct and indirect costs, pricing system and Life cycle costing.

TEXT BOOKS:

1. Chetan Singh Solanki., Solar Photovoltaic: "Fundamentals, Technologies and Application", PHI Learning Pvt., Ltd., 2009.
2. Panneer Selvam, R, "Engineering Economics", 2nd edition, Prentice Hall of India Ltd, New Delhi, 2013.

REFERENCES:

1. Chetan Singh Solanki., "Solar Photovoltaic Technology and Systems: A Manual for Technicians" PHI Learning Pvt., Ltd., 2013.
2. Subhes C.Bhattacharyya., "Energy Economics", Springer, 2011.
3. Sukhatme .S.P, Nayak .J.K, "Solar Energy", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
4. Jha .A.R, "Solar Cell Technology and Applications", CRC Press, 2010.

16EE459 SOLAR THERMAL CONVERSION SYSTEMS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course is aimed at familiarizing the students with principles of operation, structure, testing and installation of major types of solar thermal collectors. In this subject students will earn the knowledge solar thermal energy storage.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the basics of heat energy and heat transfer.
- ✓ Understand the concepts of solar collectors.
- ✓ Understand the solar thermal energy storage and variety of applications.
- ✓ Understand the various applications of solar collectors.

SKILLS ACQUIRED:

- ✓ Understand the fundamentals of solar flat plate collectors.
- ✓ Understand the fundamentals of concentrating solar collectors.
- ✓ Familiar with the solar low, medium and high temperature applications.

ACTIVITIES:

1. Design a prototype of solar cooker.
2. Design a prototype of solar still.
3. Design a prototype of solar dryer.
4. Evaluate the performance of solar water heating system at guest house, VFSTR University.

UNIT - I

BASICS OF HEAT ENERGY AND HEAT TRANSFER: Heat, Fundamentals of Heat transfer, Modes of heat transfer – Conduction, Convection and radiation, Basic laws of heat transfer - General discussion about applications of heat transfer, Laws of thermo dynamics.

UNIT - II

SOLAR FLAT PLATE COLLECTORS: Fundamentals of solar collectors as devices to convert solar energy to heat. Non - concentrating low temperature flat plate and concentrating collectors, classification of concentrating collectors, evacuated tube collectors, solar air heaters.

UNIT - III

SOLAR CONCENTRATING COLLECTORS: Line-focusing and point-focusing concentrators: parabolic trough, parabolic dish, heliostat field with central receiver, Fresnel lenses, compound parabolic concentrator. Sun tracking mechanisms.

UNIT – IV

SOLAR ENERGY STORAGE: Different methods, Sensible, latent heat and thermo chemical storage, solar ponds.

UNIT – V

APPLICATIONS OF SOLAR COLLECTORS: Application of non-concentrating collectors for solar water heating with natural and pump circulation, space heating, drying, seawater desalination, solar cooker. Use of concentrating collectors for process heat production and power generation.

TEXT BOOKS:

1. Sukhatme .K, Suhas P.Sukhatme., “Solar energy: Principles of thermal collection and storage”, Tata McGraw Hill publishing Co. Ltd, 8th edition, 2008.
2. G.D. Rai, “Non Conventional Energy Sources”, 4th edition, Khanna Publishers, New Delhi, 2011.

REFERENCES:

1. R.K.Rajput,”Heat And Mass Transfer”, 4th ed., S.Chand & Co, New Delhi, 2008.
2. Yogi D. Goswami, Frank Kreith, Jan F.Kreider., “Principle of solar engineering”, 2nd edition, Taylor and Francis, 2nd edition, 2003.
3. Tiwari .G.N, “Solar energy: Fundamentals, Design, Modeling and Applications”, CRC Press Inc., 2002.
4. Artur V.Kilian, “Solar Collectors: Energy Conservation, Design and Applications”, Nova Science Publishers Incorporated, 2009.
5. Soteris A.Kalogiru, “Solar Energy Engineering: Processes and systems”, 1st edition, Academic press, 2009.
6. Duffie .J. A & Beckman .W.A, “Solar Engineering of Thermal Processes”, 3rd edition, John Wiley & Sons, Inc., 2006.
7. Garg .H.P,Prakash.J, “Solar energy fundamentals and applications”, Tata McGraw Hill publishing Co. Ltd, 2006.

FOOD TECHNOLOGY

16CH246 FOOD SAFETY AND REGULATIONS

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

This course will deal with various laws and regulations to be followed by food industries. The objective of this course is to enable the students to have a clear idea about various laws governing the food product and process specification

Course Outcomes:

The student will be able to

- ✓ Understand the requirement of food laws
- ✓ Understand the role of each food law
- ✓ Gain knowledge about how to attain certification for standards

SKILLS ACQUIRED:

- ✓ Identify the source of contamination
- ✓ Determine the standards to be followed to attain certification

ACTIVITIES:

- ✓ List down microbial standards from FSSAI

UNIT – I

Introduction, concept of food safety and standards (FSSAI), food safety strategies.Food hazards and contaminations - biological, chemical and physical factors.Prevention and control of hazards.

UNIT – II

Indian Food Regulatory Regime (Existing and old), PFA Act and order, Additives, Contaminants and Pesticide Residue. Essential Commodities Act, 1955,

UNIT – III

International Food Standards., Export (Quality Control and Inspection) Act, 1963. BIS Other product specific standards; AGMARK.

UNIT – IV

Voluntary Quality Standards and Certification GMP, GHP, HACCP, GAP, Good Animal Husbandry Practices, Good Aquaculture Practices,

UNIT – V

Traceability and authentication, Certification and quality assurance;Risk assessment studies: Risk management, risk characterization and communication.;ISO 9000, ISO 22000, ISO 14000, ISO 17025, PAS 22000, IFS.Halal & Kosher Standard.

Text Books:

1. Singal RS, Handbook of indices of food quality and authenticity; Woodhead Publ. Cambridge, UK.
2. Shapton DA, Principles and practices of safe processing of foods; Butterworth Publication, London.
3. Winton AL, Techniques of food analysis; Allied Science Publications New Delhi.

Suggested Readings:

1. Pomeranze Y, Food analysis - Theory and Practice; CBS Publications, New Delhi.
2. Jacob MB, The chemical analysis of foods and food products; CBS Publ. New Delhi
3. FSSAI website: www.fssai.gov.in

16CH346 FOOD QUALITY AND EVALUATION

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

This course will deal with various methods on how to maintain quality of food Which is useful in export markets and storage of foods.’

The objective of this course is to enable student to have clear idea on how to maintain quality of food.

Course Outcomes:

The Student will be able to understand

- ✓ General principles of food quality.
- ✓ Quality attributes of food.
- ✓ Quality control Aspects in Food industries.

SKILLS ACQUIRED:

- ✓ Identify the quality of food.
- ✓ Determine the international standards for exports

ACTIVITIES:

- ✓ Carryout sensory analysis on different food products using differential methods.

UNIT – I

Definitions - food quality General principles of food quality. Hazards - physical, chemical and biological.

UNIT – II

Cross contamination Limits for pesticide and metal contamination of food. Food additives- types- usage, permissible limits

UNIT – III

Quality attributes - size, shape, colour, viscosity, texture, taste and flavor.

UNIT – IV

Quality control system in storage, Quality control aspects in food industries, Importance of quality control in marketing of Food products - domestic and export markets.

UNIT – V

International standards for export and quarantine requirements for export of Agricultural and Horticultural produce.

Text Books:

1. Shapton DA, Principles and practices of safe processing of foods; Butterworth Publication, London.
2. Winton AL, Techniques of food analysis; Allied Science Publications New Delhi.

Suggested Readings:

1. Pomeranze Y, Food analysis - Theory and Practice; CBS Publications, New Delhi.
2. Jacob MB, The chemical analysis of foods and food products; CBS Publ. New Delhi

16CH346 SUBJECTIVE AND OBJECTIVE EVALUATION IN FOOD PRODUCTS

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

This course will deal with quality evaluation, objectively and subjectively the objective of this course is to avail the student with various experimental methods

Course Outcomes:

- ✓ The student will be able to evaluate subjective and objective evaluation comparison.
- ✓ Instrumental analysis will be performed by the students

SKILLS ACQUIRED:

- ✓ Evaluate the quality and compare objectively and subjectively
- ✓ Instrumental analysis like spectroscopy, polarimetry, DSC, SEM,TEM,GC and HPLC

ACTIVITIES:

- ✓ List down USFDA standards for jam and jelly.
  .

UNIT – I

Introduction and importance of quality evaluation- subjective and objective evaluation comparison

UNIT – II

Subjective evaluation Introduction and importance- sensory analysis

UNIT – III

Sensory evaluation – methods and application.

UNIT – IV

Objective/ instrumental analysis – spectroscopy; Polarimetry; DSC; SEM; TEM; GC; HPLC

UNIT – V

Objective analysis of Rheological and textural properties

Text Books:

1. Singal RS, Handbook of indices of food quality and authenticity; Woodhead Publ. Cambridge, UK.
2. Shapton DA, Principles and practices of safe processing of foods; Butterworth Publication, London.

Suggested Readings:

1. Pomeranze Y, Food analysis - Theory and Practice; CBS Publications, New Delhi.

16CH446 FOOD SAFETY AND PUBLIC HEALTH

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

The course will deal with how to maintain food safety, quality, and quantity management of food. The objective of this course is to learn about various food borne infections.

Course Outcomes:

- ✓ The student will get knowledge about GHP, GAP and GMP.
- ✓ The student will also know about safety standards

SKILLS ACQUIRED:

- ✓ Principles of food safety
- ✓ Quality Management
- ✓ Microbiological standards and guidelines

ACTIVITIES:

- ✓ List down GMP and GHP standards for processing of tea..

UNIT – I

Introduction and Principles of food safety–Food Safety System - Quality attributes- Total Quality Management.

UNIT – II

Background and Structure, GHP, GAP, GMP, Principles and Implementation of HACCP- case studies.

UNIT – III

Food borne infections and intoxications; characteristic of microorganism; microbial growth in food; intrinsic and extrinsic factors

UNIT – IV

Food poisoning - botulism –, Food sanitation – indicators of food safety – coliform bacteria food processing plant sanitation – microbiological standards and guidelines -salmonellosis – gastroenteritis, .,

UNIT – V

Food borne pathogens – *Clostridium, Bacillus ceres, Staphylococcus aureus, Vibrio, Campylobacter, Yersinia etc*- coliform bacteria food processing plant sanitation – microbiological standards and guidelines

Text Books:

1. Winton AL, Techniques of food analysis; Allied Science Publications New Delhi.

SUGGESTED READINGS:

1. Pomeranze Y, Food analysis - Theory and Practice; CBS Publications, New Delhi.

INFORMATION TECHNOLOGY

16CS246 UNIX/LINUX AND SHELL PROGRAMMING

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

Student explore to Unix/Linux operating system utilities like file processing, process management, disk management, networking and ability to write the shell program for specific task.

Course Outcomes:

- ✓ Installing several Linux distributions on direct hardware setup and virtual hardware setup
- ✓ Managing files and directives
- ✓ Knowing process attributes and basic level of process management
- ✓ Able to write shell script for given operating system task

SKILLS ACQUIRED:

- ✓ File and process manipulation
- ✓ Design and develop shell script programs

ACTIVITIES:

- ✓ Understand the Linux environment
- ✓ Perform file management and multiple tasks using shell scripts in Linux environment.
- ✓ Administer user accounts and provide file security.
- ✓ Create user - defined commands through system calls.

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UNIT – I

Introducing the Unix and Linux Operating System: A Brief History of Unix, Linux and Unix, Installing Linux, Introducing Unix/Linux shells, Logging into Unix/Linux, Basic commands: date, cal, who, clear, man, whatis.

UNIT – II

Understanding Unix/Linux File System: Exploring the Root Hierarchy, Using paths, Pathnames, and Prompts, pwd, Navigating the file system, cd, ls, mkdir, cp, rm, chmod, Usage of Vi editor.

UNIT – III

Unix/Linux file Processing: Input/output redirection, manipulating files- cat, touch, mv, find, paste, cut, sort, join, Advanced file processing: Selection commands-pipe, comm., diff, head, tail, wc, uniq, grep, sed.

UNIT – IV

Introduction to shell script programming: The program development lifecycle, variables, shell operators, redirection operators, more about wild card characters, shell logic structure, sequential logic, decision logic.

UNIT – V

Shell Script looping logic, the while loop, case logic, using shell functions, exploring the unix/Linux utilities- df, du, finger, ps, uname, ifconfig, ping, netstar, Installing application and packages in Linux.

Text Book:

1. Michael Palmer, "Guide to Unix using Linux", Cengage Learning, 4th Edition, 2008.

Reference Books:

1. Sumitabha Das, "Unix Concepts And Applications", 4th Edition. TMH, 2006.
2. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming", 1st Edition, Cengage Learning India, 2003.

16CS352 JAVA PROGRAMMING

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

This course intended to develop software that covers the principles of object oriented programming which includes defining class, creating objects, usage of abstraction, encapsulation, inheritance and polymorphism. Further, it offers concepts of multi-threading and exception handling

Course Outcomes:

The student will be able to:

- ✓ Distinguish between procedures oriented and object oriented concepts of programming.
- ✓ Understand OOP concepts and features of Java language.
- ✓ Apply Object Oriented concepts in problem solving.

SKILLS ACQUIRED:

- ✓ Data hiding and abstraction
- ✓ Code reusability
- ✓ Create new packages and interfaces
- ✓ Develop multi-threaded applications
- ✓ Runtime error handling Parallel programming

ACTIVITIES:

- ✓ Implementing the concept of encapsulation.
- ✓ Design a sample program which exhibits inheritance
- ✓ Developing a program which implements polymorphism
- ✓ Implementing a program for multithreading
.

UNIT – I

INTRODUCTION: Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP principles, Encapsulation, Inheritance and polymorphism, Compiling and running of simple Java program, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting.

UNIT – II

CLASSES AND OBJECTS: Concepts of classes and objects, Class fundamentals, Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, This key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and inner classes.

UNIT – III

INHERITANCE: Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance.

UNIT – IV

PACKAGES AND INTERFACES: The object class, Defining, Creating and accessing a package, Understanding classpath, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and extending interfaces.

UNIT – V

EXCEPTION HANDLING, MULTI THREADING: Concepts of exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and finally keywords, Built-in exceptions, Creating own exception, Sub classes, Concepts of multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication.

TEXT BOOK:

1. Herbert Schildt, “The Complete Reference Java J2SE”, 9th edition, TMH Publishing Company Ltd, New Delhi, 2008.

REFERENCE BOOKS:

1. Cay Horstmann, “Big Java”, 2nd edition, John Wiley and Sons, 2006.
2. O’Reilly, “Head First JAVA”, 2nd edition, O’Reilly Media Inc, 2005
3. Herbert Schildt, “A Beginner’s Guide”, 6th edition, McGraw Hill Education, 2014.

16IT343 MOBILE APPLICATION DEVELOPMENT USING ANDROID

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

Students will be able to:

- ✓ Get familiarity with the Android operating system development environment.
- ✓ Create user-friendly mobile user interfaces and views. Develop basic Android applications for mobiles

SKILLS ACQUIRED:

- ✓ Writing mobile applications for user requirements.
- ✓ Usage of various components of Android operating system.
- ✓ Utilization of activities, intents, layouts and views for content.

ACTIVITIES:

- ✓ Installation of Android Studio and required plug-ins.
- ✓ Creating activities, Dialog boxes and linking other activities in the application.
- ✓ Creating applications by using Activities, Fragments and Intents.
- ✓ Implementing applications using different views.

UNIT – I

GETTING STARTED WITH ANDROID**:** Android introduction, Versions of android, Features of android, Architecture, Devices in the market, Developer community.

UNIT – II

ACTIVITIES, FRAGMENTS, INTENTS: Understanding activities, Linking activities using intents, Fragments, Calling built in apps using intents.

UNIT – III

GETTING TO KNOW ANDROID UI: Understanding the components of screen - Views and view groups, Liner layout, Absolute layout, Table layout, Relative layout, Frame layout, Scroll view.

UNIT – IV

DISPLAY ORIENTATION: Anchoring views, Resizing and repositioning views, Managing changes to screen orientation, Utilizing the action bar, Creating UI programmatically.

UNIT – V

DESIGNING UI WITH VIEWS: Using basic views - Text view, Button, Image Button, Edit text, check Box, Toggle button, Radio button, and Radio group views, Progress bar view and Auto complete text view.

Test Book:

1. Wei-Meng Lee, "Beginning Android Application Development", 1st Edition, John Wiley & Sons, Inc., 2012.

Reference Books:

1. Raimon Refols Montane, Laurence Dawson, "Learning and Android Application Development", 1st Edition, PACKT Publishing, 2016.
2. Reto Meier, "Professional Android 4 Application Development", 3rd Edition, Wrox, 2012.
3. Adam Gerber and Clifton Craig, "Learn Android Studio", 1st Edition, Apress, 2015.

16IT443 ADVANCED MOBILE APPLICATION DEVELOPMENT USING ANDROID

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

This course enables the student to explore advanced user interface components, persistent data storage, messaging techniques, client/server applications and mobile app development process. In addition, the student develops his/her ability to create two/three or n-tier mobile applications.

Course Outcomes:

The student will be able to:

- ✓ Get familiarity in mobile user interface components.
- ✓ Use data storage procedures and retrieval process.
- ✓ Apply several mobile communication techniques.
- ✓ Create interoperable mobile apps using version control and deployment.

SKILLS ACQUIRED:

- ✓ Design and development of mobile commerce applications.
- ✓ Implement temporary and persistent mobile apps like contacts, messaging, and messengers etc…
- ✓ Prepare apk or other mobile app deployment format files.

ACTIVITIES:

- ✓ Create Image Gallery for online Shopping in Grid view.
- ✓ Create menus for any one standard mobile application.
- ✓ Design and develop contacts mobile application using SQLite Database.
- ✓ Implement an Android program for HTTP Connection
- ✓ Design and develop simple charting mobile app using socket programming
- ✓ Create the APK file for all the above mobile experiments and create signature certificates.

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UNIT – I

DISPLAYING PICTURES AND MENUS WITH VIEWS: Image views to display pictures - Gallery and Image views, Image Switcher, Grid View; Menu Views – Creating the helper methods, Option menu, Content Menu.

UNIT – II

DATA PERSISTENCE: Creating and using data bases – Creating and DBAdapter helper class, Using Data base, Creating Database.

UNIT – III

MESSAGING: SMS Messaging – Sending SMS Messages, Sending SMS using Intent, Receiving SMS messages, Sending E-mail.

UNIT – IV

NETWORKING: Consuming web services using HTTP, Consuming JSON Services, and Socket Programming.

UNIT – V

PUBLISHING ANDROID APPLICATION: Preparing for publishing – Versioning your application, Digitally signing android applications; Deploying APK File using Deployment tools.

Test Book:

1. Wei-Meng Lee, "Beginning Android Application Development", 1st Edition, John Wiley & Sons, Inc, 2012.

Reference Books:

1. Raimon Refols Montane, Laurence Dawson, "Learning and Android Application Development", 1st Edition, PACKT Publishing, 2016.

2. Reto Meier, "Professional Android 4 Application Development", Wrox, 3rd Edition, 2012.

3. Adam Gerber and Clifton Craig, "Learn Android Studio", 1st Edition, Apress, 2015.

16CS448 PYTHON PROGRAMMING

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

This course is aimed at offering the fundamental concepts of Python scripting language to the students. It starts with the basics of python programming and deal with lists, dictionaries, functions, exceptions and files. The objective of this course is to enable the students to develop the applications using the concepts of python.

Course Outcomes:

Student will be able to

- ✓ Understand the basic terminology used in computer programming to write, compile and debug programs in python language
- ✓ Use different data types to design programs involving decisions, loops, and functions.
- ✓ Handle the exceptions which are raised during the execution of python scripts.

SKILLS ACQUIRED:

- ✓ Identify suitable data types of an application
- ✓ Apply control statements for decision making problems.
- ✓ Design an application to perform various operations using class
- ✓ Create a list of data and perform operations on data and result is stored on file

ACTIVITIES:

- ✓ Implement of data types such as scalars, arrays, lists using Python.
- ✓ Develop functions using Python.
- ✓ Copy the content of one file into another.
- ✓ Perform operations such as display, calculate percentage, add, delete and modify student data.
- ✓ Implement matrix operations.

UNIT - I

Introduction: History of Python Features of Python, Python Installation on Windows & LINUX, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT - II

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations.

Control Flow: if, elif, else, for, while, break, continue, pass

UNIT - III

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT - IV

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. **Modules:** Creating modules, import statement, from. Import statement, name spacing,

Error and Exceptions Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions.

UNIT - V

Files: Opening and Closing files, reading and writing, tell (), seek(), rename ()

Object Oriented Programming OOP in Python: Classes, Methods, Constructor Method, Inheritance, Overriding Methods.

Text Books

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly (files)

Reference Books

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage

16CS353 STATISTICS USING PYTHON

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

This course makes a student familiar with the python interactive environment which includes the installation of statistical packages, data structures, statistical functions, different data format conversions and various plots. In addition, it teaches to perform statistical manipulations and programming in a more efficient way when compared with traditional statistical analysis.

The students will be able to:

- ✓ Hands on practice in exploratory data analysis.
- ✓ Use of several distributions.
- ✓ Write functions including generic functions using various methods and loops.
- ✓ Select and perform manipulations on values as required for a specific statistical analysis.

SKILLS ACQUIRED:

- ✓ Create a large corpus using lists and data frames.
- ✓ Perform Linear algebra operations on data for finding correlation and covariance.
- ✓ Develop functions for data manipulation algorithms.

ACTIVITIES:

- ✓ Taking the large amounts of data and finding vector length, min, mode, max and average of that data.
- ✓ Applying list operations on big data for data interpretation.
- ✓ Converting list data into data frames and performing various operations on the data frames.
- ✓ Reading the data from various formats and converting them into required formats.

UNIT – I

Exploratory Data Analysis: A statistical approach, Importing the Data, Data Frames, Variables, Transformation, Validation, Interpretation.

Unit – II

Distributions: Representing Histograms, Plotting Histograms, NSFG variables, Outliers, First Babies, Summarizing Distributions, Variance, Effect Size, Reporting Results.

Unit – III

Probability Mass Functions: PMFS, Plotting PMFs, Other visualizations, The class size paradox, DataFrame Indexing

Unit – IV

Cumulative Distribution Functions: The limits of PMFs, Percentiles, CDFs, Representing CDFs, Comparing CDFs, Percentile-based statistics, Random Numbers, Comparing Percentile Ranks.

Unit – V

Modeling Distributions: The exponential distribution, The normal distribution, Normal Probability plot, The log normal distribution, The pareto distribution, Generating random numbers.

Text Book:

1. Allen B. Downey, " Think Stats: Explorating Data Analysis", 2nd Edition, O'Reilly Media, 2014.

Reference Book:

1. Rul Sarmento and Vera Costa, Comparative Approaches to Using R and Python for Statistical Data Analysis, IGI Global, 2017

16CS446 DATA SCIENCE USING PYTHON

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objective:

Through this Data Science with Python course, students will learn how to process, clean, visualize and analyze data by using Python, one of the most popular data science tools. Students will learn cutting edge Machine Learning techniques in Python. Post the course learners will become an in-demand Data Scientists.

Course Outcomes:

Students are able to:

- ✓ Learn how to analyze large amounts of data to bring out insights
- ✓ Get knowledge on relevant examples and cases make the learning more effective and easier
- ✓ Gain hands-on knowledge through the problem solving based approach of the course along with working on the skill set at the end of the course.

SKILLS ACQUIRED:

- ✓ Learn to apply data science methods and techniques, and acquire analysis skills.
- ✓ Basic data manipulation & data cleaning using Python and pandas Regular Expressions

ACTIVITIES:

- ✓ Taking the large amounts of data and finding vector length, min, mode, max and average of that data.
- ✓ Applying list operations on big data for data interpretation.
- ✓ Converting list data into data frames and performing various operations on the data frames.
- ✓ Reading the data from various formats and converting them into required formats.

UNIT – I

Introduction to data science, Python basics, Data processing using arrays, file input/output with arrays.

UNIT – II

Introduction to pandas data structure, computing descriptive statistics, essential functionality, Handling missing data.

UNIT – III

Reading and writing data with text format, Binary data formats, interacting with HTML and web API's

UNIT – IV

Combing and merging data sets, data transformation and string manipulation.

UNIT – V

Date and time data types and tools, Time series basics, Time zone handling.

Test Book:

1. Wes McKinney, "Python for data analysis", 1st Edition, O'Reilly Media, 2012:

Reference Books:

1. Joel Grus,"Data Science from Scratch", O'Reilly Media Inc., 2015.
2. Cathy O'Neil and Rachel Schutt, "Doing Data Science", O' Reilly Media Inc., 2013.

MECHANICAL ENGINEERING

16ME255 3D PRINTING TECHNOLOGY

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objectives:

This course offers the basic Introduction to 3D Printing, its evolution and gives exposure to the various available 3D printing processes. The objective of this course is to enable student to understand the concepts and implement 3D printing technologies to fabricate intricate & complex engineering components.

Course Outcomes:

The student would be able to:

- ✓ Understand the Basic 3D Printing concepts, its evolution, importance & exposure to the existing different 3D Printing Processes.
- ✓ Model and fabricate products using FDM technology.
- ✓ Apply 3D printing process that suits for the given application area.
- ✓ Analyze the effective process parameters that optimize the technology.

SKILLS ACQUIRED:

The student will be able to

- ✓ Understand the use of prototypes and their importance.
- ✓ Identify the conventional and non-conventional machine processes and choose the right depending on the requirement.
- ✓ Analyze the effect of process parameters on 3D fabricated components.
- ✓ Design process parameters that are suitable for manufacturing specific required products.
- ✓ Evaluate the effect of changing the parameters on the product output.
- ✓ Develop 3D products using latest 3D printing technologies.

ACTIVITIES:

- ✓ Design and fabricate universal coupling with FDM Technology.
- ✓ Fabricate planetary gear mechanism using ABS & PLA materials.
- ✓ Fabricate Engine block assembly by varying process parameters.

UNIT – I

Introduction: Need for the compression in product development, Comparison with conventional manufacturing, History of 3 D printing technology, Applications, Classification of RP systems.

UNIT – II

RP Process: Liquid Type : Principle, process parameters, process details and applications of Stereo lithography systems, Solid Ground Curing, Liquid Thermal Polymerization (LTP), Beam Interference Solidification (BIS)

UNIT - III

RP Process: Solid type : Principle, process parameters, process details and applications of Laminated Object Manufacturing, Fused Deposition Modeling, Ballistic Particle Manufacture (BPM)

UNIT – IV

RP Process: Powder type : Principle, process parameters, process details and applications of Laser Engineered Net Shaping, 3D Printing, Selective Laser Sintering

UNIT – V

RP Process Optimization : Rapid Manufacturing Process: Rapid Manufacturing Process Optimization-Factors influencing accuracy -data preparation errors, part building errors, errors in finishing, influence of part build orientation.

Text Books:

1. Pham D T and Dimov S S, “Rapid Manufacturing”, Verlag, 2001.
2. Paul F Jacobs, “Stereo Lithography and other RP&M Technologies”,
3. Terry Wohlers, “Wohlers Report 2001”, Wohlers Associates,2008.

16ME367 REVERSE ENGINEERING

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objectives:

Reverse Engineering (RE) is an effective learning technique if other "solutions" are available on the market. Applying reverse engineering methodologies allow engineers to disassemble and re-assemble of the device, taking care to document, test, analyze and report on the study of its function.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the Reverse Engineering (RE) Methodology
- ✓ Disassemble products and specify the interactions between its subsystems and their functionality
- ✓ Understand Computer-Aided RE and Rapid Prototyping Technology
- ✓ Re-draw electrical schematics from available PCBs
- ✓ Understand RE applications in software engineering
- ✓ Create minimal cost base product life cycle designs with higher reliability.

SKILLS ACQUIRED:

The student will be able to

- ✓ The basic understanding of engineering systems.
- ✓ Understanding the terminologies related to re-engineering, forward engineering, and reverse engineering.
- ✓ The Understanding of Reverse Engineering methodologies.
- ✓ Understanding of Reverse engineering of Systems, Mechanical RE, Electronic RE, and Computer RE.

ACTIVITIES:

- ✓ The students will be given asked to disassemble any of an engineering product and to apply RE methodologies.
- ✓ The students will be asked to write a technical report documenting their work in the project.
- ✓ Communication diagram will be given as assignments.
- ✓ The group of students which has performed their project in a good way have to present their findings using the communication skills e.g. Power point presentations.
- ✓ The practical skills are applied in the project assigned for the students visiting this course.

UNIT – I

Introduction : Scope and tasks of RE - Domain analysis- process of duplicating

UNIT – II

Tools for RE : Functionality- dimensional- developing technical data - digitizing technique construction of surface model - solid-part material- characteristics evaluation – software and application- prototyping – verification

UNIT – III

Concepts : History of Reverse Engineering – Preserving and preparation for the four stage process – Evaluation and Verification- Technical Data Generation, Data Verification, Project Implementation.

UNIT – IV

Data Management : Data reverse engineering – Three data Reverse engineering strategies – Definition –organization data issues - Software application – Finding reusable software components – Recycling real-time embedded software – Design experiments to evaluate a Reverse. Engineering tool – Rule based detection for reverse Engineering user interfaces – Reverse Engineering of assembly programs: A model based approach and its logical basics

UNIT – V

Integration : Cognitive approach to program understated – Integrating formal and structured methods in reverse engineering – Integrating reverse engineering, reuse and specification tool environments to reverse engineering -–coordinate measurement – feature capturing –surface and solid members.

Text Books:

1. Design Recovery for Maintenance and Reuse, T J Biggerstaff, IEEE Corpn. July 1991
2. White paper on RE, S. Rugaban, Technical Report, Georgia Instt. of Technology, 1994
3. Reverse Engineering, Katheryn, A. Ingle, McGraw-Hill, 1994
4. Data Reverse Engineering, Aiken, Peter, McGraw-Hill, 1996
5. Reverse Engineering, Linda Wills, Kluiver Academic Publishers, 1996
6. Co-ordinate Measurment and reverse engineering, Donald R. Honsa, ISBN 1555897, American Gear Manufacturers Association

16ME368 SAFETY ENGINEERING

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objectives:

This course was designed to make the Mechanical Engineers to monitor and increase standards of the safety in various industries. This course was included with techniques, methodologies and tools to prevent unsafe operations and accidents.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the safety rules and regulations, standards and codes
- ✓ Identify importance of safety in operation of various machines and equipment used in industry.
- ✓ Investigate the accidents in industries.
- ✓ Develop knowledge related to safety education and training.
- ✓ Improve health and welfare measures in engineering industry
- ✓ Create minimal cost base product life cycle designs with higher reliability.

SKILLS ACQUIRED:

The student will be able to

1. Implement safety engineering techniques in various industries.
2. Investigate the accidents and prepare a report over the accident investigation.
3. Evaluate safety performance and monitor the safety.
4. Design preventive maintenance in health and welfare of workers' aspects in engineering and industry.
5. Development process.

UNIT – I

CONCEPTS : Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety.

UNIT – II

TECHNIQUES: Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

UNIT – III

ACCIDENT INVESTIGATION AND REPORTING: Concept of an accident, reportable and non reportable accidents, unsafe act and condition – principles of accident prevention, Supervisory role- Role of safety committee – Accident causation models - Cost of accident. Overall accident investigation process - Response to accidents, India reporting requirement, Planning document, Planning matrix, Investigators Kit, functions of investigator, four types of evidences, Records of accidents, accident reportsClass exercise with case study.

UNIT – IV

SAFETY PERFORMANCE MONITORING : Reactive and proactive monitoring techniques - Permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety "t" score, safety activity rate – problems.

UNIT – V

SAFETY EDUCATION AND TRAINING: Importance of training-identification of training needs-training methods – programme, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

Text Books:

1. Accident Prevention Manual for Industrial Operations", N.S.C.Chicago, 1982

2. Heinrich H.W. "Industrial Accident Prevention" McGraw-Hill Company, New York, 1980.

3. Krishnan N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997.

4. John Ridley, "Safety at Work", Butterworth & Co., London, 1983.

5. Roland P. Blake , "Industrial Safety" Prentice Hall, Inc., New Jersey, 1973

16ME457 PRODUCT LIFE CYCLE MANAGEMENT

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
20	48	4	12	2	2

Course Description and Objectives:

This course deals with in-depth concepts of product development through its life cycle at various stages. The objective of this course is to enable the students to develop an optimal product life cycle designs.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand the concepts and significance of product life cycle management.
- ✓ Develop suitable strategic plan in accordance with customer requirements and company policy.
- ✓ Build optimal process plans and work flow from start to end of product manufacturing.
- ✓ Evaluate process controllability charts to monitor outliers of process parameters.
- ✓ Create minimal cost base product life cycle designs with higher reliability.

SKILLS ACQUIRED:

The student will be able to

- ✓ Design a life cycle chart of any engineering product.
- ✓ Create suitable PLM strategy with respect to customer requirement
- ✓ Identify tools required and work process flow for a given product.
- ✓ Analyze process control using SPC Charts.
- ✓ Perform failure mode effect analysis of a product
- ✓ Develop appropriate soft computing algorithms in product development process.

ACTIVITIES:

- ✓ Formulate a process plan for production of Gear Box
- ✓ Identify the nonconformance of washers in a given lot
- ✓ Perform failure mode analysis of a rotor system

UNIT – I

INTRODUCTION: Background, Overview, Need, Benefits, Concept of Product Life Cycle. Components / Elements of PLM, Emergence of PLM, Significance of PLM, Customer Involvement.

UNIT – II

PRODUCT LIFE CYCLE ENVIRONMENT: Product Data and Product Workflow, Company's PLM vision, The PLM Strategy, Principles for PLM strategy, Preparing for the PLM strategy, Developing a PLM strategy, Strategy identification and selection, Change Management for PLM.

UNIT – III

PRODUCT DEVELOPMENT PROCESS & METHODOLOGIES : Integrated Product development process - Conceive – Specification, Concept design, Design - Detailed design, Validation and analysis (simulation), Tool design, Realize – Plan manufacturing , Manufacture, Build/Assemble , Test (quality check) , Service - Sell and Deliver , Use , Maintain and Support, Dispose. Bottom-up design, Top-down design, Front loading design workflow, Design in context, Modular design.

UNIT – IV

PRODUCT DEVELOPMENT METHODOLOGIES & ANALYSIS TOOLS: Concurrent engineering - work structuring and team Deployment - Product and process systemization - problem, identification and solving methodologies. Product Reliability, Mortality Curve. Design for Manufacturing, Design for Assembly. Design for Six Sigma.

Probabilistic design concepts-FMEA-QFD-Taguchi Method for design of experiments - Design for product life cycle. Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity

UNIT – V

RECENT ADVANCES : Intelligent Information Systems - Knowledge based product and process models - Applications of soft computing in product development process - Advanced database design for integrated manufacturing.

Text Books :

1. Grieves, Michael. Product Lifecycle Management, McGraw-Hill, 2006. ISBN 0071452303
2. Product Life Cycle Management - by Antti Saaksvuori, Anselmi Immonen, Springer, 1st Edition (Nov.5, 2003)
3. Stark, John. Product Lifecycle Management: Paradigm for 21st Century Product Realisation, Springer-Verlag, 2004. ISBN 1852338105
4. Product Design & Process Engineering, McGraw Hill – Kogalkusha Ltd., Tokyo, 1974.

16ME256 BASICS IN ROBOTICS

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
		-

WA/RA	SSH/HSH	CS	SA	S	BS

Course Description and Objectives:

This course deals with the classification of robots, forward and inverse kinematics, end-effectors, various types of actuators and sensors and basics in control systems. The objective of this course is to learn the basic concepts of robots and try to develop the robots for societal needs.

Course Outcomes:

The student will be able to:

- ✓ Discuss the concept of brief history of robot, construction and various types of links and joints of a manipulator.
- ✓ Calculate the forward and inverse kinematics for various configurations of the robotic manipulators.
- ✓ Design the robot end effectors and its sensors for customized applications.
- ✓ Acquire knowledge about various sensors, actuators and control systems
- ✓ Demonstrate the concept of concept basic control system and its applications.

SKILLS TO BE ACQUIRED:

- ✓ Specify the various types of robots based on coordinates systems.
- ✓ Determine the position and orientation of the end effecter with respect to base frame.
- ✓ Design and analysis of various types of grippers.
- ✓ Specify the actuators and sensors based on applications.

UNIT-1 **L-12**

INTRODUCTION: Introduction to Robotics, Laws of Robotics, Classifications by coordinate system, Robot components, Degree of freedom, Robot links and joints, Work space analysis, Applications of Robots.

UNIT-2 **L-12**

KINEMATICS: Coordinate frames, Mappings: Changing descriptions from frame to frame, Translations, Rotations and Transformations, Kinematic Modelling of the manipulator, D-H Representation, Forward Kinematics and Inverse Kinematics.

UNIT-3 **L-12**

END EFFECTORS: Classification of end effectors, Tools as end effectors, Drive system for grippers, Mechanical, Adhesive, Vacuum, Magnetic grippers. Gripper force analysis and gripper design. Active and passive grippers.

UNIT-4 **L-12**

ACTUATORS & SENSORS: Pneumatic, Hydraulic actuators, Electric actuators: Servomotor, Stepper motors. Feedback components: Sensors. Types and applications, Position sensors, Potentiometers, Resolvers, Encoders, Velocity sensors.

UNIT-5 **L-12**

CONTROL SYSTEMS-I: Introduction to control systems, Open loop and closed loop systems, Elements of closed loop systems, Block diagram reduction techniques, Transfer function, Mechanical and Electrical Systems.

TEXT BOOKS:

1. R.K. Mittal & I.J.Nagrath, "Robotics and Control", 2nd ed., Tata McGraw Hill, 8th reprint 2014.
2. Spong M. and Vidyasagar M., "Robot Dynamics and Control", 2nd ed., John Wiley & Sons, 2014.
3. Nicholas Odrey, Mitchell Weiss, Mikell Groover, Roger Nagel , Ashish Dutta," Industrial Robotics - SIE: Technology - Programming and Applications:,2nd Edition, Paperback, McGraw Hill Education (India) Pvt Ltd 2017.

REFERENCE BOOKS:

1. K.S. Fu., R.C.Gonalez and C.S.G.Lee, "Robotics Control sensing, Vision and Intelligence", 1st ed., McGraw Hill International, 2nd reprint 2008.
2. Saeed B.Niku, "Introduction to Robotics Analysis, Systems, Applications", 2nd ed., PHI Learning Publication, 2009.
3. S.K. Saha, "Introduction to Robotics", 2nd ed., Tata McGraw Hill, 2009.
4. D. K Pratihar, "Fundamentals of Robotics", Narsa Publishers, 2018.

16ME369 ADVANCES IN ROBOTICS

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
		-

WA/RA	SSH/HSH	CS	SA	S	BS

Course Description and Objectives:

This course introduces the concept of Jacobian analysis, dynamics, trajectory planning, control systems and various programming languages. The objective of this course is to learn the advance concepts in robotics and try to develop the robots for industrials needs.

Course Outcomes:

The student will be able to:

- ✓ Analyze the concept of jacobian and its inverse jacobian for manipulators.
- ✓ Develop equation of motion for 2 DOF RR manipulators.
- ✓ Evaluate various robot trajectory planning techniques.
- ✓ Explore different control systems for customized robotics applications.
- ✓ Build programs for various tasks using robot programming languages.

SKILLS TO BE ACQUIRED:

- ✓ Apply the knowledge of singularity conditions and identify the joint velocity.
- ✓ Determine the torque required for each joint of the robot.
- ✓ Specify the path between the start and end points of manipulator.
- ✓ Learn the state space analysis and Matlab programming.

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UNIT-1 **L-12**

DIFFERENTIAL MOTION OF MANIPULATOR: Introduction to Jacobian, Manipulator Jacobians for serial manipulators, Jacobian Inverse, Jacobian Singularities, Static Analysis, Problems related to Jacobian analysis.

UNIT-2 **L-12**

ROBOT DYNAMICS: Mass and inertial of links, Lagrangian formulation for equations of motion for serial manipulators, Kinetic and potential energy, Lagrangian-Euler dynamic mode., Direct and inverse dynamics.

UNIT-3 **L-12**

TRAJECTORY PLANNING: Introduction to Trajectory planning, Definitions and planning tasks, Joint space techniques, Cartesian space techniques, Joint-space versus Cartesian space trajectory planning.

UNIT-4 **L-12**

CONTROL SYSTEMS-II: Steady State error and coefficients, Root locus concepts, Stability, State space analysis, Introduction to linear control systems, Second order linear control systems and its characteristics, Linear second order SISO model.

UNIT-5 **L-12**

ROBOT PROGRAMMING: Introduction, Methods of Robot Programming, On line programming, Teach pendant control, Lead through programming, Capabilities and Limitations of lead through methods.

TEXT BOOKS:

1. Mittal R.K., and Nagrath I.J., *Robotics and Control,* Tata Mc-Graw Hill.
2. Schilling, R. J., Fundamentals of Robotics Analysis & Control, Prentice Hall of India.
3. Fu, K. S., Gonzalez, R. C. and Lee, C. S., Robotics: Control, Sensing, Vision, and Intelligence, McGraw Hill.
4. Spong M.W., and Vidyasagar M., Robot Dynamics & Control, John Wiley & Sons (ASIA) Pte Ltd.
5. Saha S.K., *Introduction to robotics*, Tata Mc-Graw Hill.
6. Katsuhiko Ogata,*Modern Control Engineering*, Pearson Education.

REFERENCE BOOKS:

1. Groover M.P., *Industrial Robotics*, Pearson Education.
2. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics : Control, Sensing, Vision and Intelligence", McGraw Hill, 1987.
3. Craig J.J., *Introduction to Robotics,* Pearson Education.
4. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 2006.

16ME370 FIELD AND SERVICE ROBOTS

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
		-

WA/RA	SSH/HSH	CS	SA	S	BS

Course Description and Objectives:

This course deals with the concept of field and service robots, various path planning algorithms, various mobile robots using different environments and usage of robots in various industrial applications. The objective of this course is to learn the usage of mobile robots in real time environments and industrial applications.

Course Outcomes:

The student will be able to:

- ✓ Explore various field and service robots and its applications.
- ✓ Discuss the concept of localization, map representation and vision for mobile robots.
- ✓ Acquire the knowledge about robot motion planning algorithms.
- ✓ Understand various applications of mobile and field robots.
- ✓ Demonstrate the robots used in various industrial applications.

SKILLS TO BE ACQUIRED:

- ✓ Apply the knowledge of field and service robots.
- ✓ Learn various path planning algorithms.
- ✓ Explain the localization of map and inspection
- ✓ Learn the concept of robots used in different applications.
  .

UNIT-1 **L-12**

INTRODUCTION: History of service robotics, Present status and future trends, Need for service robots, Applications, Examples and Specifications of service and field Robots.

UNIT-2 **L-12**

LOCALIZATION & INSPECTION
Introduction-Challenges of Localization- Map Representation- Probabilistic Map based Localization.
Robotic vision systems, image representation, object recognition and categorization, depth measurement, image data compression, visual inspection, software considerations.

UNIT-3 **L-12**

PLANNING & NAVIGATION: Introduction to path planning, Road map path planning, Cell decomposition path planning, Potential field path planning, Obstacle avoidance.

UNIT-4 **L-12**

MOBILE & FIELD ROBOTS: Wheeled and legged robots, vision, touch, sound, Vision, Tactile Sensing. Performance, Interaction, Safety and robustness, Applications.
Ariel robots- Collision avoidance-Robots for agriculture, mining, exploration, underwater, civilian and military applications, nuclear applications, Space applications.

UNIT-5 **L-12**

INDUSTRIAL APPLICATIONS: Types of industrial robots, Load handling capacity, general considerations in Robotic material handling, material transfer, machine loading and unloading, Robot centered cell. Application of Robots in continuous arc welding, Spot welding, Spray painting, assembly operation, cleaning robot for underwater applications.

TEXT BOOKS:

1. Roland Siegwart, Illah Reza Nourbakhsh, DavideScaramuzza, „Introduction to Autonomous Mobile Robots", Bradford Company Scituate, USA, 2004.
2. Mikell P. Groover,"Automation, Production Systems, and Computer Integrated Manufacturing", 2nd Edition, John Wiley & sons, Inc, 2007
3. RiadhSiaer, „The future of Humanoid Robots- Research and applications‟, Intech Publications, 2012.

REFERENCE BOOKS:

1. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India P Ltd., 2006.
2. Kelly, Alonzo; Iagnemma, Karl; Howard, Andrew, "Field and Service Robotics ", Springer, 2011.

16ME458 ARTIFICIAL INTELLIGENCE FOR ROBOTS

Hours Per Week:

L	T	P	C
4	-	-	4

Total Hours:

L	T	P
		-

WA/RA	SSH/HSH	CS	SA	S	BS

Course Description and Objectives:

This course deals with the concept of artificial intelligence for robots, problem solving, planning algorithms, reasoning techniques, various learning methods used in various applications. The objective of this course is to develop the AI concepts in various mobile robots in real time environments.

Course Outcomes:

The student will be able to:

- ✓ Explore the concept of AI in Robotics and its problem solving.
- ✓ Acquire the knowledge about various planning algorithms.
- ✓ Develop the concept of various reasoning techniques.
- ✓ Discuss various types of learning methods using in AI.
- ✓ Apply AI concepts on various robotics planning algorithms.

SKILLS TO BE ACQUIRED:

- ✓ Learn the concept of artificial intelligence and problem solving in AI.
- ✓ Solve the various planning algorithms used in AI.
- ✓ Explain the concept of various reasoning techniques and learning methods used in AI
- ✓ Learn the concept AI in robots.

.

UNIT-1 **L-12**

INTRODUCTION:

Introduction to AI, History, state of the art, Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents.

PROBLEM SOLVING: Solving problems by searching –Informed search and exploration–Constraint satisfaction problems–Adversarial search, knowledge and reasoning–knowledge representation – first order logic.

UNIT-2 **L-12**

PLANNING

Planning withforward and backward State space search – Partial order planning – Planning graphs–Planning with propositional logic – Planning and acting in real world.

UNIT-3 **L-12**

REASONING

Uncertainty – Probabilistic reasoning–Filtering and prediction–Hidden Markov models–Kalman filters–Dynamic Bayesian Networks, Speech recognition, making decisions.

UNIT-4 **L-12**

LEARNING

Forms of learning – Knowledge in learning – Statistical learning methods –reinforcement learning, communication, perceiving and acting, Probabilistic language processing, perception.

UNIT-5 **L-12**

AI IN ROBOTICS

Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A modern approch", Pearson Education, India2003.

2. Negnevitsky, M, "Artificial Intelligence: A guide to Intelligent Systems",. Harlow: Addison-Wesley, 2002.

REFERENCE:

1. David Jefferis, "Artificial Intelligence: Robotics and Machine Evolution", Crabtree Publishing Company, 19992.

MANAGEMENT

16MS202 PRINCIPLES AND PRACTICE OF MANAGEMENT

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

The main object of the course is to explain about concepts, principles and practice of management. To imbibe in-depth knowledge to the students on planning, decision making, organizing and directing and controlling aspects of management.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Understand principles of management and functions including planning, organizing, directing and controlling
- ✓ Understand concepts of managing people including motivating, leading and communication
- ✓ Improve ability to examine managerial issues and problems and to develop feasible alternatives that can result in better decision making
- ✓ Develop an awareness of multiple approaches that can be used to resolve managerial problems
- ✓ Importance of managerial economics in business decision making
- ✓ Demand concepts and methods of demand forecasting
- ✓ Production function and law of variable proportions
- ✓ Cost concepts and break even analysis
- ✓ Pricing decisions in various market situations

UNIT – I

Introduction to Management: Concept of management, Management functions, Managerial roles, skills and levels, Is management science or art?, History and current thinking: Classical approach ,Behavioral approach ,Management science approach ,The contingency approach ,The systems approach.

UNIT -II

Planning & Decision Making: Concept of planning ,Purpose of planning ,Planning process, Management by objectives, Defining decision making ,Types of decisions ,Decision making process ,Decision making conditions, Group decision making and ,Decision trees

UNIT – III

Organizing: Concept of organizing, organizing process, Organization structures, departmentation, Responsibility, authority and delegation, span of management

UNIT – IV

Directing: Concept of motivation, Theories of motivation: Process theories of motivation, Content theories of motivation, Strategies for motivating organization members, Concept of leadership, Trait approach to leadership, Situational approach to leadership , Communication process, Barriers to communication, Interpersonal communication in organization

UNIT - V

Controlling: Concept of controlling, Controlling process, Types of control, Techniques of controlling

Text Books:
1. Samuel C.Certo, S.Trevis Certo: Modern Management, 10/e, Prentice-Hall, New Delhi, 2007
2. Stoner, Freeman, and Gilbert, Jr. Management, 6/e, Pearson education, New Delhi, 2006.

Reference Books:
1. Heinz Weihrich, Harold Koontz: Management A Global perspective, 10/e, Tata McGraw Hill, 2007.
2. Daft, The New Era of Management, Thomson, 7/e, New Delhi, 2007.
3. Schermerhorn: Management, 8/e, Wiley, India, 2006.

Other resources:

Harvard business review south Asia
Vikalpa, the journal for decision makers
IIMB Management review

16MS301 MANAGERIAL ECONOMICS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

To make the students familiar with the basic concepts and principles of Business Economics.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Importance of managerial economics in business decision making
- ✓ Demand concepts and methods of demand forecasting
- ✓ Production function and law of variable proportions
- ✓ Cost concepts and break even analysis
- ✓ Pricing decisions in various market situations

UNIT – I

Introduction to Economics-Wealth, Welfare and Scarcity Definitions, Classification and Scope of Economics, Nature & Scope of Managerial Economics, Basic tools and techniques of Business Economics, Relation of Managerial Economics with functional areas of business.

UNIT – II

Demand Analysis: Types of Demand, Demand determination, Concept of Elasticity and measurement, Demand forecasting, Survey & Statistical methods.

UNIT – III

Theory of Production: Production function, Marginal rate of technical substitution, Iso-quants and Iso-costs, production function with one/two variable factors, Law of Variable Proportions, and Returns to Scale, internal and external economies.

UNIT – IV

Cost Analysis: Cost concepts, cost determinants, cost output relationship in the short and long run, Break-Even analysis, Simple problems in Break-even Analysis.

UNIT – V

Features and types of different competitive situations – Perfect competition, Monopoly, Monopolistic competition and Oligopoly, pricing methods in practice.

Text Books:

1. Gupta: Managerial Economics, 1/e TMH, 2005.
2. A.R.Arya Sri, Managerial Economics and Financial Analysis, TMH, 2/e, 2010.

Reference Books:

1. Dominic Salvatore, Managerial Economics, Thomson, 2/e, 2006
2. Mote Paull, Managerial Economics, 1/e, TMH, 2004

16MS302 FINANCE FOR ENGINEERS

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Helping non-financial professionals like Engineers to raise their awareness of finance and use financial information in making better business decisions
Provides an understanding of the basic financial accounting terms and concepts like financial statements - balance sheet, income statement, statement of cash flows, that firms use to describe their businesses

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ By raising financial awareness, students are better able to manage businesses' revenues, costs, profits and cash.
- ✓ Students will also be able to use their new financial knowledge to make more effective decisions.

UNIT – I

Introduction to Financial statements -main components of a typical set of financial statements or annual report - key underlying accounting concepts used in the preparation of financial statements.

UNIT – II

Business Analysis - Know how to interpret financial statements and analyze businesses using the 7-step approach - Perform a SWOT analysis using financial statements

UNIT – III

Cash Operating Cycle - cash operating cycle and what affects a company's cash flow - Manage the cash operating cycle

UNIT – IV

Costing - Different categories of costs which exist and their implication on costing - costing concepts, and apply them in making business decisions-Break-even analysis

UNIT – V

Investment Appraisal Tools - payback period, net present value and internal rate of return methods of project appraisal in decision making - Understand briefly the concepts of shareholder value, gearing and weighted average cost of capital

Text Books:

1. Accounting for Non-Accounting Students" by JR Dyson, Pearson.

2. Ross, Stephen A., Westerfield, Randolph W. and Jordan, Bradford D., Essentials of Corporate Finance with Connect Plus. Seventh Edition. New York, NY, Mc-Graw Hill Irwin 2008. ISBN 978-0-07-742768-9.

16MS401 ENGINEERING ENTREPRENEURSHIP

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Engineering Entrepreneurship introduces engineering students to the concepts and practices of technology entrepreneurial thinking and entrepreneurship. The course is firmly presented in a "real-world" format, including students taking the roles of company founders and investors, creating a vision and execution plan for their company, and raising funds –exactly as they would in a true entrepreneurial endeavour. Using lectures, case studies, business plans, and student presentations, the course teaches life skills in entrepreneurial thought.

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- ✓ Concepts and practices of technology entrepreneurial thinking and entrepreneurship.
- ✓ Entrepreneurial mind-set and culture that has been developing in companies of all sizes and industries
- ✓ Entrepreneurial process from the generation of creative ideas to exploring feasibility to creation of an enterprise for implementation of the ideas.
- ✓ How to create and present a business plan for a technology idea. Students will experience the dynamics of participating on a business team and the power inherent in a team relative to individual effort.
- ✓ Tools and life skills required to participate in the entrepreneurial process within a large company, in a new venture, or as an investor Plan and control the HR function effectively

UNIT – I

Introduction to Entrepreneurship, Introduction to Technology, Entrepreneurship and Technology Ventures, Attributes and Myths of Technology Entrepreneurs

UNIT – II

Engineers as Entrepreneurs, The Mind-set of the Entrepreneurial Leader, Creating and Selling the Entrepreneurial Value Proposition.

UNIT – III

Entrepreneurial Idea Generation and Feasibility Analysis, Technology Commercialization Potential, Paths and Barriers from Idea to Market, Assessing and Presenting the Opportunity.

UNIT – IV

Business Structuring and Strategy, Business planning and the Business Plan, Financial Analysis and Projections; Market and Competitive Analysis, Presentation of the Opportunity,

UNIT – V

Intellectual Property Strategies for Technology Companies; Marketing, Sales and Distribution Strategies, Investment and Financial Strategies, Venture Growth and Value Harvesting.

Text Books:

1. H. Nandan, "Fundamentals of Entrepreneurship", 5th ed., PHI, New Delhi, 2007.
2. Technology Ventures: From Idea to Enterprise, 3rd Edition, Dorf, Richard, Byers, Thomas, and Nelson, Andrew; ISBN 978-0073380186
3. New Venture Creation, 6thEdition or 5thEdition, Timmons, Jeffry A; ISBN:0072498404, January 2004.

Reference Books:

1. Robert D Hisrch, Michael P Peters, Dean A Shpherd, "Entrepreneurship", 6th ed., New Delhi, 2006.
2. Dr. C. B. Gupta, Dr. S. S Khanka "Entrepreneurship and Small Business Management", 4th ed., Sultan Chand & Sons, New Delhi.
3. Dr. C. B. Gupta, Dr. N.P. Srinivasan "Entrepreneurship Development in India", 5th ed., Sultan Chand & Sons, New Delhi.
4. The Art of the Start: The time-tested, battle-hardened guide for anyone starting anything, Kawasaki, Guy; ISBN: 1591840562, Portfolio – a member of Penguin Group; 2004 Monk & the Riddle, Komisar, Randy; ISBN: 1578516447, Harvard Business School Press; September 2001.

HUMANITIES

16HS219 INDIAN HISTORY AND CULTURE

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course introduces basic understanding of Indian culture and history. The course objective is to describe the various stages of the Indian history, understand the importance of different historical events in shaping the Indian society and to enable the students understand the relevance of Indian history and make them much more socio-conscious in the society.

Course Outcomes:

Upon successful completion of this course, the student will be able to

1) To acquaint the students with the Indian history and culture.
2) To prepare the students for the civil services examinations [as Indian history is very important both at the prelims and mains level].
3) To make the students more inclined knowing Indian history not only from the examination point of view but to feel proud of our rich cultural heritage [literature, music, sculpture, art, architecture].
4) To make the students balanced individuals, responsible in protecting and glorifying our history.

SKILLS TO BE ACQUIRED:

- ✓ Mapping historical places since ancient to modern
- ✓ Compare different perspective to reading or understanding of history/historical events
- ✓ Prepare essays with broad historical understanding
- ✓ Identify major turn of events and evaluate the historical development of Indian society since ancient time

ACTIVITIES:

- ✓ Presentation on Ancient Indian History
- ✓ Group discussion on different viewpoints and interpretation of history
- ✓ Paper presentation on the visit to the museum and archives
- ✓ Group discussion on different religion and their importance
- ✓ Interactive sessions about the evolution of the Indian society since ancient to modern

UNIT - I

Ancient Indian History : Prehistoric Background of Indian culture. Harappan culture: Cities – Society – economy and trade , End of the Harappan cities. Society and Economy of the early Vedic and later Vedic periods. Emergence and Spread of Puranic thesim, Buddhism and Jainism. Mauryans, Post Mauryans and Sangam Period. The age of Satavahanas and the Guptas The Pallavas, the Chalukyas and the Cholas.

UNIT –II

Medieval Indian History : General Condition under the Delhi Sultanate. General Condition under the rulers of the Vijayanagara Empire. General Conditions under the rule of the Mughals Shivaji and the rise of the Marathas. Bhakti Movement

UNIT – III

Indian Culture : Salient aspects of Art forms – Music and Dance Language and Literature , Architecture and Sculpture, Paintings and places of Cultural interest

UNIT –IV

British Rule in India : The Beginning of European settlements. Government and the economic policies of the British empire in India 1757 – 1857. The First War of Independence of 1857 and the consequent administrative changes. Religious and Social Reforms after 1858.

UNIT – V

Struggle for freedom : Economic impact of the British rule The national Movement 1858-1885; 1885-1905; 1905-1920; 1920-1947 Contribution from various states India after Independence-Post independence consolidation of states.

Text Books :

1. Romila Thapar A History of India –I – Penguin Books
2. Percival Spear A History of India –II – Penguin Books

References Books :

1. S.L. Mukharjee Ancient History of India, Tata Mc Graw Hill,2008
2. S.L. Mukharjee Medieval History of India,Tata Mc Graw Hill,2008
3. Bipin Chandra Indian Struggle of Independence, Viking , 2007.
4. A.L Basham (ed) A Cultural History of India , Oxford, 1975.

16HS224 POLITY AND GOVERNANCE OF INDIA

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course introduces basic understanding of Indian polity and constitution. The course objective is to make students to understand the functioning of government at the centre and state level besides local self government as outlined in the constitution and gives basic knowledge about the fundamental rights & duties of a citizen besides gives the knowledge about Elections and Democracy at work.

Course Outcomes:

The student will be able to:

- ✓ Applies the constitution and its principles to the day to day happenings.
- ✓ Inculcates the respect for the constitution and rights of others besides safeguarding one's own rights.
- ✓ Analyzes functioning of executive, legislative and Judiciary.
- ✓ Compares the Indian constitution with other countries

SKILLS:

- ✓ Analyze political events of the nation.
- ✓ Study and compare various contemporary governments and constitutions
- ✓ Analyze the functions of the government authorities

ACTIVITIES:

- ✓ Conduct mock parliament.
- ✓ Evaluate political changes in the country
- ✓ Visits government offices(Chebrolu MRO&MPDO)
- ✓ Group discussion on basic human rights and gender sensitivity
- ✓ Conduct mock panchayat meetinings

UNIT – I

Overview of Indian constitution : Making of Indian constitution, Salient features, Preamble, Significant Provisions; Amendments; Basic structure.

UNIT – II

Working of the Indian Constitution : Features of Indian Federal system, Centre-State relations- Legislative, executive, financial, Issues and concerns – coalition governments; Administrative, Reforms.

UNIT – III

Structure of the Government : Union Government, State Government, Local Government

UNIT – IV

Powers and Functions of Constitutional, Statutory and Non statutory bodies : Constitutional - Election Commission, UPSC, Finance Commission, CAG etc., Statutory - NHRC, CVC, etc., Non statutory – Planning Commission, National Development Council etc.,

UNIT – V

Political Dynamics : Representation of Peoples' Act, Political Parties, Pressure Groups, Elections, Electoral Reforms, Transparency, Accountability and Right to Information.

TEXT BOOKS:

1. D.D. Basu—Indian Constitution
2. Subhash C. Kashyap : Our Parliament, Publication Division

References:

1. P.M. Bakshi—Indian Constitution
2. Laxmikanth, Indian Polity

16HS307 ECONOMIC AND SOCIAL DEVELOPMENT OF INDIA

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

This course introduces basic understanding of Indian economy. The course objective is to make students to understand the role of government in managing economy and gives basic knowledge about different sectors of the economy besides equipping them the tools to analyze the state of current economy.

Course Outcomes:

The student will be able to:

- ✓ Applies the macro economics techniques and its principles to the day to day happenings.
- ✓ Inculcates the respect for the constitution and rights of others besides safeguarding one's own rights.
- ✓ Analyzes functioning of state of economy.
- ✓ Analyzes the impact of external sector on Indian economy

SKILLS TO BE ACQUIRED:

- ✓ Calculate GDP,NI,CPI,WPI
- ✓ Monitor the stock markets and foreign trade
- ✓ Analyze social evils like poverty, unemployment etc
- ✓ Analyze Industrial growth and functioning of the banking sector

ACTIVITIES:

- ✓ Study market fluctuation
- ✓ Visit banks and corporate offices
- ✓ Analze the impact of globalization on the Indian economy
- ✓ Practical knowledge on patent rights
- ✓ Compare popular programmes of different government

UNIT - I

Structure of the Economy : Basic Concepts, Sources of Revenue and classification of, expenditures of Union, Government, Fiscal indicators, Structure of the Economy, Recent trends in the National Income, Performance on the social front.

UNIT – II

LPG Policies : Transition from Centralized Planning to Indicative Planning, LPG Policies, Globalization and its discontents, WTO, TRIPS, TRIMS, GATS.

UNIT – III

Agrarian Issues : Agrarian Structure, Land Reforms ,Farm subsidies, Agricultural Price Policies, Food Security Agrarian Crisis and Farmer suicides, WTO and Indian Agriculture

UNIT – IV

Industrial Strategy : Strategy of Industrialization, Special Economic Zones, FDI Policy Multi-National Companies and their importance, Rise of Corporate power in India, Privatization and Disinvestment policies, Infrastructure policies

UNIT – V

Poverty Alleviation Programmes : Measures of Poverty and inequality and trends therein. Anti Poverty Programmers - Public Distribution System Wage Employment Programmes Concepts of Social justice and Inclusive growth and their components.

TEXT BOOKS:

1. Dutt and Sundaram: “Indian Enconomy”, 2014 edition, S. Chand & Co.
2. Misra & Puri: “Indian Economy”, 2014 edition, Himalaya Publications.

REFERENCE BOOKS:

1. Vivek Kumar Singh: “CSAT Comprehensive Manual” 2014 edition.
2. Joseph E. Stigltz (2003) : “Globalization and its Discontents” W.W Norton,
3. Jean Dreze and Amartya Sen (2014) : “An Uncertain Glory : India and its Contradictions” Penguin.
4. Ramesh Singh (2014): “Indian Economy for Civil Services Examinations”, Mc Graw Hill.

16HS308 GEOGRAPHY AND ENVIRONMENTAL CONCERNS OF INDIA

Hours Per Week:

L	T	P	C
3	1	-	4

Total Hours:

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
10	30	5	10	5	5

Course Description and Objectives:

Students will be introduced to various phenomena like El-Nino, Global

Warming both at Global and Regional levels and several physiographic phenomena like origin and distribution of Earth quakes, volcanoes tsunamis and resources.

Course Outcomes:

The student will be able to:

- ✓ Analyses oceanic and climatic phenomena.
- ✓ The students will analyze the regional issues inconsonance with global happenings.
- ✓ Student will apply general principles of geography and environment and can provide the solutions.
- ✓ Inculcates environment consciousness.

SKILLS TO BE ACQUIRED:

- ✓ Map reading
- ✓ Discuss the oceanic and climatic phenomena
- ✓ Analyze the regional issues in consonance with global happenings
- ✓ Address geographic and environmental issues

ACTIVITIES:

- ✓ Presentation and group discussion on vital environmental issues
- ✓ Visit to IMD
- ✓ Study tidal movements
- ✓ Study different types of soils and climatic conditions
- ✓ Take part in a forestation drive nearby places

UNIT – I

Geography : Fundamental concepts of Geography, Physical Geography of India – River systems, climate, soils, minerals, geological Strata, climatic regions, natural vegetation, Races and Physical Types of People.

UNIT – II

Scientific and Technological Development : Milestones in India's scientific and technological progress in diverse fields – space, Nuclear, IT, Defense, Agriculture and Rural technologies Prominent scientists of India and their contribution, Recent initiatives to spread scientific temper and S&T practices, Issues relating to Intellectual Property Rights

UNIT – III

Energy Sources : Sources of Energy-availability and consumption pattern, Energy policy and pricing. Issues relating to hydel power (Big Dams), Thermal Plants and Nuclear power Green Energy technologies and their importance.

Unit – IV

Biodiversity : Meaning and importance of Bio-diversity, Sustainable Development Ecosystems and their management Bio-Diversity of India, Bio- spheres and Biodiversity hot spots of India Initiatives to preserve bio-diversity.

Unit – V

Environmental issues : Magnitude, causes and consequences of environmental pollution in India Factors that led to global warming and climate change Recent international protocols to tackle climate change, Carbon trading and its implications, Concerns of Developing Countries Disaster Management and Environmental Impact assessment.

TEXT BOOKS:

1. Goh Cheng Leong: Certificate Physical and Human Geography
2. Valdiya : Environmental Geology.

REFERENCE BOOKS:

1. NCERT: 6^{th} to 12^{th} Books for Geography
2. NCERT: General geography

MINOR SPECIALIZATIONS

D. ELECTRONICS & COMMUNICATION ENGINEERING

Minor-D Electronics & Communication Engg.	L	T	P	To	C
	4	0	-	4	4

EC223 ELECTRONIC DEVICES

Course Description and Objectives:

As part of this course, to deliver the knowledge about switches and relays, knowledge about physics of basic semiconductor devices. To enhance comprehension capabilities of students through understanding of electronic devices, introduce and motivate students to the use of basic power electronic devices and understand DC biasing needed for various applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the semiconductor devices with the help of characteristics.

CO2: Investigate the characteristics of Amplifier Circuits employing BJT and FET devices.

CO3: Design half wave and full wave rectifiers with and without filters.

CO4: Analyze the working of BJTs and FETs under various biasing conditions.

UnitI -Surface Mounted Devices (SMDs)

Connectors, Relays and Switches: Various types of switches, e.g. Slide, rotary, push, Toggle etc, their symbols and applications. Concept of 'make' and 'brake' contacts in relays. Various types of relays and applications. Various types of connectors, their functions and applications

UnitII - Semiconductor Physics:

Intrinsic semiconductors, Conductivity, atomic and crystal structure of germaniumand silicon, covalent bonds, generation and recombination, effect of temperature on conductivity of intrinsic Semiconductors, energy levels diagram of conductor, insulators and intrinsic semiconductors, Extrinsic semiconductor materials - Doping of impurity, P and N type semiconductors and their conductivity, Minority and majority carriers~ Drift and Diffusion currents.

Unit III-Semiconductor Diodes & Rectifiers

P-N junction diode, mechanism of current flow in P-N junction, behaviour of P-N junction characteristics, Zenor diode, zener and avalanche breakdown, Tunnel diode, Schottky diode, Varactor diode,Light emitting diode.
Rectifiers: Half wave Rectifier, Full wave rectifier, Bridge rectifier and their comparisions

Unit IV- Introduction to Bipolar Transistor & FET & MOSFET

Introduction to Bipolar Transistorconcept of bipolar transistor as two junction three terminal device PNP and NPN transistors, their symbols. Input and output characteristics. Common emitter, base, Collector configurations.
FET: Construction, operation, characteristics and equivalent circuit of JFET and its circuit applications
MOSFET: Construction, operation, characteristics and equivalent circuit of MOSFET in depletion and enhancement modes and is circuit applications. Comparison of JFET, MOSFET, BJT.

Unit V-Regulators and Power semiconductor devices

Simple Zener Regulators, UJT, SCR, TRIAC DIAC, GTO, PUT, IGBT, SCS, SUS, RCT, LASCR

TEXT BOOKS:

1. S. Salivahanan “Electronic Devices and Circuits” Tata Mcgraw-Hill second edition
2. R.L.Boylestad and Lovis Nashelsky , “Electronic Devices and Circuits Theory”, 10th ed., Pearson Education, 2010.

REFERENCE BOOKS :

1. R.L.Boylestad and LovisNashelsky , “Electronic Devices and Circuits Theory”, 10th ed., Pearson Education, 2010.
2. N.N.Bhargava, “Basic Electronics and Linear Circuits”, 1st ed.,Tata McGraw-Hill, 2009.
3. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, 5th ed.,Oxford University Press,2006

Minor-D Electronics & Communication Engg.

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EC250 ELECTRONIC CIRCUITS

Course Description & Objectives:

As part of this course, students to understand Diode switching circuits, to understand usefulness of the devices for various applications like amplifiers, oscillators etc. and understanding theoretical concepts of biasing and stabilization.

Course Outcome:

Upon successful completion of this course, students should be able to:

CO1: Analyzethe negative feedback amplifier circuits and oscillators.

CO2: Understand the working of tuned and power amplifiers.

CO3: Investigate the frequency response of multi stage and high frequency amplifiers.

CO4: Understand the time base generators.

UNIT I DIODE SWITCHING CIRCUITS

Diode as a switch, Diode clippers & Clampers. Clamping circuit theorem, practical clipping and clamping circuits. Realization of Logic Gates using Diodes: AND, OR gates using Diodes.

UNIT II- BIASING AND STABILIZATION

Dc load line, Ac load line and selection of operating point, need for biasing, various biasing techniques: fixed bias, collector to base bias and self bias with stability factors. Various compensation circuits, thermal runaway and thermal stability.

UNIT III- FEEDBACK CIRCUITS

Feedback Amplifiers: Concept and types of feedback, effects of negative feedback, Different topologies.

Oscillators: Barkhausen’s crieterion for oscillations, frequency of oscillations for Hartley , Colpitts, RC phase shift,Wein bridge and Crystal oscillators.

UNIT IV -POWER AMPLIFIERS

Classification of Power Amplifiers, Operation and Efficiency of Class A Series fed & transformer coupled, Class B Push Pull & Complimentary Symmetry, Class C Amplifiers and Comparisons.

UNIT V- MULTIVIBRATORS

Astable, Monostable and Bistable Multivibrators, Schmitt trigger using transistors.

TEXT BOOKS:

1. J. Millman and C.C. Halkias, “Integrated Electronics”, 1st ed., Tata McGraw-Hill , 2009.
2. Donald A. Neaman, “Electronic Circuit Analysis and Design”, 3rd ed.,Tata McGraw-Hill, 2009.

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory” – 9th ed.,Pearson/Prentice Hall, 2006.
2. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, 5th ed., Oxford University Press, 2006.
3. M.H. Rashid, “Micro Electronic Circuits: Analysis and Design”, 1st ed.,Thomson PWS Publ., 1999

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EC228 DIGITAL ELECTRONICS

Course Description &Objectives:

To introduce the concepts and techniques associated with the number systems and codes and minimize the logical expressions using Boolean postulates. To design various combinational and sequential circuits and provide with anSufficient Number of applications for the techniques and mathematics used in this course.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Apply the Boolean algebra knowledge of mathematics to analyze combinational and sequential digital electronic circuits using K-map and QM technique.

CO2: Design combinational circuits for the given specifications/constraints.

CO3: Analyse the sequential circuits for the given specifications/constraints.

CO4: Compare the characteristics of logic families for implementing combinational & sequential circuits.

UNIT I - Number Systems and Boolean Algebra

Review of number systems, Conversions, Arithmetic operations, Binary codes: parity code, hamming code, Fundamental concepts of Boolean algebra, Basic theorems and properties, canonical and standard forms, logic gates, Algebraic simplification and realization with basic gates and universal gates.

UNIT II-Minimization of Switching Functions

Minimization of Switching Functions, Map method, prime implicants, don't care combinations, minimal SOP and POS forms, Tabular method, prime implicant chart.

UNIT III-Combinational Logic Design

Design using conventional Logic gates, Encoder, Decoder, Multiplexer, Demultiplexer, Parity bit generator, code converters, (Designing with gates along with mention of IC numbers), Basic PLDs : PAL, PLA, ROM, PROM

UNIT IV-Sequential Logic Design

Classification of sequential circuits, Latches, Flip-Flops: SR, JK, T, D; triggering and Excitation tables, Design of Sequential circuits: Shift Registers, counters, FSM, Sequence Detectors.

UNIT V-Logic Families

Introduction to logic families, CMOS logic, Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families

TEXT BOOKS:

1 Morris Mano, “Digital Logic & Computer Design”, 1st ed., Pearson, 2005.
2 John F walkerly, Digital Design Principles and Practices, 3rd ed., PHI/Pearson Education, 2005.

REFERENCE BOOKS:

1. John M. Yarbrough, “Digital Logic Applications and Design”,1sted.,Thomson Publications, 2006.
2. Fletcher, “An Engineering Approach To Digital Design” , 1st ed.,Prentice Hall of India. 2009.
3. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
4. D. Roy Chowdhury, “Linear Integrated Circuits”, 2nd ed., New Age International(p)Ltd, , 2003.

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EC333 COMMUNICATION SYSTEMS - I

Course Description & Objectives:

As part of this course, to familiarize students with the fundamentals of analog and digital communication systems and provide students with tools for communication signal analysis. To familiarize students with various techniques for amplitude modulation and demodulation of analog signals .

Course Outcomes:

Upon successful completion of this course, students should be able to::

CO1; Compare different amplitude modulation techniques.

CO2: Analyze performance of different types of Angle modulation Techniques for a given set of parameters.

CO3: Identify the transmitter and receiver types required for a given applications.

CO4: Familiarize the calculation of SNR in different modulation techniques.

UNIT I - Basic Signals and Fourier spectrum

Block diagram of communication system, Radio frequency spectrum:

Classification of signals, Fourier Transform of various signals, Fourier Spectrum, power spectral Density, Autocorrelation and Cross-correlation.

UNIT II - Amplitude Modulation and Demodulation

Modulation, Need for modulation, Amplitude modulation: AM. DSBSC, SSBSC and power and Bandwidth requirements; Generation of AM, DSB-SC, SSB - SC, Demodulation of AM: Envelope detector

UNIT III - Angle Modulation and Demodulation

Concept of Instantaneous frequency, Frequency and phase modulations, relationship and comparison between FM and PM. Narrowband and wideband FM. Generation of FM: Direct method, indirect method. Demodulation of FM: Phase locked loop (PLL).

UNIT IV -Digital communications

Sampling, Nyquist rate, Sampling theorem, Time Division multiplexing (TDM). Block diagram of PCM, Signal to Quantization noise ratio, Delta Modulation.

UNIT V - Digital Modulation

ASK, FSK, PSK and their modulation and Demodulations. Comparison between ASK, FSK and PSK with constellation diagrams.

TEXT BOOKS:

1. B.P Lathi, Zhi Ding, “Modern Digital and Analog Comm. System” 1st ed., Oxford Press.
2. Taub, Schilling, “Principles of Communication Systems”, 3rd ed., Tata McGraw-Hill,2008

REFERENCE BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006.
3. Communication Systems Second Edition – R.P. Singh, SP Sapre, TMH, 2007.
4. Communication Systems – B.P. Lathi, BS Publication, 2006.
5. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004

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EC335 LINEAR IC APLICATIONS

Course Description & Objectives:

This subject introduces the theoretical & circuit aspects of Op-amp, which is the backbone for the basics of linear integrated circuits. To study the basic principles, configurations and practical limitations of op-amp and analyzing the designs and explain the characteristics and applications of active filters, including the switched capacitor filter understanding the operation of the most commonly used D/A and A/D converter types and its applications.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand the characteristics and specifications of operational amplifiers.

CO2: Analyze the applications of the operational amplifiers .

CO3: Design various filters and regulators.

CO4: Understand the operation and applications of phase locked loop and voltage controlled oscillators.

UNIT I- Basics of Op-amp

Classification of Integrated circuits, basic information of Opamp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, features of 741 op-amp, modes of operation : inverting, non-inverting and differential.

UNIT II - OP-AMP Applications

Basic application of Op-amp, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators.

UNIT III -Active FilterS & Oscillators

Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters.

Oscillators: Types and principle of operation – RC& Wien, waveform generators – triangular, saw- tooth, square wave.

UNIT IV-D/A and A/D Converters

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications. Data Acquisition: Instrumentation Amplifier.

UNIT V -Timers & Phase Locked Loops

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

TEXT BOOKS :

1. D. Roy Chowdhury, "Linear Integrated Circuits", 2nd ed., ANew Age International (p) Ltd, 2003.
2. JohnWalkerly, "Digital Design Principles & Practice", 3rd, Pearson Education, 2010.

REFERENCE BOOKS :

1. Tahira Parveen, "Operational Transconductance Amplifier and Analog Integrated Circuits " , I K International Publishing House Pvt. Ltd .,2010
2. G.B.Clayton, Operational Amplifiers, Butterworth, 1971.
3. Sergio Franco, "Design with Operational Amplifiers & Analog Integrated Circuits", McGraw Hill,1988.
4. Millman, "Micro Electronics", McGraw Hill, 1988

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EC336 MICROPROCESSORS AND INTERFACING

***Course Description & Objectives**:*

As part of this course, students learn about the *History of Microprocessors. Difference between microprocessors, micro controllers. To study the architecture and addressing modes of 8086 and to write assembly language programs of 8086. To study the architecture and addressing modes of 8051 and to write assembly language programs of 8051 and various interfacing circuits necessary for various applications.*

Course Outcome

Upon successful completion of this course, students should be able to:

CO1; Understand the architectures of 8086 family of microprocessors and 8051 microcontroller systems.

CO2: Select a microprocessor or microcontroller that is suitable to given application.

CO3: Analyse hardware features of 8086 processor and 8051 microcontrollers.

CO4: Create the memory and I/O interfacing with 8086 and 8051.

UNIT I - Introduction to Microprocessors

Evolution of Microprocessors, 8086 Microprocessor Architecture: Register organization, Instruction queue, and Physical address calculation. Addressing Modes, Pin description of 8086.

UNIT II - Instruction set

Assembly Language Programs: for arithmetic operations, logical operations, CALL-RET operations, Intra and inter segment calls, sorting and string operations. Interrupts of 8086.

UNIT III - Introduction to Microcontroller

Differences between microprocessor and microcontrollers, 8051 Architecture, Internal & External memory organization, Pin diagram, addressing modes, on board RAM, Special Function Register area, Addressing modes of 8051, interrupts of 8051, interfacing external memory to 8051

Unit IV - PROGRAMMING

8051 Instruction set and assembly language programming, Example programs

UNIT V- INTERFACING

Micro processor interfacing: Key board and Display Interfacing, A/D and D/A converter interfacing, traffic light,

Micro controller interfacing**:** 7-seg LED interfacing, Key board interfacing, LCD interfacing, Stepper motor interfacing.

TEXT BOOK:

1. Douglas V.Hall, "Microprocessors & Interfacing", 2nd ed., TMH, 2003
2. Mazidi "The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/E" Pearson education.

REFERENCE BOOKS:

1. A K Ray and K M Bhurchandi, "Advanced Microprocessors & Peripherals", 2nd ed., TMH,2006.
2. Raj Kamal, "Microcontroller architecture, programming, Interfacing and System Design", Pearson Education, 2005
3. The 8051 Microcontroller and Embedded Systems using Assembly and C – Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd Edition, Pearson Education, 2008.
4. Barry B.Brey: Intel Microprocessor Architecture, Programming and Interfacing- 8086/8088, 80186, 80286, 80386 and 80486, PHI,1995.

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EC338 COMMUNICATION SYSTEMS-II

Course Description & Objectives:

As part of this course, students will study the basic principles of cellular mobile system, Optical and Satellite Communications and basic principles of Radar systems. To impart knowledge on wave propagation and information theory.

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Understand model of digital communication systems.

CO2: Analyse the performance of digital modulation techniques.

CO3: Familiarize the concepts of information theory and source coding.

CO4: Apply error control coding techniques for efficient communication.

Unit I - Information Theory

*Concept of amoun*t of information and its properties. Average information, Entropy and its properties. Information rate, Basics of Channel, Concept of Mutual information and its properties, Shannon's theorem, channel capacity, capacity of a Gaussian channel, bandwidth –S/N trade off.

Unit II - Radio Wave Propagation

Ground wave Propagation, Space wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Radio-Horizon, Duct Propagation, Ionosphere Propagation, Gyro frequency, Critical Frequency, Skip Distance, Maximum Usable Frequency.

UNIT III - Introduction to Radar Engineering

Applications of Radars, Block Diagram of Simple Radar , Radar range equation,, Block diagram of Pulse Radar, Pulse Doppler Radar, Doppler Effect, CW Radar, FMCW Radar, MTI Radar

UNIT IV - Introduction to Satellite Communications

Satellite orbit, Keppler's Laws, look Angles, Geo stationary satellite, Satellite communication systems, Satellite subsystems, Satellite earth station, GEO, MEO, LEO, Applications of satellites.

UNIT V - Introduction to Optical Communications

Advantages of fiber optic system, Fiber optic communication system, spectrum of light, Characteristics and behavior of light, How light travels in a cable, snells law, fiber optic cables, fiber materials, Mechanical properties of fiber, optical fiber configuration,.

TEXT BOOKS

1. M. Kulkarni, "Micro Wave and Radar Engineering", Umesh Publications, 1998.
2. John Wiley, R.E. Collin, "Foundations for Microwave Engineering", 2nd ed., IEEE Press, 2002.

REFERENCES BOOKS

1. Ghatak, K. Thyagarajan, Introduction To Fiber Optics, Foundation Books, 2002 (Indian Edition).
2. Satellite Communication" by T. Pratt and C. W. Bostiern
3. M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., "Microwave Circuits and Passive Devices", New Age International Publishers Ltd., 1995.
4. Peter A. Rizzi, "Microwave Engineering Passive Circuits", PHI, 1999.

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EC461 SENSORS AND TRANSDUCERS

Course Description & Objectives:

As part of this course, students *understand the basic working principles of different sensors and understand the basic working principles of* transducers. To explain the operation of oscilloscopes and the basic circuit blocks in the design of an oscilloscope and to introduc*e the operation of various electronic Instruments which are used to measure the basic parameters.*

Course Outcome

Upon successful completion of this course, students should be able to:

CO1: Identify various sensors and their brief performance specifications.

CO2: Choose suitable sensor for a given physical variable and understand its principle characteristics.

CO3: Realise the different measurement systems.

CO4: Understand the working principles of Various transducers

UNIT I - Sensor - I

Basic sensor technology, sensor systems, Characteristics, conditioning bridge circuits, amplifiers for signal conditioning, different ADCs. Temperature sensors: RTD, thermister, thermocouple, basic principles, resistance temperature, characteristics, material required, application comparison, Position sensor. Displacement: capacitive sensors, potentiometer sensors. Speed: Hall Effect sensors.

UNIT II - Sensor – II

IR sensors for distant measurement: basic principle and applications. Accelerometer: characteristic, shock, vibration, pressure sensors, Flow, level, force, weight, sensors. Bio sensors, humidity, optical and thermal infrared detectors.

Unit III- Electronic instrumentation

Instrumentation and measurement systems, measurement system performance, static calibration, errors in measurement, true value, accuracy and precision, linearity, hysteresis, Errors in ammeters and voltmeters, permanent magnet moving coil, ohmmeters, measurement of self inductance, Schering bridge, measurement of frequency, sources of errors in bride circuits,

Unit IV - Electronic Measurements

CRO: Electro static deflection, post deflection acceleration of electron beam, observation of wave forms on CRO, measurements of voltages and currents, multi input oscilloscopes, Negative resistance oscillators, square wave and pulse generators, Function generator, Q meter.

UNIT V - Transducers

Classification of Transducers, stain gauges, photoelectric transducers, capacitive, inductive transducers, LVDT Thermoelectric transducers, load cell, light and proximity sensors, data acquisition systems.

TEXT BOOKS:

1. A.K Sawhney “Electrical and Electronic Measurements and Instrumentation” Dhanpat Rai & Co.
2. Sensors and actuators: control systems instrumentation Clarence W. De Silva CRC Press, 2007

REFERENCES BOOKS:

1. David A. Bell, “Electronic Instrumentation & Measurements”, 2nd ed., PHI, 2003.
2. A.K. Sawhany, “Electrical and Electronics Measurements & Instrumentation”, Dhanpath Roy & Co, 2005

MINOR SPECIALIZATIONS

A. MANAGEMENT

Minor - A. Management

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MS203 PRINCIPLES OF MANAGEMENT & ORGANIZATIONAL BEHAVIOUR

Course Description and Objective:

Objective of the course is to give basic perspectives of Management theories and practice. This will form foundation for further study of functional areas of management and give a conceptual framework for understanding.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand management thought and its evolution
2. Importance of planning and its process in the organizations
3. Process of organizing and types of organizational structures
4. Directing and control process in the organizations
5. Nature and scope of organizational behaviour

UNIT – I **- 14 Hrs**

Introduction to Management: Concept of management –- nature of management – importance of management – functions of management – evolution of management thought - scientific management – Modern management – human relations theories – management Vs administration.

UNIT – II **- 12 Hrs**

Planning: Importance – advantages – disadvantages – types of plans – process of planning – steps involved in planning, Techniques of planning - Decision – Decision Making – Process.

UNIT – III **- 10 Hrs**

Organizing: Principles of organization – types of organization structures, merits, demerits and suitability –Departmentation, Centralization and decentralization

UNIT – IV **- 14 Hrs**

Directing and Controlling: Meaning and Nature of Directing – leadership, Communications - formal and informal communication.
Controlling: Importance – Process and Techniques of controlling.

UNIT – V **- 10 Hrs**

Organizational Behaviour: Organizational Behaviour – Meaning – Nature and Scope of Organizational Behaviour – Contributions of different disciplines of OB – Context of OB – Organizational and Environmental context.

Text Books:

1. Rama Swamy, "Principles of Management", Himalaya Publication.
2. L.M.Prasad, "Principles and Practices of Management", Sultan Chand.

Reference Books:

1. Jonus A. F. Stoner, "Management", Thomson.
2. Heinz Weihrich, Harold Koontz, "Management A Global Perspective", TMH, 10/e, 2002.
3. Stephen P. Robbins Mary Coulter, "Management", PHI, 8/e, 2006

Minor - A. Management	L	T	P	To	C
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MS212 BUSINESS ENVIRONMENT AND ETHICS

Course Description and Objective:

To inculcate knowledge and awareness of Indian environment of business and it's impact on d business decision making and imbibe the ethical values in the minds of young entrepreneurs.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand components of business environment and their impact on business performance
2. Issues of socio - political environment and their influence on business
3. Challenges of Techno, economic and legal environmental factors on business efficiency
4. Importance of ethical environment in conducting business
5. Ethical implications and corporate social responsibility

UNIT – I **- 12 Hrs**

Business Environment: Introduction, Importance of Business Environment – External and Internal Environment – External Environment, Demographic, Social, Cultural, Political, Economic, Legal, Internal Environment of Business.

UNIT – II **- 12 Hrs**

Socio – Political Environment: Demographic Environment, undertaking demographic, Demographic classification, Social Environment, Undertaking Society, Social Class and Social Status, Social Stratification, understanding family, political environment, impact of political environment on business.

UNIT – III **- 12 Hrs**

Techno – Economic – legal environment: A brief review of industrial policies, since independence – Monetary policy – Balance of payments – Money and Capital Markets, Technological Environment–understanding technology and technology science.

UNIT – IV **- 12 Hrs**

Business Ethics: Ethics Analysis based on understanding of perceptual differences, Ethics and corporate social responsibility, Social responsibility.

UNIT – V **- 12 Hrs**

BUSINESS ETHICS AND CSR: Ethical implication technology, ethics in natural and global environment – corporate environmental responsibility.

TEXT BOOKS:

1. K.Aswathappa, “Essentials of Business Environment”, 5th ed., Himalaya 2007.
2. S.K.Chakraborty, “The Management and Ethics”, 5th ed., Oxford University Press, 2008.

REFERENCE BOOKS:

1. Francis cherunilam, “Business Environment Text and Cases”, 17th ed., Himalaya, 2008.
2. Dutt and Sundaram, “Indian Economy”,17th ed., S. Chand, New Delhi, 2009.
3. William H. Shaw, Vincent Barry, “Moral Issues in Business”, 6th ed., Thomson, 2008.

Minor - A. Management

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MS303 MARKETING AND HR MANAGEMENT

Course Description and Objective :

The objective of the course is to provide basic knowledge of functional areas of Management i.e., Marketing and Human Resource Management and their importance in achieving organizational goals.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand concepts of marketing and Indian marketing environment
2. Importance of segmentation, targeting and positioning in marketing planning
3. Importance of Marketing mix elements in attracting customers to buy
4. Nature, scope, importance and functions of HRM
5. Job analysis, performance evaluation, wage and salary administration

UNIT – I **- 12 Hrs**

Introduction to Marketing: Needs, Wants, Demands, Products, Exchange, Transactions, Market, Marketing, Production Concept, Product Concept, Sales Concept, Marketing Concept, Societal Marketing Concept, Marketing Environment, Indian Marketing Environment.

UNIT – II **- 12 Hrs**

Market Segmentation: Identification of Market Segments – Consumer and Institutional / Corporate Clientele – Segmenting Consumer Markets, Segmentation Basis, Selecting Target Markets, Segmentation and Targeting as a Basis for Strategy Formulation, Developing and Communicating a Positioning Strategy.

UNIT – III **- 12 Hrs**

Marketing Mix Elements:

A. Product Management: Product Life Cycle, Product Line, Product Mix, Product-line decisions, Brand decisions, classification of new products, New Product Development

B. Pricing Strategy: Objectives of Pricing, Methods of Pricing.

C. Sales And distribution Management:

D. Marketing Communication: The communication process, Communication mix, Managing advertising, sales promotion, Public relations and Direct Marketing.

UNIT – IV **- 12 Hrs**

Human Resource Management: Introduction: Definition, Nature – Scope – Objective – Importance – Functions of HRM – Challenges of HRM, Human Resource Planning Process – Corporate social responsibility.

UNIT – V **- 12 Hrs**

Human Resource Development Process: Basic prerequisites – Job Analysis, Job Description – Job Specification and evaluation – Job Design – Training Methods – Performance Appraisal – Objectives – Methods – Wage and Salary Administration.

TEXT BOOKS:

1. Rajan Saxena, "Marketing Management", 2nd ed., TMH, 2006.
2. V.S.Ramaswamy , S.Namakumari, "Marketing Management", 3rd ed., Macmillan, 2003.

REFERENCE BOOKS:

1. Phillip Kotler, "Maketing Management", 11th ed, Pearson Publishers, 2007.
2. Philip Kotler and Kelvin Lane, "Marketing Mangement", 12th ed., Pearson Education, 2007.
3. Mirza S. Saiyadain – "Human Resource Management", 5th ed., Tata McGraw-Hill, 2001.
4. Aswatappa, "Human Resource and Personnel Management" 10th ed., Tata McGraw Hill,2009.

Minor - A. Management	**L**	**T**	**P**	**To**	**C**
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MS310 ENTREPRENEURSHIP AND PROJECT MANAGEMENT

Course Description and Objective:

To provide the knowledge of essentials of entrepreneurship and government role in promoting entrepreneurship. The course also covers basics of project management and Networking techniques.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand essentials of entrepreneurship and factors effecting entrepreneurship
2. Entrepreneurial motivation, steps involved in preparing a business plan
3. Government role in promoting entrepreneurship
4. Causes of sickness and measures to revival
5. Essentials of project management and project management techniques

UNIT – I **- 12 Hrs**

Introduction to Entrepreneurship: Definition of entrepreneurship, characteristics of entrepreneurship, evolution of the term entrepreneur, traits of an entrepreneur, functions of an entrepreneur and enterprise, stages in entrepreneurial process, barriers to entrepreneurship, environmental factors affecting entrepreneurship.

UNIT – II **- 12 Hrs**

Entrepreneurial motivation: the motivating factors, entrepreneurial ambitions, compelling factors, facilitating factors, the achievement motivation, business plan and steps involved in business plan.

UNIT – III **- 12 Hrs**

Governmental role in promoting entrepreneurship: role of DIC, SIDO, SISI, NSIC, SIDBI, NISIET, PMEGP, commercial banks, subsidies and incentives offered by the government.

UNIT – IV **- 12 Hrs**

Sickness and measures to revival sickness: sickness causes – marketing, finance, production, human resources, poor management, competition, lack of infrastructure management.

Understanding the causes for sickness, role of the government in reviving the sick units.

UNIT – V **- 12 Hrs**

Project evaluation, auditing and monitoring: project feasibility study, techniques of project evaluation, and steps in project auditing, project monitoring and its procedure, project management techniques-CPM, PERT, GANTT CHART, and project CRASHING.

Text Books:

1. H. Nandan, "Fundamentals of Entrepreneurship", 5th ed., PHI, New Delhi, 2007.
2. P Gopalkrishnan & V E Ramamoorthy, "Text Book of Project Management", 6th ed., McMillan, 2008.

Reference Books:

1. Robert D Hisrch, Michael P Peters, Dean A Shpherd, "Entrepreneurship", 6th ed., New Delhi, 2006.
2. N Singh, "Project Management & Control", 6th ed., Himalaya, 2007.
3. Dr. C. B. Gupta, Dr. S. S Khanka "Entrepreneurship and Small Business Management", 4th ed., Sultan Chand & Sons, New Delhi.
4. Dr. C. B. Gupta, Dr. N.P. Srinivasan "Entrepreneurship Development in India", 5th ed., Sultan Chand & Sons, New Delhi.

Minor - A. Management	L	T	P	To	C
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MS409 PRODUCTION AND OPERATIONS MANAGEMENT

Course Description and Objectives:

The objective of the course is to enable students to learn the basics of Operations and Production which will help them in understanding actual business process. Important concepts of TQM, Six Sigma and ISO series are also covered in the course.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand production and production systems and value engineering
2. Factors effecting plant location and essentials of materials management
3. Concepts of work study, method study and reliability
4. Importance of quality control and concepts of TQM, Six Sigma and ISO series
5. Recent developments in production and operations management

UNIT – I

Production: Systems concept of Production, characteristics of modern production operations management, recent trends in production and operations management.
Types of Production Systems: Flow, Job-shop and Batch manufacturing.

Productivity: Basic concepts, measurement of productivity – total productivity, factor productivity, methods for improvement of productivity.
Product design, new product development and value engineering.

UNIT – II

Plant location and layout: Factors affecting plant location and layout, types of plant layouts – process, product and fixed position layout.

Material management: inventory control, purchase function, ABC analysis, Economic Order Quantity (EOQ) and just in time concept.

UNIT - III

Work study – Method study, Time study, Standard time calculations, work sampling.

Plant Maintenance – preventive, breakdown, total productive maintenance.

Reliability – concept of reliability, reliability improvement and calculations.

UNIT - IV

Quality control – quality, quality control, quality control vs inspection and statistical quality control. Control charts for variables and attributes. Six sigma, ISO series, TQM & Demings contribution to quality.

UNIT - V

Modern production & international operations management : Just-in-time manufacturing, kaizen, Business process reengineering, supply chain management, lean manufacturing.

Nature of international operations management: Strategic issues, outsourcing, managing service operations, international quality standards, TQM, internationalization of R & D.

TEXT BOOKS:

1. R. Paannerselvam, "Production and Operations Management", 2nd ed., PHI 2006.
2. K. Aswathappa, K.Sridhara Bhat, "Production and Operations Management", 2nd ed., HPH, 2010.

REFERENCE BOOKS:

1. S. N. Chary, "Production and Operations Management", 6th ed., Tata McGraw-Hill, 2006
2. Buffa, "Modern Production Operation Management", 6th ed., Willey 2008.
3. Joseph S Matrinich, "Production and Operations Management", 8th ed., Willey 2008.

MINOR SPECIALIZATIONS

C. INFORMATION TECHNOLOGY

Minor-C Information Technology	**L**	**T**	**P**	**To**	**C**
	4	0	-	4	4

CS223 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course description and Objectives:

On Completion of this course, the student will be able to understand fundamentals of object- oriented programming in Java, including defining classes, invoking methods, using class libraries. Have the ability to write a computer program to solve specified problems. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

The student is expected to have

- *Understanding of OOP concepts and basics of java programming (Console and GUI based)*
- *The skills to apply OOP and Java programming in problem solving*
- *Should have the ability to extend his knowledge of Java programming further on his/her own.*

UNIT I - Introduction, Classes and Objects

Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects Class fundamentals – Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT II - Inheritance, Packages and Interfaces

Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces.

UNIT III - Exception Handling, Multithreading

Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating own exception Sub classes, Concepts of Multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, deadlocks, Thread groups.

UNIT IV - Applets & Event Handling & AWT Controls

Applet Class, Applet Architecture, Applet Skeleton - Applet Initialization and Termination, Overriding update(), Simple Applet, Display Methods, Requesting Repainting - A simple banner Applet, Using The Status Window, The HTML APPLET Tag, Passing parameters to Applets, Applet Context and show Document.

Event sources, Event classes – ActionEvent, AdjustmentEvent, ComponentEvent, Container Event, Focus Event, InputEvent, ItemEvent, KeyEvent and MouseEvent, Delegation event model, Event Listeners, Handling mouse and Keyboard events, Adapter classes.

UNIT V - AWT & Swing

Concepts of components, Container, Panel, Window, Frame, Canvas, Font class, Color class and Graphics. AWT Controls : Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers - Flow, Border, Grid, Card and Grid bag.

JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, Text fields, Buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS

1. Herbert Schildt, “The Complete Reference Java J2SE”, 7th ed., TMH Publishing Company Ltd, New Delhi, 2008.
2. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd ed., TMH, 2009.

REFERENCE BOOKS

1. Cay Horstmann, “Big Java”, 2nd ed., John Wiley and Sons, 2006.

Minor-C Information Technology

L	T	P	To	C
4	0	-	4	4

IT201 INTERNET AND WEB TECHNOLOGIES

Course Description & Objectives:

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

Course Outcomes:

- *Analyze a web page and identify its elements and attributes.*
- *Create web pages using XHTML and Cascading Style Sheets.*
- *Build dynamic web pages using JavaScript (Client side programming).*
- *Create XML documents and Schemas.*
- *Build interactive web applications using AJAX.*

UNIT I - Networking Concepts

Introduction, Protocols in Computer Communications, the OSI Model, OSI Layer Functions.

Introduction, Why Internet Working?, Problems in Internet Working, Dealing with Incompatibility Issues, A Virtual Network, Internet Working Devices, Repeaters, Bridges, Routers, Gateways, A Brief History of the Internet, Growth of the Internet.

UNIT II - Network Protocols

Introduction, Brief History of WWW, the Basics of WWW and Browsing, Hyper Text Markup Language, Common Gateway Interface, Remote Login.

UNIT III -JavaScript and AJAX

Introduction, JavaScript, Basic Concepts, Controlling JavaScript Execution, Miscellaneous Features, JavaScript and Form Processing, Pop-up Boxes. AJAX:Introduction, How AJAX Works?, Life without AJAX, AJAX Coding, Life with AJAX.

UNIT IV -Introduction to XML

What is XML?, XML versus HTML, Electronic Data Interchange, XML Terminology, Introduction to DTD,Document-Type Declaration,Element-Type Declaration,Attribute Declaration,Limitations of DTDs, Introduction to Schema, Complex Types, Extensible Stylesheet Language Transformations, Basics of Parsing, JAXP

UNIT V - Creating Good Web Pages

Introduction, Top Level Navigation, Creating Sample Layouts, Metaphor, Theme, and Storyboard, Screen Resolution,3-Column Layout, Using Frameworks, Using Graphics, Usability for the Handheld Devices, Creating Multilingual Web sites, XHTML and Web Browser Compatibility Issues, Designing the Basic Elements of a Home Page.

TEXT BOOK:

1. Achyut Godbole,Atul Kahate"Web Technologies:TCP/IP,Web/Java Programming, and Cloud Computing",Third Edition,McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
2. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill, 2007.

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CS315 OPERATING SYSTEMS

Course Description & Objective:

In this course students should understand how the operating system effectively manages system resources.

Course Outcomes:

- *To understand the types of Operating systems and analyze the process scheduling Algorithms and Case study on processing Scheduling.*
- *To understand the resource sharing among the processes in the system.*
- *To understand how to manage the memory during the process execution (Memory Management) and File Management system.*

UNIT I - Introduction

What Operating System do, Operating System structure. Process Concept: Overview, Process scheduling, Operations on process, Inter process communication. Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Case Study: Process scheduling in Linux.

UNIT II - Process Synchronization

The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors, Classical problems of synchronization, Case Study : Process Synchronization in Linux.

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UNIT III - Deadlocks

Deadlock Characterization, Methods of Handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock Detection and Recovery.

UNIT IV - Memory Management

Continuous memory allocation, paging, structure of the page table, segmentation, demand paging, page replacement algorithms.

UNIT V - File System

File Concept, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File-System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management.

Secondary-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, RAID Structure.

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Principles", 7th edition, John Wiley & Sons Inc, 2006.

REFERENCE BOOKS:

1. William Stallings, "Operating Systems – Operating System: Internals and Design Principles", 6th edition, , Prentice Hall, 2005.
2. Andrew S Tanenbaum ,"Modern Operating Systems", 3rd edition, , Prentice Hall, 2007.

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IT311 UNIX AND SHELL PROGRAMMING

Course Description & Objectives :

Effectively use Unix and C to write, test, debug, and maintain modest-sized programs, design, build, and use software tools that fit well into Unix, writing such tools both in the Bourne Shell and in C, using Unix arguments and standard input and output facilities, design modest-sized program using independent modules (abstract data types), that offer some potential for reuse, clearly explain the principles behind Unix concepts such as the file system structure, pipelines, file permissions, and environments use standard C libraries (including the standard C library, stdio, and ctype) and their associated header files effectively in writing programs.

Course Outcomes:

- *Students will have learned to use the Unix system as programmers and developers.*
- *Students will learn Unix structure, commands, and utilities.*
- *Students will become versed with regular expressions and shell programming.*

UNIT I - Introduction to Unix

Introduction to UNIX, Unix structure, Unix Features, Common commands - Date, Time,

Calender, Who, Password, Echo and Man, Basic Vi editor - Modes, Commands Related to Modes, Inserting, Deleting Text and Moving Cursor, FileSystems, FileNames, FileTypes, Directories, File Permissions, Commands to be covered here are : cp, mv, ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, umask, ulimit, ps, who, finger, arp, ftp, telnet and rlogin, process utilities, Disk & network utilities.

UNIT II - Unix Utilities

What is a shell, Shell relationships,Standard streams,Redirection, Pipes, Tee command, Command Substitution, Shell variables, Conditions, History and control structures and Shell programming. Filters, Text processing utilities and backup utilities, Detailed commands to be covered are: cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, more, pg, comm, cmp, diff, tr, awk and tar.

UNIT III- File I/O & File Directories

File descriptor, open function, close function, Create function,lseek, read,write, Filesharing, dup and dup2 functions, fcntl, ioctl functions. File status, Stat, fstat, lstat Functions, File types, Permission, Ownership of new files and Directories, File system, Links, File times, Directory related functions, The System calls to be covered are : access,umask, chmod, fchmod, chown, link, unlink, symlink, mkdir, rmdir, chdir, fchdir, getcwd and utime.

UNIT IV- Environment of Unix Process & Process control

Process identifiers, fork, vfork, exit, wait, waitpid, wait3, exec Functions, Race conditions, Zombie process. Signal Concepts, Signal handling, Important signals: kill, raise, alarm, pause, and abort.

UNIT V -Inter Process Communication

Pipes, FIFO, System V IPC – Message Queue, Semaphore and Shared Memory.

TEXT BOOKS :

1. Behrouz A. Forouzan, Richard F.Gilberg, “Unix and shell Programming”, 1st ed.,Thomson, 2005.
2. W.R.Stevens, “Advanced Programming in the UNIX environment”, 1st ed., Pearson Education, 2006.

REFERENCE BOOKS :

1. Uresh vahalia, “Unix internals,the new frontiers”, 1st ed., Printice Hall Publications, 1995.
2. Meeta Gandhi, “The C Odyssey UNIX “, 3rd ed., BPB Publications, 2004.
3. Yashwant Kanitkar, “Unix Shell programming”, 1st ed., BPB publications, 1996
4. Sumithabha Das, “Unix The Ultimate Guide”, 1st ed., Tata McGraw Hill, 2008.

Minor-C Information Technology	**L**	**T**	**P**	**To**	**C**
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CS222 DATABASE SYSTEMS

Course description and Objectives:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS. The course will focus on 5 main areas such as Information gathering, Data analysis, Database design, Concurrency and robustness, Efficiency and scalability.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- *Describe the fundamental elements of relational database management systems*
- *Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.*
- *Design ER-models to represent simple database application scenarios*
- *Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.*
- *Improve the database design by normalization.*

UNIT I - Database System- concepts and architecture

Data modelling using the Entity Relationship (ER) modelling and Enhanced Entity Relationship (EER) modelling, Specialization and Generalization.

UNIT II - The Relational Model

Relational database design using ER to relational mapping, Relational algebra and relational calculus, Tuple Relational Calculus, Domain Relational Calculus, SQL.

UNIT III - Database design theory and methodology

Functional dependencies and normalization of relations, Normal Forms, Properties of relational decomposition, Algorithms for relational database schema design.

UNIT IV - Transaction processing concepts

Schedules and serializability, Concurrency control, Two Phase Locking Techniques, Optimistic Concurrency Control, Database recovery concepts and techniques.

UNIT V - Data Storage and indexing

Single level and multi level indexing, Dynamic Multi level indexing using B Trees and B+ Trees, Query processing and Query Optimization, Introduction to database security.

TEXT BOOKS:

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems (5/e), Pearson Education, 2008.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill, 2003.

REFERENCE BOOKS:

1. Silberschatz, Korth, “Data base System Concepts”, 4th ed., McGraw hill, 2006.
2. Peter Rob and Carlos Coronel, Database Systesm- Design, Implementation and Management (7/e), Cengage Learning, 2007.

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CS434 MULTIMEDIA SYSTEMS

Course Description and Objectives:

Understand the characteristics of multimedia systems and how to address issues Be aware of the differences among multimedia authoring systems. Be familiar with the software development process as practiced in a multimedia development environment Be able to design, write, document, debug and evaluate a non trivial multimedia system. Appreciate and understand the legal and ethical issues associated with developing multimedia systems, particularly in regard to use of media clips developed by others.

Course Outcomes:

- *Write action script for a particular problem.*
- *Design and Draw customized GUI components.*
- *Apply Transformations on Components.*
- *To make use of fundamental concepts and formulate best practices*

UNIT I

Introduction to Multimedia, Media and Data Streams, Sound/Audio, Images and Graphics, Video and Animation.

UNIT II

Data Compression, Optical Storage Media; Computer Technology, Multimedia Operating Systems.

UNIT III

Networking Systems, Multimedia Communication Systems; Database Systems.

UNIT IV

Multimedia Architecture; Multimedia Documents, Hypertext and MHEG.

UNIT V

User Interfaces, Synchronization, Abstractions for Programming; Multimedia Application Development; Virtual Reality; Future Directions.

TEXT BOOKS:

1. Ralf Steinmetz, Klara Nahrstedt "Multimedia: Computing Communications & Applications" Pearson Education (2004)
2. Parekh Ranjan "Principles of Multimedia" Tata McGraw-Hill (2007)

REFERENCE BOOKS:

1. John E Koegal, Buford "Multimedia Systems" IIBK. (1994)
2. John Vince "Virtual Reality Systems" ACM Press (1995)

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CS225 SOFTWARE ENGINEERING

Course Description and Objectives:

This course will be helpful for the student to understand the concept of a software life cycle, the role of process models and how to produce a set of software requirements. This course introduces the concepts and methods required for the construction of large software intensive systems. It aims to develop a broad understanding of the discipline of software engineering.

Course Outcomes:

After completing the course students will be able to:

- *Plan a software engineering process to account for quality issues and non-functional requirements;*
- *Employ a selection of concepts and techniques to complete a small-scale analysis and design project.*
- *Interact with a client to elicit input, and communicate progress.*
- *Employ group working skills - including general organization, planning and time management, and inter-group negotiation, etc.*
- *Translate a specification into a design, and then realize that design practically, all using an appropriate software engineering methodology.*

UNIT I - Introduction to Software Engineering

The evolving role of software, Changing Nature of Software, Software myths. Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models. The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

UNIT II - Requirements Engineering & Analysis Modeling

Requirements engineering Tasks: Inception, elicitation, elaboration, negotiation, specification, validation, requirements management.

Initiation of requirements engineering process: Identify stakeholders recognizing multiple view points, working towards collaborator, asking the first question. Building the analysis model: data modeling-data objects, attributes, relationship, cardinality and modularity. Class based modeling: identify analysis classes, specify attributes, and define operations, CRC model, association and dependency, analysis package**.**

UNIT III - Software Design

Design Engineering: Design process and Design quality, Design concepts, the design model, Data flow diagrams, process specification.
Creating an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural Design.
Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

UNIT IV - Process & Product Metrics and Software Testing

Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. Metrics for Process and Products: Software Measurement, Metrics for software quality.
Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

UNIT V - Risk & Quality Management

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

TEXT BOOKS

1. Roger S. Pressman “Software Engineering, A practitioner’s Approach”, 6th ed., McGrawHill International Edition, 2008.

REFERENCE BOOKS

1. Sommervelle “Software Engineering”,7th ed., Pearson education, 2008.
2. Shely Cashman Rosenblatt,” Systems Analysis and Design” 1st ed., Thomson Publications,2006.

Minor-C Information Technology

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CS425 DATAWAREHOUSING & DATAMINING

Course Description and Objectives:

This course is about knowing of how to make use of historical data so that high end business decision can be taken for the growth of an organization. The main objective of this course is to designing the intelligent machines which can take risk business decisions behalf of humans using the datamining techniques like classification, clustering, outlier detection, association rule mining.

Course Outcomes:

Students are able to

- *Learn the basic concepts of Database Technology Evaluation steps and also understood the need of data mining and its functionalities*
- *Explore the efficient and effective maintenance of Data Warehouses.*
- *Apply the data mining functionalities like Clustering, Classification, Association Analysis to real world data.*
- *Discover interesting patterns and association rules from huge volume of data used to do classifications and predictions.*
- *Gain knowledge on developing areas like Web Mining, Text Mining, and Spatial Mining.*

UNIT I - Introduction & Data Warehousing

Why Data Mining, What is Data Mining, Kinds of Data, Kinds of Patterns, and Technologies used, Kinds of applications adopted, Major issues in Data Mining.

Basic Concepts, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction

UNIT II - Data Preprocessing

Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT III - Data Cube Technology

Preliminary Concepts, Data Cube Computation Methods, Processing Advanced Kinds of Queries by Exploring Cube Technology, Multidimensional Data Analysis in Cube Space

Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods

Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining

UNIT IV - Classification & Advanced Classification

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy

Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Classification Using Frequent Patterns, Lazy Learners, Other Classification Methods

UNIT V - Cluster Analysis & Advanced Cluster Analysis

Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering

Probabilistic Model-Based Clustering, Clustering High-Dimensional Data

TEXT BOOKS:

1. Jiawei Han Micheline Kamber – “Data Mining Concepts & Techniques”, Third Edition, Morgan Kaufmann Publishers, 2012.

REFERENCE BOOKS :

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, First Edition,2012.
2. Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit”, first edition John Wiley and Sons Inc., 2002.
3. Alex Berson, Stephen Smith, Kurt Thearling, “Building Data Mining Applications for CRM”, first edition, Tata McGraw Hill, 2000.
4. Margaret Dunham, “Data Mining: Introductory and Advanced Topics”, first edition, Prentice Hall, 2002.
5. Paulraj Ponnaiah, “Data Warehousing Fundamentals”, first edition, Wiley Publishers, 2001.

Minor-C Information Technology

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CS435 SOFTWARE TESTING METHODOLOGIES

Course Description and Objectives:

Software testing is a subject where the student will learn and apply basic skills needed to create and automate the test plan of a software project.It aims to describe principles and strategies for generating system test cases and to understand the essential characteristics of tools used for test automation.

Course Outcomes:

Students who have completed this course would have learned

- *Various test processes and continuous quality improvement*
- *Types of errors and fault models*
- *Methods of test generation from requirements*
- *Behavior modeling using UML: Finite state machines (FSM)*
- *Test adequacy assessment using: control flow, data flow, and program mutations*

UNIT I - Introduction

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II - Transaction Flow Testing & Domain Testing

Transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT III - Paths, Path products and Regular expressions

Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

UNIT IV - Logic Based Testing & State, State Graphs and Transition testing
Overview, decision tables, path expressions, kv charts, specifications.
State graphs, good & bad state graphs, state testing, Testability tips.

UNIT V - Graph Matrices and Application
Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Winrunner tools for functional / Regression testing (Ref Text book2).

TEXT BOOKS:

1. Boris Beizer, “Software Testing Techniques”, 2nd ed., Dreamtech, 2006.
2. Dr.K.V.K.K.Prasad, “Software Testing Tools”, 1st ed., Dreamtech. 2008.

REFERENCES BOOKS:

1. Brian Marick, “The craft of software testing”, 2nd ed., Pearson Education, 2007.
2. Edward Kit, “Software Testing in the Real World “, 2nd ed., Pearson Education, 2008.

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	4	0	-	4	4

CS322 OBJECT ORIENTED ANALYSIS & DESIGN

Course Description and Objectives:

This course explains how a software design may be represented as a set of interacting objects that manage their own state and operations. It describes the activities in the object - oriented design process and introduces various models that can be used to describe an object-oriented design.

Course Outcomes:

- *To understand the fundamental principles of Object Oriented programming.*
- *To master key principles in Object Oriented analysis, design, and development.*
- *Be familiar with the application of the Unified Modelling Language (UML) towards analysis and design.*

- *To know common patterns in Object Oriented design and implement them.*
- *To be familiar with alternative development processes.*

UNIT I - Introduction to UML

Importance of Modeling, Principles of Modeling, Object Oriented Modeling, Conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II - Basic Structural Modeling & Basic Behavioral Modeling

Classes, Relationships, Common Mechanisms, and Diagrams. Use cases, Use case Diagrams, Interactions, Interaction Diagrams, Activity Diagrams.

UNIT III - Class & Object Diagrams

Terms, Concepts, Modeling Techniques for Class & Object Diagrams.

UNIT IV - Advanced Structural Modeling & Advanced Behavioral Modeling

Advanced Classes, Advanced Relationships, Interfaces, Types and Roles, Packages.

Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.

UNIT V - Architectural Modeling

Component, Deployment, Component Diagrams and Deployment Diagrams.

TEXT BOOKS:

1. Booch G., Rumbaugh J. & Jacobsons I., “The Unified Modeling Language User Guide”, Addison Wesley, 2002.

REFERENCE BOOKS:

1. Meilir Page-Jones, “Fundamentals of Object Oriented Design in UML”, 4th ed., Pearson Education, 2008.
2. Pascal Roques, “Modeling Software Systems Using UML2”, 2nd ed., WILEY- Dreamtech India Pvt. Ltd, 2004.
3. Atul Kahate, “Object Oriented Analysis & Design”, 1st ed., The McGraw-Hill Companies, 2008.
4. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, “UML 2 Toolkit”, 1st ed., WILEYDreamtech India Pvt. Ltd., 2003.

MINOR SPECIALIZATIONS

B. HUMANITIES & SCIENCES

Minor-B Humanities	L	T	P	To	C
	4	0	-	4	4

Paper – I (II Year) : HS219: INDIAN HISTORY AND CULTURE

Course Description &objectives:

This course introduces basic understanding of Indian culture and history. The course objective is to describe the various stages of the Indian history and their importance, understand the importance of different historical events in shaping the Indian history and to enable the students understand the relevance of Indian history and make them much more socio-conscious in the society.

Course Outcomes:

1. To acquaint the students with the Indian history and culture.
2. To prepare the students for the civil services examinations [as Indian history is very important both at the prelims and mains level].
3. To make the students more inclined knowing Indian history not only from the examination point of view but to feel proud of our rich cultural heritage [literature , music , sculpture , art , architecture].
4. To make the students balanced individuals, responsible in protecting and glorifying our history.

Unit- I Ancient Indian History

Prehistoric Background of Indian culture.
Harappan culture – Cities – Society – economy and trade - End of the Harappan cities.
Society and Economy of the early Vedic and later Vedic periods
Emergence and Spread of Puranic thesim, Buddhism and Jainism.
Mauryans, Post Mauryans and Sangam Period
The age of Satavahanas and the Guptas
The Pallavas, the Chalukyas and the Cholas

Unit –II Medieval Indian History

General Conditions under the Delhi Sultanate.
General Conditions under the rulers of the Vijayanagara Empire.
General Conditions under the rule of the Mughals
Shivaji and the rise of the Marathas.
Bhakti Movement

General Conditions under the rule of the Mughals

Shivaji and the rise of the Marathas.

Bhakti Movement

Unit – III Indian Culture

Salient aspects of Art forms – Music and Dance
Language and Literature
Architecture and Sculpture
Paintings and places of Cultural interest

Unit –IV British Rule in India

The Beginning of European settlements.
Government and the economic policies of the British empire in India 1757 – 1857.
The First War of Independence of 1857 and the consequent administrative changes.
Religious and Social Reforms after 1858.

Unit – V Struggle for freedom

Economic impact of the British rule
The national Movement 1858-1885; 1885-1905; 1905-1920; 1920-1947
Contribution from various states
India after Independence- Post independence consolidation of states

Text Books

1. Romila Thapar — A History of India –I – Penguin Books
2. Percival Spear — A History of India –II – Penguin Books

References Books

1. S.L. Mukharjee — Ancient History of India, Tata Mc Graw Hill,2008
2. S.L. Mukharjee — Medieval History of India,Tata Mc Graw Hill,2008
3. Bipin Chandra — Indian Struggle of Independence, Viking , 2007.
4. A.L Basham (ed) — A Cultural History of India , Oxford, 1975.

Minor-B Humanities	L	T	P	To	C
	4	0	-	4	4

Paper – II (II Year): HS224: Polity and Governance of India

Course Description &objectives:

This course introduces basic understanding of Indian polity and constitution. The course objective is to make students to understand the functioning of government at the centre and state level besides local self government as outlined in the constitution and gives basic knowledge about the fundamental rights & duties of a citizen besides gives the knowledge about Elections and Democracy at work.

Course Outcomes:

1. Applies the constitution and its principles to the day to day happenings.
2. Inculcates the respect for the constitution and rights of others besides safeguarding one's own rights.
3. Analyzes functioning of executive, legislative and Judiciary.
4. Compares the Indian constitution with other countries

Unit -I : Overview of Indian constitution

Making of Indian constitution

Salient features

Preamble

Significant Provisions; Amendments; Basic structure

Unit – II: working of the Indian Constitution

Features of Indian Federal system

Centre-State relations- Legislative, executive, financial

Issues and concerns – coalition governments ; Administrative Reforms

Unit - III: Structure of the Government

Union Government

State Government

Local Government

Unit – IV: Powers and Functions of Constitutional, Statutory and Non statutory bodies

Constitutional - Election Commission, UPSC, Finance Commission, CAG etc.,

Statutory - NHRC, CVC, etc.,

Non statutory – Planning Commission, National Development Council etc.,

Unit – V: Political Dynamics

Representation of Peoples' Act

Political Parties

Pressure Groups

Elections, Electoral Reforms

Transparency, Accountability and Right to Information

TEXT BOOKS:

1. D.D. Basu—Indian Constitution
2. Subhash C. Kashyap : Our Parliament, Publication Division

References:

1. P.M. Bakshi—Indian Constitution
2. Laxmikanth, Indian Polity

Minor-B Humanities	L	T	P	To	C
	4	0	-	4	4

Paper – III (III Year): HS307 Economic and Social Development of India

Course Description &objectives:

This course introduces basic understanding of Indian economy. The course objective is to make students to understand the role of government in managing economy and gives basic knowledge about different sectors of the economy besides equipping them the tools to analyze the state of current economy.

Course Outcomes:

1. Applies the macro economics techniques and its principles to the day to day happenings.

2. Inculcates the respect for the constitution and rights of others besides safeguarding one's own rights.
3. Analyzes functioning of state of economy.
4. Analyzes the impact of external sector on Indian economy

Unit I: Structure of the Economy

Basic Concepts

Sources of Revenue and classification of expenditures of Union Government

Fiscal indicators

Structure of the Economy

Recent trends in the National Income

Performance on the social front

Unit II: LPG Policies

Transition from Centralized Planning to Indicative Planning

LPG Policies

Globalisation and its discontents

WTO, TRIPS, TRIMS, GATS

Unit III: Agrarian Issues

Agrarian Structure, Land Reforms

Farm subsidies, Agricultural Price Policies, Food Security

Agrarian Crisis and Farmer suicides, WTO and Indian Agriculture

Unit IV: Industrial Strategy

Strategy of Industralisation, Special Economic Zones, FDI Policy

Multi-National Companies and their importance

Rise of Corporate power in India

Privatization and Disinvestment policies

Infrastructure policies

Unit V: Poverty Alleviation Programmes

Measures of Poverty and inequality and trends therein

Anti Poverty Programmers -

Public Distribution System

Wage Employment Programmes

Concepts of Social justice and Inclusive growth and their components

TEXT BOOKS:

1. Dutt and Sundaram: "Indian Enconomy", 2014 edition, S. Chand & Co.
2. Misra & Puri: "Indian Economy", 2014 edition, Himalaya Publications.

REFERENCE BOOKS :

1. Vivek Kumar Singh: "CSAT Comprehensive Manual" 2014 edition.
2. Joseph E. Stigltz (2003) : "Globalization and its Discontents" W.W Norton,
3. Jean Dreze and Amartya Sen (2014) : "An Uncertain Glory : India and its Contradictions" Penguin.
4. Ramesh Singh (2014): "Indian Economy for Civil Services Examinations", Mc Graw Hill.

Minor-B Humanities	L	T	P	To	C
	4	0	-	4	4

Paper – IV (III Year): HS308 Basic Numeracy, Mental Ability and Logical Reasoning

Course Description and Objectives:

Students will be introduced to various Arithmetic and Reasoning Problems.

The students will have acquaintance with various problems like Simple and Compound Interest, Time & distance etc. besides solving puzzles and Non verbal Reasoning.

Course Outcomes:

Upon successful completion of this course, students should able to

1. Student can meet the demands of current job market besides equipping them higher studies like CAT,GMAT etc...
2. Solves Arithmetic and Reasoning Problems within shortest possible time without paper work.
3. Student exhibits better analytical skills and aptitude skills.
4. Student develops interpretational skills.

Unit I: Basic Numeracy and Data Interpretation:

Number systems, Number Series, HCF and LCF of Numbers, Fraction, Simplification, Percentage, Average, Ratio and Proportion, Partnership and Share, mixtures, Chain Rule

Unit II: Basic Numeracy and Data Interpretation:

Time and work, Time and Distance, Profit, Loss and Discount, Simple Interest, Trains, Clocks, Area of Plane Figures, Data Interpretation, Data Sufficiency

Unit IV: General Mental Ability:
Syllogisms, Logical Deductions, Statements and Conclusions, Statements and Assumptions, Statements and Courses of Action and Reasoning,

Unit III: General Mental Ability;
Set theory, Venn and Network Diagrams, Permutations and Combinations, Probability

Unit V: Logical Reasoning:
Verbal reasoning, Logical Reasoning based on Arrangements and Ranking, Team Formations, Quantitative Reasoning, Sequence and Series, Blood Relationships, Direction Test, Puzzle Test.

TEXT BOOKS:

1. Quantitative Aptitude for Competitive Examinations by R. S. Aggarwal (2013)

2. The Pearson Guide to Quantitative Aptitude for Competitive Examinations by Dinesh Khattar (2013)

REFERENCE BOOKS:

1. Quantitative Aptitude for Competitive Examinations by Trishna Knowledge Systems (2013)

2. A Modern Approach to Verbal & Non-Verbal Reasoning by R. S. Aggarwal (February 2010

Minor-B Humanities	L	T	P	To	C
	4	0	-	4	4

Paper – V (IV Year): HS403 Geography and Environmental Concerns of India

Course Description and Objectives:
Students will be introduced to various phenomena like El-Nino, Global Warming both at Global and Regional levels and several physiographic phenomena like origin and distribution of Earth quakes, volcanoes tsunamis and resources.

Course Outcomes:

Upon successful completion of this course, students should able to

1. Analyses oceanic and climatic phenomena.
2. The students will analyze the regional issues inconsonance with global happenings.
3. Student will apply general principles of geography and environment and can provide the solutions.
4. Inculcates environment consciousness.

Unit I: Geography

Fundamental concepts of Geography

Physical Geography of India – River systems, climate, soils, minerals, geological Strata, climatic regions, natural vegetation,

Races and Physical Types of People

Unit II: Scientific and Technological Development

Milestones in India's scientific and technological progress in diverse fields – space, Nuclear, IT, Defense, Agriculture and Rural technologies

Prominent scientists of India and their contribution

Recent initiatives to spread scientific temper and S&T practices

Issues relating to Intellectual Property Rights

Unit III: Energy Sources

Sources of Energy-availability and consumption pattern, Energy policy and pricing

Issues relating to hydel power (Big Dams), Thermal Plants and Nuclear power

Green Energy technologies and their importance

Unit IV: Biodiversity

Meaning and importance of Bio-diversity, Sustainable Development Ecosystems and their management

Bio-Diversity of India, Bio- spheres and Biodiversity hot spots of India

Initiatives to preserve bio-diversity

Unit V: Environmental issues.

Magnitude, causes and consequences of environmental pollution in India

Factors that led to global warming and climate change
Recent international protocols to tackle climate change, Carbon trading and its implications,
Concerns of Developing Countries
Disaster Management and Environmental Impact assessment

TEXT BOOKS:

1. Goh Cheng Leong : Certificate Physical and Human Geography
2. Valdiya : Environmental Geology.

REFERENCE BOOKS :

1. NCERT : 6th to 12th Books for Geography
2. NCERT : General geography

I

YEAR

M.Tech.

BIOTECHNOLOGY

I SEMESTER

- 17BT001 - Advanced Bioprocess Engineering
- 17BT003 - Enzyme Technology
- 17BT005 - Advanced Biochemical Reactions Engineering
- 17VL007 - r-DNA Technology
- - Elective Course - I
- - Elective Course - II

II SEMESTER

- 17HS001 - Research Methods
- 17HS002 - Employment Orientation Program
- 17BT002 - Upstream and Downstream Processing
- 17BT004 - Bio Analytical Techniques
- 17BT006 -Plant Design and Economics for Biotechnologists
- 17BT008 - Bioprocess Modeling Control & Simulation
- - Elective Course - III
- - Elective Course - IV

COURSE CONTENTS

I SEM & II SEM

17BT001 ADVANCED BIOPROCESS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course helps to familiarize various aspects of bioreactors, to understand the media requirements and working conditions for profitable run of bioprocess industries with the help of data analysis.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- *Operate the fermenter*
- *Design the medium for production of metabolites*
- *Understand the modes of fermentation*

SKILLS:

- ✓ Operation of autoclave and fermentation reactor
- ✓ Able to design and optimize the medium
- ✓ Solid-state fermentation
- ✓ Shake-flask fermentation

ACTIVITIES:

- *Preparation fermentation medium*
- *Use of batch and fed batch systems for production of bio-based products*
- *Yield calculations*
- *Software usage for Medium design and optimization*

UNIT - I

Kinetics of Microbial Growth, Sterilisation and Product Formation: Different modes of operation - batch, fed batch and continuous cultivation. Simple unstructured kinetic models for microbial growth-Monod model, Growth of filamentous organisms, Substrate and product inhibition on cell growth and product formation. Different types of industrial sterilization, Thermal death kinetics of microorganisms, Batch and continuous heat sterilization of liquid media, Filter sterilization of liquid media, Air sterilization and design of depth filters.

UNIT - II

Metabolic Stoichiometry and Energetics: Stoichiometry of cell growth and product formation, Elemental balances, degrees of reduction of substrate and biomass, Available electron balances, Yield coefficients of biomass and product formation, Maintenance coefficients energetic analysis of microbial growth and product formation, Oxygen consumption and heat evolution in aerobic cultures.

UNIT - III

Bioreactor Operation: Choosing the cultivation method, design and operation of a typical aseptic, aerobic fermentation process, Environmental requirements for animal cell cultivations, Reactors for large scale production using animal cell, plant cell cultivation, Active and Passive Immobilization of cells, Diffusional limitations in Immobilized cells, Bioreactor considerations in Immobilized cell.

UNIT - IV

Transport Phenomena in Bioprocess System: Gas – Liquid mass transfer in cellular systems, Determination of oxygen rates, Mass transfer for freely rising or falling bodies, Correlations for mass transfer coefficient and interfacial area, Mass transfer across free surface, Other factors affecting K_La, Heat transfer correlations.

UNIT - V

Mixed culture and Solid State Fermentation: Introduction, Major classes of interactions in mixed cultures, simple models describing mixed cultures interactions, Mixed cultures in nature and industrial utilization of mixed cultures, Solid-state fermentation.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

Microbial Culture Studies:

1. Culturing of different types of microorganisms used in the production of commercially important products.
2. Growth of microorganisms.
3. Temperature effect on growth-estimation of energy of activation and Arrhenius Constant for microorganisms.
4. Study of Growth substrate utilization and product formation kinetics in shake – flask cultures.
5. Batch and fed batch cultures

   a) Estimation of Monod parameters

   b) Pure and mixed cultures

   c) Production of secondary metabolites in synthetic and complex industrial media.

Enzyme Kinetics:

6. Extraction of commercially important enzymes, Development of enzyme assays and quantification of enzyme activity and specific activity.

7. Estimation of Michaelis - Menten parameters
8. Effect of pH and temperature on enzyme activity
9. Kinetics of inhibition, Techniques of enzyme immobilization - matrix entrapment, ionic and cross linking.

TEXT BOOKS:

1. Shuler, M.L. and Kargi, F. "*Bioprocess Engineering – Basic concepts* – 2nd Ed., Prentice Hall of India Pvt. Ltd., 2005
2. Peter F. Stanbury, Stephen J. Hall & A. Whitaker, *Principles of Fermentation Technology,* 2nd ed., Butterworth – Heinemann an Imprint of Elsevier India Pvt. Ltd., 2005.

REFERENCE BOOKS:

1. Bailey and Ollis, "Biochemical Engineering Fundamentals", 2nd Ed., McGrawHill, 1986.
2. Pauline M. Doran, "Bioprocess Engineering Calculation", Blackwell Scientific Publications.
3. Harvey W. Blanch, Douglas S. Clark, "Biochemical Engineering," Marcel Dekker, Inc.

17BT003 ENZYME TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course offers an introduction to enzymes and their functions. The main purpose of this course is to explore various aspects of enzymes such as their classification, mechanism of action, isolation methods and kinetics.

Course Outcomes:

The student will be able to:

- Describe various classes of enzymes, their active sites and energetics of enzyme - substrate complex.
- Gain knowledge on key structural and energetic factors of enzyme stability.
- Summarize current processes involved in industrial enzyme production from plants, animals and microorganisms.
- Understand the different immobilization methods and analyze the bioconversions in immobilized reactors.

SKILLS:

✓ Isolate commercially important enzymes.

✓ Estimate enzyme activity by colorimetric and spectroscopic methods.

✓ Immobilize enzymes for commercial applications.

UNIT –I

INTRODUCTION TO ENZYMES: Discovery of enzymes - a historical recall; Classification of enzymes; Applications of enzymes; Principles of catalysis - collision theory, transition state theory, role of entropy in catalysis; Comparison of chemical and enzyme catalysis; Stability, deactivation and catalytic activities; Mechanisms of enzyme action; Concept of active site and energetics of enzyme substrate complex formation; Specificity of enzyme reaction.

UNIT -II

ISOLATION OF ENZYMES: Extraction and purification of crude enzyme extracts from plant, animal and microbial sources; Methods of characterization of enzymes; Development of enzymatic assays.

UNIT - III

KINETICS OF ENZYME ACTION: Kinetics of single substrate reactions; Estimation of Michaelis - Menten parameters; Importance of Km; Multi-substrate reaction mechanisms and kinetics; Turnover number; Types of Inhibition - kinetic models, substrate and product inhibition; Allosteric regulation of enzymes; Deactivation kinetics.

UNIT - IV

ENZYME IMMOBILIZATION: Physical and chemical techniques for enzyme immobilization - adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding; Advantages and disadvantages of different immobilization techniques; Overview of applications of immobilized enzyme systems.

UNIT - V

IMMOBILIZED ENZYME REACTORS: Design of immobilized enzyme reactors- packed bed, fluidized bed membrane reactors; Bioconversion calculations in free enzyme CSTRs and immobilized enzyme reactors; Stability, deactivation and catalytic activities.

TEXT BOOKS:

1. T. Palmer, “Enzymes”, 1st edition, East West Press, 2004.
2. N.K. Prasad, “Enzyme Technology - Pace Maker of Biotechnology”, 1st edition, PHI publishers, 2011.

REFERENCEBOOK:

1. Devasena, “Enzymology”, 1st edition, PHI, 2011.

ACTIVITIES:

- Isolate amylase/ peroxidase/ urease from various sources.
- Purify the enzyme by different methods.
- Estimate K_M and Vmax of different enzyme reactions.
- Immobilize peroxidase on various substrates cloth, fabric, glass bead and encapsulation.

17BT005 ADVANCED BIOCHEMICAL REACTION ENGINEERING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course gives immense knowledge on reaction kinetics and searching for reaction mechanism of non elementary reactions. In addition it also provides insights into different types of bio-reactors, their design and operation. The objectives of the course are to impart knowledge of bio-reactor designing and operation for specific conditions and also to compare performances of various bio-reactors.

Course Outcomes:

The student will be able to:

- Develop rate equation for chemical reaction and determine rate kinetics.
- Get knowledge on basic concepts of reactor design.
- Optimization of reactor operation,
- Estimate thermodynamic parameters of reactions.

SKILLS:

- ✓ Searching for reaction mechanism
- ✓ Development of reactor design equation
- ✓ Optimization of reactor operation
- ✓ Determination of reaction thermodynamics

UNIT - I

OVERVIEW OF CHEMICAL REACTION ENGINEERING: Classification of reactions, variables affecting the rate of reaction, Concept of order, molecularity of a reaction, definition of reaction rate, concentration dependent term of rate equation, Temperature dependent term of rate equation, Evaluation of rate constants using Arrhenius equation. Searching for a mechanism

UNIT - II

IDEAL REACTORS: Types of reactions, interpretation of batch reactor data. Introduction to reactor design, general discussion, symbols and relationship between C_A and X_A. Ideal batch reactor, Steady-state mixed flow reactor, Steady-state plug reactors.

UNIT - III

MULTIPLE REACTIONS AND NON ISOTHERMAL REACTIONS: Introduction to multiple reactions, qualitative discussion about product distribution, quantitative treatment of product distribution and of reactor size. Heats of reaction, equilibrium constants from thermodynamics, equilibrium conversion, general graphical design procedure, optimum temperature progression, heat effects, adiabatic operations and non adiabatic operations.

UNIT - IV

CHARACTERIZATION OF REACTORS: Batch bioreactor design, Definition of chemostat, turbidostat, single flow single stage chemostat, single flow multistage chemostat, recycle flow in chemostat, Plug flow behavior, design of plug flow reactor.

UNIT - V

NON-IDEAL REACTORS & HETEROGENEOUS REACTIONS: Concepts of residence time distribution, micro mixing and macro mixing, Reasons for non-ideality, concept of macro using –RTD analysis (E-C-F functions), diagnosing the ills of non-ideal bioreactors.

HETEROGENEOUS REACTIONS: Solid catalyzed reactions, the rate equation for surface kinetics, Pore diffusion, resistance combined with surface kinetics, performance equation for reactors containing porous catalyst particles, product distribution in multiple reactions.

TEXT BOOKS :

1. Octave Levenspiel, “Chemical Reaction Engineering” , 3rd ed. JohnWiely & Sons, 1999.
2. D.G.Rao, “Introduction to Biochemical Engineering”, McGraw-Hill, 2005.
3. P.M.Doran , “Bioprocess Engineering Principles”, Academic Press, 1995.
4. M.L.Shuler and F. kargi , “Bioprocess Engineering”, Prentice Hall of India ,1992.

REFERENCE BOOKS :

1. H.S. Fogler, “Elements of Chemical Reaction Engineering”, 2nd ed. PHI, 1992.
2. J.M.Smith, “Chemical Engineering Kinetics”, 3rd ed. Mc Graw Hill, 1981.

ACTIVITIES:

- Measurement of microbial growth kinetics in fermentor
- Determination product formation kinetics in continuous mode in fermentor
- Measurement of RTD by tracer injection methods

17BT007 R-DNA TECHNOLOGY

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The course is oriented towards understanding the processes of gene expression and regulations. The objective of the course is to provide awareness about different vectors used for gene transfer, enzymes, cloning methods, expression and detection of clones. It is also aimed to provide insights into molecular methods, markers and applications of r-DNA technology.

Course Outcomes:

The student will be able to:

- Gain knowledge on gene expression and regulations.
- Analyze structure and organization of different vectors used in gene transfer.
- Understand and handle enzymes used in gene manipulation.
- Perform cloning methods, expression and detection of clones.
- Excel in molecular techniques, markers and applications of r-DNA technology.

SKILLS:

- ✓ Design and construct vectors.
- ✓ Identify restriction patterns for molecular scissors.
- ✓ Perform stable transformation.
- ✓ Realize gene silencing.

UNIT - I

PLASMIDS, TRANSPOSONS / VECTORS FOR GENE TRANSFERS: Plasmids- definition, types, identification, classification, purifications and transfer of plasmids. Host restriction in transfer; Transposable elements- definition, detection of transposition in bacteria, types of bacterial transposons, mechanisms of transposition and excision; Applications of transposons, retrotransposons; Enzymes involved in genetic engineering; Different types of cloning vectors- plasmid (pUC 19), lambda phage, cosmid, M13, BAC, YAC and YEP.

UNIT - II

EXPRESSION AND DETECTION OF CLONES: Cloning strategies; sequencing; DNA fingerprinting; Blot analysis- Southern, Northern, Western blot; Dot and slot blot; PCR- principles, designing of primers, methodology and applications of PCR.

UNIT - III

MOLECULAR TECHNIQUES: Purification of genomic DNA from living cells; Manipulation of purified DNA; Introduction of DNA into living cells - methods of gene transfer; DNA hybridization.

UNIT - IV

GENE REGULATION IN PROKARYOTES AND EUKARYOTES: Prokaryotes - lactose, arabinose and tryptophan operons; Repressors and activators; Sigma switch in *Bacillus subtilis*; Eukaryotes - gene regulation, promoters and enhancer elements; Gene rearrangement; Gene amplification.

UNIT - V

HISTONES, RNA AND EPIGENETIC MECHANISMS: Types of histones and their participation in compact and relaxed genomes; DNA methylation; Histone modifications; Acetylation; RNA silencing; Micro RNA; RNAi-mediated gene regulation; Methods of detecting epigenetic mechanisms – interplay of epigenetic mechanisms in development, differentiation, regeneration and aging.

ACTIVITIES:

- Culture bacterial cells.
- Isolaton of bacterial and plasmid DNA.
- Handling micropipettes to deal with molecular enzymes.
- Experimentation on gel electrophoresis.
- Preparation of competent cells.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Isolation of plasmid DNA by alkaline lysis method from *E.coli*.
2. Restriction analysis of plasmid DNA and analysis by agarose gel electrophoresis.
3. Amplification of gene by polymerase chain reaction (PCR).
2. Preparation of competent cells by calcium chloride treatment for plasmid transformation.
3. Setting up of ligation reaction using T4 DNA ligase.
4. Transformation of chemically competent *E. coli* with the ligation mixture, plating and analysis of transformants.
5. Setting up a dephosphorylation reaction using alkaline phosphatase enzyme.
6. Cloning of gene into a plasmid vector and transformation to *E. coli*.

TEXTBOOK:

1. T.A.Brown, “Gene Cloning and DNA analysis”, 5th edition, Blackwell Scientific Publications, 2006.

REFERENCE BOOKS:

1. S.B. Primrose, “Principles of Gene manipulation and Genomics”, 5th edition, Blackwell Scientific Publications, 2006.
2. D. Freifelder, “Essentials of Molecular Biology”, 7th edition, Narosa Publishing House, 2006.

17HS001 RESEARCH METHODS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondarydata, probability and non-probability sampling techniques.

UNIT-II

Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III

Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion,measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminateanalysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution inInterpretation, Significance of Report writing, Different steps in writing Report, Layout of theResearch Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copy rights.

Text Books:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17BT002 UPSTREAM AND DOWNSTREAM PROCESSING

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

***Course Description and Objectives*:**

This course helps to familiarize students with the downstream section of a bioprocess for the production of biotechnological products. To familiarize the student regarding removal of insoluble's, product isolation, high-resolution techniques and product polishing.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- *Design the fermentation medium*
- *Operate the electrophoresis unit*
- *Use the chromatographic methods*
- *Understanding of current purification technologies*

SKILLS:

- ✓ *Able to separate the product of interest*
- ✓ *Able to eliminate trace contaminants and impurities*
- ✓ *Able to operate sonicator*
- ✓ *Able to use the chromatography techniques*

UNIT - I

Upstream processing: Integrated bioprocesing, Inoculum media for industrial fermentation, Fermentation Media - Media composition, Media sterilization and contamination, Media economics, Screening for fermentation media.

UNIT - II

Primary Separation and Recovery Processes: Cell disruption methods for intracellular products, removal of insolubles, Biomass (and particulate debris) separation techniques, flocculation and sedimentation, centrifugation and Filtration methods.

UNIT - III

Enrichment Operations: Membrane based separations micro and ultra filtration theory, design and configuration of Membrane separation equipment, applications, Precipitation methods (with salts, organic solvents, and polymers) Extractive separations, aqueous two-phase extraction, Insitu product removal.

UNIT - IV

Product Resolution / Fractionation and polishing: Adsorptive chromatographic separation processes, Electrophoretic separations (all electrophoresis techniques including capillary electrophoresis), Gel Permeation Chromatography, dialysis, Crystallization.

UNIT - V

New and Emerging Techniques:

Pervaporation, Super critical extraction, foam based separation, Product recovery trains-few examples.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Chromatography techniques - Paper, TLC, HPLC, Gel filtration & Ion exchange chromatography.
2. Electrophoresis &Blotting techniques-Native- PAGE, SDS-PAGE &Western Blot technique.
3. Solid separation methods - Filtration, Sedimentation, Centrifugation, Product enrichment operations – Liquid-Liquid extraction and Two-phase aqueous Extraction.
4. Protein precipitation and its recovery.
5. Product crystallization and drying.

ACTIVITIES:

- *Preparation fermentation medium*
- *Use of chromato graphy techniques for separation of bioproducts*
- *Use of Electrophoresis units and gel preparation*
- *Experiments on Cell disruption methods*

TEXT BOOKS:

1. James E Bailey, David F., "Ollis, Biochemical Engineering Fundamentals", 2^{nd} Ed., Mc Graw Hill, 1993.
2. Asenjo J.M., "Separation Processes in Biotechnology", Marcel Dekker Inc. 1993.
3. "Product Recovery in Bioprocess Technology", BIOTOLSeries, VCH, 1990.

REFERENCE BOOKS :

1. Wankat P.C, " Rate Controlled Separations ", Elsevier, 1990.
2. Belter PA and Cussler E, " Bioseparations ", Wiley , 1985
3. McCabe, Smith, Harriott, "Unit Operations of Chemical, Engineering", 5^{th} ed.,Tata Mc Graw Hill.

17BT004 BIO ANALYTICAL TECHNIQUES

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The objective of this course is to understand the scope of application, advantages and limitations of the various modern analytical and separation techniques.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- *Understand the principles involved in functioning of various instruments and noise in instrumental measurements*
- *Understand the advantages and limitations of various analytical techniques.*
- *Learn different separation techniques.*

SKILLS:

✓ Skilled handling of microscope.
✓ Handling of various modes in UV Visible spectrophotometer.
✓ Chromatography techniques.
✓ Experience in working with data sets.

ACTIVITIES:

- Qualitative and quantitative analysis of biomolecules.
- Purify biomolecules from plants.
- Compare different analytical methods to estimate enzymes.

UNIT - I

SPECTROSCOPY: Principle, instrumentation and application of Colorimeter, UV – Visible Spectrophotometer, IR spectrophotometer, Flourimeter, Flame photometer, x-ray spectroscopy, NMR spectroscopy.

UNIT - II

MICROSCOPY AND ELECTROPHORESIS: Basics of phase contrast, confocal and fluorescent microscopy; electron microscopy – SEM and TEM; Flow cytometry; Electrophoresis – principles, supporting materials-paper, starch, agarose, polyacrylamide types – gel and capillary electrophoresis; disc; Isoelectric focussing; immuno-electrophoresis; isotachophoresis.

UNIT – III

CHROMATOGRAPHY: Chromatography – principles; types - paper, thin layer, adsorption, ion-exchange, affinity, gel filtration, gas liquid and HPLC; GC-MS; Simulation moving bed.

UNIT - IV

RADIOACTIVE TECHNIQUES: Radioactive isotopes, radioactive decay and their types; principles of scintillation counting; isotope dilution technique; radioactive techniques-RIA; GM counter; Scintillation counter; Autoradiography; Applications in Medicine & Diagnosis; Radiation hazards and methods for containment and prevention.

UNIT – V

THERMO ANALYTICAL TECHNIQUES: Theory of thermal analysis; thermo gravimetric; Basic theory, construction and working of Differential Thermal Analysis (DTA); Differential Scanning Calorimeter (DSC).

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. Verification of Lambert -Beers Law by UV -VIS spectrophotometer.
2. Estimation of reducing sugars (Benedict's method).
2. Estimation of proteins and nucleic acids by U.V. method.
3. Separation of different macromolecules by HPLC.
4. Estimation of vitamin B by turbidometry method.
5. Estimation of turbidity by U.V. method.
6. Estimation of chlorophyll by colorimetric method.
7. Determination of lambda max.
8. Calibration of pH meter.

TEXT BOOKS:

1. Willard and Merrit, "Instrumental Methods and Analysis" . 6th ed, CBS Publishers & Distributors.
2. Keith Wilson, Kenneth H. Goulding, "A Biologist Guide to Principles and Techniques of Practical Biochemistry", 3rd ed., ELBS series.
3. Skoog and West, "Fundamentals of Analytical Chemistry", 1982.

REFERENCE BOOKS:

1. Ewing GW, "Instrumental Methods of Chemical Analysis", Mc Graw Hill Book Company, 1989.
2. Braun. H, "Introduction to Chemical Analysis", McGrawHill, 1987.

17BT006 PLANT DESIGN AND ECONOMICS FOR BIOTECHNOLOGISTS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	-	-	-	-	-	-

Course Description and Objectives:

This course is oriented towards the bioreactor requirements for handling different types of biomass and economics of bioreactor fabrication and plant maintenance. The objective of this course to give immense knowledge on types of bioreactors, design and operation of bioreactors. It also discusses about plant design and economics related to plant construction and operation.

Course Outcomes:

The student will be able to:

- Gain knowledge on concepts of reactor design.
- Design, develop, operation and controlling of bioreactor
- Develop flow diagrams for plant design and construction
- Estimate product cost and depreciation cost of plant equipement

SKILLS:

- General plant design considerations
- Design considerations for plant and animal cell cultures
- Economic issues related to plant construction and operation
- Estimate replacement costs and profitability.

ACTIVITIES:

- Design of flow sheet for plant construction
- Design of bioreactor for plant and animal cell cultures
- Feasibility survey for development of new product
- Estimation of replacement cost of new equipment.

UNIT - I

INTRODUCTION: Introduction, types of bioreactors: stirred-tank bioreactors, airlift bioreactors. Heat transfer. Scale up: stirred-tank bioreactors, airlift bioreactors. Introduction of airlift bioreactors, design and construction of the airlift-loop reactor. air-lift reactor microgravity, loop reactors and fluid bed reactors. New Bio reactors for aerobic processes.

UNIT - II

DESIGN ASPECTS: Agitated vessels, flowpatterns, flownumber, velocity patterns and velocity gradients, power consumptions, power correlations, power consumption in non newtonian liquids, agitator selection and scaleup. **Hydrodynamics:** Two-phase flow, mixing, oxygen transfer, isobaric method, non-isobaric model, oxygen transfer in a three phase flow.

UNIT - III

BIOREACTOR DESIGN FOR PLANT & ANIMAL CELLS CULTURE: Introduction, plant cells: plant cell bioreactors, characteristics of plant cell suspensions, plant cell bioreactor requirements, plant cell bioreactor design, plant cell bioreactor operation, alternative cultures for plant cells.Animal cells:Animal cell bioreactors, animal cell bioreactor operation, and animal cell bioreactor design.

UNIT - IV

DESIGN AND COST CONSIDERATIONS: General design considerations, Cash flow for industrial operations, capital investments, estimation of capital investments, cost indices, estimation of total product of cost direction, production costs, fixed charges, plant overhead costs, financing. Interest and investment cost, type interest, nominal and effective interest rates, continuous interest, present worth and discount annuities

UNIT - V

DEPRECIATION AND PROFITABILITY: Depreciation: types of depreciation, services life, salvage value, present value, methods for determining depreciation, single unit and group depreciation. Profitability: alternative investments and replacements, profitability standards, discounted cash flow, capitalized cost, pay out period alternative investments, analysis with small investments, increments and replacements.

TEXTBOOK:

1. ScraggA.H., “Bioreactors in Biotechnology”, Edited by EllisHorwood Limited, England 1991.
2. M.S. Peters and K.D.Timmerhaus, “Plant Design and Economics for Chemical Engineering”, 4th ed., Mc Graw Hill,.,1991.
3. Mccabe Smith, Harriott, “Unit Operations of Chemical Engineering”, 5th ed., Mc Graw Hill.1992.

REFERENCE BOOKS:

1. Mukhopadhyay S.N., “Process Biotechnology Fundamentals”, 2nd ed., Viva Books Private Limited, Chennai 2004

17BT008 BIOPROCESS MODELING CONTROL & SIMULATION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course deals with the basic models in bioprocess engineering. The main intention of this course is to provide knowledge of various parameters to be considered in bioprocess and control and simulation of bioprocesses.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- Understand the basic concepts of modeling.
- Develop models for bioprocesses.
- Design, operate and analysis of bioreactors.
- Simulate bioprocess models for optimum product yield.

SKILLS:

- ✓ *Modeling of fermentation processes*
- ✓ *Basic fundamental laws used in modeling*
- ✓ *Parameter estimation for enzyme kinetics and Monod equation*
- ✓ *Various simulation techniques*

ACTIVITIES:

- Development of mathematical models for bioprocesses
- Design and operation of bioreactor
- Simulation of mathematical models using computer software
- Validation of mathematical models.

UNIT - I

INTRODUCTION TO MODELING: Process Design – Process Synthesis, Process Analysis, Optimization, Strategy for Process Engineering, Process Plant Simulation; Modeling Aspects – Physical Modeling, Mathematical Modeling, Model Formulation Principles, Fundamental Laws used inModeling, Cybernetics, Controlled System and Principles of Similarity.

UNIT - II

THE KINETICS OF ENZYME–CATALYZED REACTIONS: Michaelis–Menton Kinetics, Evaluation of Parameters in the Michaelis–Menton Equation: Kinetics of Substrate Utilization, Product Formation and Biomass Production in cell cultures – Ideal Batch Reactor, Ideal Continuous-FlowStirred–Tank Reactor (CSTR),Monod Growth Kinetics, Monod Chemostat Model, and Product yield coefficient and Growth-Cycle Phases for Batch Cultivation.

UNIT - III

DESIGN AND ANALYSIS OF BIOLOGICAL RECTORS: Ideal Bioreactors – Fed Batch Reactors, Enzyme- Catalyzed Reactions in CSTRs, CSTR Cell eactorswith Recycle and Wall growth, The Ideal Plug-flowTubular Reactor, Dynamic Models.

UNIT - IV

MODELING OF FERMENTATION PROCESSES: System Analysis Approach to the Mathematical Modeling of fermentation processes – Kinetics of Simple Processes, Stoichiometry of Microbial Processes, Physiological Aspects of Mathematical Models for Fermentation Processes, Modeling of Oxygen Transfer, and The use of Simple Mixing Models for Simulation of Fermentation Processes; Mathematical Model Identification– Preliminary Analysis of Experimental data, Rate Relationship and Kinetic Parameters.

UNIT - V

FUNDAMENTALS OF MASS BALANCING: Mass Balances - Systems without Chemical Reactions, Study State Processes without Chemical Reactions, Intermittent Operation without Reactions; Systems with Chemical Reactions – Processes with (bio) Chemical Reactions, Steady state system with chemical reactions, Intermittent operation with Chemical Reactions. Transient Mass Balances – A Perfectly Stirred Tank Model, Transient Mass Balances with Reactions. The Plug Flow Model.

TEXT BOOKS :

1. B.V. Babu, “Process Plant Simulation”, OXFORD University Press, 2004.
2. JAMES E. BAILEY, David F.OLLIS, “Biochemical Engineering Fundamentals”, 2nd ed., McGrawHill, International Book Company,1986

REFERENCEBOOK :

1. B. VOLESKY and J. VOTRUBA, “Modeling and Optimization of Fermentation Processes”, ELSEVIER, 1992.

17HS002 EMPLOYMENT ORIENTATION PROGRAM

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Preamble:

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.

ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.

iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech

students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education

according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and

get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.63

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- 5 Marks for attendance
- 5 Marks for formative assessment
- 40 Marks for summative assessment

I

YEAR

M.Tech.

BIOTECHNOLOGY

ELECTIVES

I SEMESTER

- 17BT009 Advanced Process Engineering Principles-I
- 17BT011 Bioinformatics and Molecular Modeling
- 17BT013 Microbiology and Biochemistry
- 17BT015 Advanced Plant and Animal Biotechnology
- 17BT017 Mass Transfer Separations
- 17BT019 Advanced Fermentation Technology

II SEMESTER

- 117BT010 Immunotechnology
- 17BT012 Computational Biology
- 17BT014 Environmental Biotechnology
- 17BT016 Industrial Biotechnology and Metabolic Engineering
- 17BT018 Advanced Process Engineering Principles-II
- 17BT020 Cancer Biology and Therapy

COURSE CONTENTS

I SEM & II SEM

17BT009 ADVANCED PROCESS ENGINEERING PRINCIPLES-I

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description and Objectives:

This course mainly deals with basic principles necessary quantification and regulation of fluid flow in process industries. it describes different types of flow, development of empirical equations for fluid flow in pipes, frictional losses in fluid flow, measurement of fluid flow. The objectives of this course are to impart knowledge of fluid flow behavior, flow measurement.

Course Outcomes:

The student will be able to:

- Get knowledge on basic concepts of fluid flow.
- Development of empirical equations for fluid flow in pipes
- Estimate fractional losses in fluid flow.
- Measure the flow rate using different flow measuring devices

SKILLS:

- ✓ Characterization of flow behavior
- ✓ Analysis of various types of losses in fluid flow
- ✓ Estimation of terminal velocities of particles
- ✓ Calculation of power requirement for pumping of fluids

ACTIVITIES:

- Calibration of Bernoulli's theorem
- Estimation of frictional losses with different types of fitting to pipes
- Calculation of capacity of pump required for pumping of fluid using centrifugal pump
- Flow measurement using venturimeter.

UNIT - I

INTRODUCTION TO PROCESS ENGINEERING PRINCIPLES: Introduction to unit operations and unit processes, Units and dimensions, basic quantities and derived units. Conversion of units. Concept of mass and force, definition of g_c and its utility. Various equations of state including ideal gas law to evaluate P-V-T data, their, application in process calculations by solving basics numerical problems.

UNIT - II

RHEOLOGY OF FLUIDS: Newton's law of viscosity. Concept of Newtonian and non - Newtonian fluids, Different types of non-Newtonian fluids with examples in bioprocesses. Fluid mechanics-Properties of fluids, fluid statics, and energy balance in fluid flowthrough pipes and conduits, Bernoulli's equation and its application, calculation of power required for pumping fluids. Examples from bioprocess systems.

UNIT - III

MOMENTUM TRANSFER: Flow through pipes, Laminar and turbulent flow characterization by Reynolds number, average velocity, pressure drop due to skin friction and foam friction, friction factor chart, Hagen-Poiseuille equation

UNIT - IV

DRAG AND SETTLING: Flow past immersed bodies: Definition of drag and drag coefficient. Introduction of the concept of packed beds. Friction in flow through beds of solids, derivation of friction factor equations and pressure drop expressions. Motion of particles through fluids, terminal velocity.

UNIT - V

MEASURING AND TRANSPORTATION: Fluid transportation machinery: Different types of pumps, positive displacement pumps, reciprocating Pumps, diaphragm pumps, centrifugal pumps, Calculation of pump horse power. Flow measuring devices-manometers, orifice meter, venture meter and rotameter

TEXT BOOKS :

1. PaulineM.Doran., "Bioprocess Engineering Principles", Academic Press, 1995.
2. Mc Cabe, W.L, Smith J.C.,and Harriot P, "Unit Operations of Chemical Engineering", Mc-Graw Hill, 3rd ed., 2006.

REFERENCE BOOKS :

1. D.G.Rao, "Introduction to Biochemical Engineering", Tata Mc Graw Hill , 2005.
2. S. K. Ghosal, S. K. Sanyal and S. Dutta, "Introduction to Chemical Engineering", TMH Publications, 1993.

17BT011 BIOINFORMATICS AND MOLECULAR MODELING

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course offers basic concepts in computational skills and computational methods to study, organise, analyse and interpret biological information at molecular, genetic and genomics levels. It also offers knowledge on an overall understanding about the critical relationship among biomolecular structure, function and force field models. The objective of this course is to introduce the analysis of biological data using software tools and is to train students in utilizing basic modelling techniques to explore biological phenomena at the molecular level

Course Outcomes:

The student will be able to:

- Demonstrate understanding of biological sciences by articulating the methods of science, explaining why current biological knowledge is both contestable and testable through further inquiry and explaining the role and relevance of biotechnology in society.
- Gain software skills to critically analyze and solve problems in biotechnology.
- Demonstrate cognitive skills in mastery of advanced theoretical knowledge in bioinformatics and apply this knowledge to solve complex problems.
- Understand the principles and practice molecular modelling and modern drug discovery

SKILLS:

- ✓ Design, conduct and interpret scientific research on bioinformatics.
- ✓ Conduct statistical analysis of biological data pertaining to genomics and proteomics.
- ✓ Apply a scientific approach to problems involving molecular phylogeny.
- ✓ Estimate energy minimization upon docking

ACTIVITIES:

- Retrieval of FASTA format from databases.
- Perform BLAST and FASTA software analysis for both nucleic acids and amino acid sequences.
- Construct phylogenetic trees using software tools such as PHYLIP and PAUP.
- Perform protein homology modelling.

UNIT - I

INTRODUCTION: Scope of Bioinformatics, Elementary commands and protocols,ftp, telnet, http. Primer on information theory. DNAMapping and sequencing –Map alignment – Large scale sequencing methods - Shotgun – DNA sequencing – Sequence assembly.

UNIT - II

SEQUENCE ALIGNEMENT AND DYNAMIC PROGRAMMING &PHLOGENY: Heuristic Alignment algorithms. Global sequence alignments-Neddleman-Wunsch Algorithm, Smith-Waterman Algorithm-Local sequence alignments (Amino acid substitutionMatrices (PAM, BLOSUM).

Ultrasonic trees – parsimony – Ultrametric problem – Perfect phylogeny – Phylogenetic alignment – connection betweenmultiple alignment and tree

UNIT - III

BIOLOGICAL DATABASE AND THEIR USE: Introduction to Biological databases, Organization and management of databases. Searching and retrieval of information from the World Wide Web. Structure databases - PDB (Protein Data Bank), Molecular Modeling Databases (MMDB). Primary Databases NCBI, EMBL, DDB. Swissprot, PIR,KEGG. Bio Chemical databases- KEGG, EXGESCY, BRENDA, WIT

UNIT - IV

INTRODUCTION TO MOLECULAR MODELLING : Introduction - Useful Concepts inMolecularModelling: Coordinate Systems. Potential Energy, Surfaces. Molecular Graphics. Surfaces.Computer Hardware and Software. TheMolecular Modelling Literature. Force Fields, Bond Stretching,Angle Bending, Introduction to Non-bonded Interactions. Electrostatic Interactions. Van der Waals Interactions.Hydrogen Bonding inMolecular Mechanics. Force FieldModels for the Simulation of LiquidWater.

UNIT – V

EnergyMinimisation andRelatedMethods for Exploring the Energy Surface. Non-Derivativemethod, 1st and 2nd orderminimisationmethods.Computer SimulationMethods. Simple Thermodynamic Properties and Phase Space. Boundaries. Analyzing the Results of a Simulation.

TEXT BOOKS:

1. Mount. D. Cold, “Bioinformatics: Sequence andGenomeAnalysis”,Spring Harbor Lab.: 2001
2. T KAttwood, D J parry-Smith, “Introduction to Bioinformatics”, 1st Edition,11th Reprint, Pearson Education, 2005.
3. A. R. Leach, “Molecular modelling principles and application”, Longman Company, 2001.

REFERENCE BOOKS:

1. Harshawardhan P.Bal, “Bioinformatics – Principles andApplications “ TataMac Graw Hill.
2. Arthur.M.Lesk , “Introduction to Bioinformatics”, Oxford University Press.
3. J.M.Haile, “Molecular Dynamics Simulation ElementaryMethods”,JohnWiley and Sons, 1997.
4. Satya Prakash Gupta, “QSAR andMolecular Modeling”, Springer -Anamaya Publishers, 2008.

17BT013 MICROBIOLOGY AND BIOCHEMISTRY

Hours Per Week :

L	T	P	C
3	3	-	3

Total Hours :

L	T	P
45	-	-

xxxx

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To familiarize the student to understand about classification, diversity and physiology of microorganisms. Also to acquaint about the methods of microbe cultivation and sterilization techniques as well as microbial diseases, host pathogen interaction and their control. The major objective of the course is the complete understanding of the entire chemical processes associated with living cells at the molecular level.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- Understand the scope and historical developments in the field of microbiology.
- Identify and classify the microorganisms based on various attributes.
- Cultivate pure cultures using specific as well as enrichment media.
- Understand the structures and functions of biological molecules and interactions.
- Gain sufficient insights into redox biochemistry.
- Acquire knowledge on various pathways in intermediary metabolism and bioenergetics.

SKILLS:

- ✓ Handle different microscopes.
- ✓ Isolate microbes.
- ✓ Aseptic maintenance of lab and hood.
- ✓ Maintain stock cultures.
- ✓ Identify biomolecules by colorimetric and biochemical assays.
- ✓ Quantify macromolecules using UV-VIS Spectrophotometer.
- ✓ Operation of HPLC.

ACTIVITIES:

- Isolate microbes from different sources – air, soil and water.
- Purify different strains of bacteria and fungi.
- Carryout sterilization processes.
- Estimate macromolecules in biological fluids.
- Model exercises on building structures of Macromolecules.

UNIT - I

INTRODUCTION TO MICROBIOLOGY: Discovery of microorganisms, Theory of spontaneous generation, Germ theory of diseases, Major contribution and events in the field of Microbiology, Scope and relevance of microbiology, Development of pure culture methods, Enrichment culture methods, Development of microbiology in twentieth century.

UNIT - II

MAJOR GROUPS OF MICROORGANISMS: Micro diversity, Diversity classification of Woese *et al*. Three domains of life. Five - kingdom system of Whittaker. Classification systems - Phylogenetic, Phenetic, Taxonomic ranks, Major characteristics used in Taxonomy, Molecular approaches to microbial taxonomy, Structural organization and multiplication of bacteria, viruses, algae and fungi.

UNIT - III

MICROBIAL GROWTH AND GENETIC SYSTEM: Theory and practice of sterilization, Principles of microbial nutrition, Construction of culture media, Enrichment culture techniques for isolation of chemoautotrophs, chemoheterotrophs and photosynthetic microorganisms. Growth factors and their functions in metabolism. Aerobic and anaerobic metabolism, Definition of growth, Growth curve, Availability of oxygen, Culture collection and Maintenance of cultures. Bacterial genetic system-Transformation, Conjugation and Transduction.

UNIT - IV

INTRODUCTION TO BIOMOLECULES: Biomolecules- Occurrence, classification, structure, properties and functions of carbohydrates, proteins, lipids and vitamins, Stabilization of proteins and nucleic acids, Structural and functional relationships in complex carbohydrates, proteins and nucleic acids.

UNIT - V

METABOLIC PATHWAYS AND PROTEIN TARGETING: Metabolic pathways of Carbohydrates, Lipids, Proteins, Amino acids and Nucleic acids. Bioenergetics- Redox biochemistry, energy rich compounds, respiratory chain, oxidative phosphorylation and triose phosphate cycle. Plasma membrane structure and transport, Protein targeting.

TEXT BOOKS :

1. Lehninger, A. L., Nelson, D. L. and Cox, M. M. “Principles of Biochemistry”, 3rd ed., Freeman Publishers, NewYork.2000.
2. Prescott LM, Harley JP, Klein DA,Wm. C. Brown, “Microbiology” 3rd ed,Tata McGraw Hill.
3. Roger Y Stanier, “General Microbiology”, 5th ed., Macmillan,

REFERENCEBOOKS :

1. Donald Voet and Judith G. Voet .”Biochemistry”, Volume 1 Biomolecules, Mechanisms of Enzyme Action, & Metabolism; 2004.
2. J.L.JAIN., “Textbook of Biochemistry”, 5thed., S.Chand Publishers, 2002.

17BT015 ADVANCED PLANT AND ANIMAL BIOTECHNOLOGY

Hours Per Week :

L	T	P	C
3	3	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description and Objectives:

This Course was designed to provide the advanced concepts and industrial applications in the field of agricultural biotechnology.Production of high yielding, disease resistant crop varieties by using plant transformation technology. Introduction and concepts about Structure and organization of animal cell lines and stems cell culture and embryonic development to enhance the live stock production for the future needs. Concepts of Molecular farming and production antibiotics, plantibodies from GM organisms. To provide students opportunities to participate in R&D projects, and develop clinical and laboratory research skills.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- *Acquaint with principles, scientific and commercial applications in plant tissue culture technology and transformation techniques.*
- *Be familiar with sterile techniques, media preparation.*
- *Gain knowledge of how plants can be transformed with respect to pest resistance, herbicide tolerance.*
- *Support methodologies in plant tissue/cell culture, horticulture and floriculture to plant improvement.*
- *How to modify physiological processes to obtain biotechnological products to be applied to agricultural, social and medical areas.*

SKILLS:

- ✓ Maintenance of the sterility of the plant tissue culture lab.
- ✓ Extraction of explant from various sources of the plant.
- ✓ Design of polyhouse, Development of callus from explant.
- ✓ Hardening and acclimatization of clone.
- ✓ Maintenance of animal celllines in laboratory.

ACTIVITIES:

- *Multiplication of ornamental explants by micropropagation.*
- *Visit to plant/seed company to understand the micro propagation and genetic transformation of commercial crops.*
- *Visualize cell division under microscope.*
- *Observe different cell lines isolated from various sources*

UNIT - I

INTRODUCTION TO TISSUE CULTURE & APPLICATIONS: An over view and important concepts of tissue culture and tissue engineering technology, its applications in various fields. Embyo culture and embryo rescue. Anther, pollen, ovary, ovule, nucellus culture, Endosperm culture for production of haploid plants and homozygous lines. Germplasm conservation (Cryopreservation); Hardening & Field transformation of cultured Plants;

UNIT - II

PLANTGENETICENGINEERING FOR PRODUCTIVITY AND PERFORMANCE (BIOTIC & ABIOTIC STRESS): Gene transformation technology-Agrobacterium mediated gene transfer; Agrobacterium based vectors, viral vectors and their application. Direct gene transfer methods; chemical methods, electroporation, microinjection, particle bombardment Herbicide resistance, Insect resistance, Disease resistance, virus resistance,. Abiotic stress tolerance ;Drought, temperature, salt tolerance.

UNIT - III

ANIMAL BIOTECHNOLOGY: Primary culture – Mechanical and enzymatic mode of desegregation, establishment of primary culture. Subculture -passage number, split ratio, seeding efficiency, criteria for subculture. Cell cycle; primary cell culture; nutritional requirements for animal cell culture; techniques for mass culture of animal cell lines.

UNIT - IV

TECHNIQUES OFANIMAL BIOTECHNOLOGY: *In vitro* fertilization - Concept of superovulation, collection, maintenance, andmaturation of oocytes, fertilization of oocytes, Maintenance and assessment of embryos, embryo transfer -Artificial insemination, preparation of foster mother, surgical and non-surgical methods of embryo transfer, donor and recipient aftercare.

UNIT - V

MOLECULAR FARMING & INDUSTRIAL PRODUCTS: Production of secondary metabolites from plants and animals, principles and mechanisms of Processes for enhancing the production of secondarymetabolites. Technology of plant cell culture for production of chemicals; Bioreactors systems andmodels for mass cultivation of plant and animal cells.

Applications of Plant and Animal biotechnology principles for the production of quality oil, Industrial enzymes, Antigens (edible vaccine) and plantibodies. Application of animal cell culture for production of vaccines, growth hormones; interferons, cytokines and therapeutic proteins.Hybridization of cell lines, stem cells and its application in organ synthesis; transgenic animals andmolecular farming.

Text Books:

1. H.K.Das, "Text Book of Biotechnology ". 5th ed., Wiley India, (P) Ltd. New Delhi, 2007.

2. H.S. Chawla, "A Text Book of Plant Biotechnology", 2nd ed., Oxford & IBH, New Delhi, 2002.

3. M. Clynes, "Animal Cell Culture Techniques", Springer, 2008.

Reference Books:

1. Freifelder D," Molecular Biology", Jones and Bartlett Publishers inc. 1987.
2. Kalyan Kumar De., "Introduction to Plant Tissue Culture", 2nd ed., New Central BookAgency, Kolkata, 1992.
3. Jennie, P.Mather & David Barnes (Ed.) "Animal Cell Culture Methods", Academic Press (An imprint of Elsevier) USA. 1998.

17BT017 MASS TRANSFER SEPARATIONS

Hours Per Week :

L	T	P	C
3	3	-	3

Total Hours :

L	T	P
45	-	-

xxxx

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course deals with the major chemical separation process units, selection among alternate separation technologies. The main intention of this course is to provide complete design calculations for mass transfer equipment.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- Understand various classes of mass transfer operations.
- Estimate mass transfer rates of diffusion components .
- Understand concepts of humidification, drying, distillation and extraction
- Determination of no. of stages or trays required for given separation of components.

SKILLS:

- ✓ Design media for fermentation.
- ✓ Generate probiotics.
- ✓ Generate recombinant proteins.

ACTIVITIES:

- Estimation of diffusivity of gases and liquids
- Determination of batch drying curve
- Determination of no. of trays required for distillation column using McCabe- Thiele method
- Performing leaching and extraction techniques

UNIT - I

DIFFUSION AND MASS TRANSFER COEFFICIENTS: The Mass TransferOperations: Classification of theMass –Transfer Operations, Choice of SeparationMethod,Methods of Conducting the Mass-Transfer Operations, Design Principles, Molecular Diffusion, Steady StateMolecular Diffusion in Fluids at Rest and in Laminar Flow, estimation of diffusivity of gases and liquids, type of solid diffusion. Types of mass transfer coefficients, Dimensionless numbers, explanation of mass transfer coefficients by various theories, diffusion between phases.

UNIT - II

HUMIDIFICATION: Vapor-Pressure Curve, Definitions, Psychometric Charts, Enthalpy of gas-vapor Mixtures, Humidification and Dehumidification. **DRYING:** Drying equilibrium, batch drying under constant drying conditions, mechanisms of batch drying, rotary dryer, drum dryer, spray dryer.

UNIT - III

DISTILLATION: Fields of applications, VLE for miscible liquids,immiscible liquids, Positive and negative deviations from ideality, enthalpy-concentration diagrams, flash vaporization and differential distillation for binary andmulti component mixtures. Continuous rectification-binary systems, multistage tray towers –method of Mc Cabe and Thiele, enriching section, exhausting section, feed introduction, total reflux, minimum and optimum reflux ratios, packed distillation column, Steam distillation.

UNIT - IV

EXTRACTION OPERATIONS: LIQUID-LIQUID EXTRACTION: Fields of usefulness, liquid-liquid equilibrium, equilateral triangular co-ordinates, choice of solvent, multistage wise extraction. **LEACHING:** Fields of applications, preparation of solid for leaching, types of leaching, leaching equilibrium, Single stage and multi stage leaching calculations.

UNIT - IV

ADSORPTION: Adsorption, types of adsorption, nature of adsorbents,adsorption equilibrium, Adsorption Hysteresis, effect of temperature, Heat of adsorption, stage wise operations. **CRYSTALIZATION:** Crystal geometry, equilibria and yields,supersaturation, classification of crystallisers, material balance of crystalisers.

TEXT BOOKS :

1. Robert E. Treybal, “Mass Transfer Operations”, 3rd ed.,Mc. Graw Hill, International Year.
2. Binay. K.Dutta, “Principles of Mass Transfer and Separation Processes”,Prentice Hall of India, New Delhi, 2007.

REFERENCEBOOK :

1. Alapati Suryanarayana “Mass Transfer Operations”, 1st Edition,New-Age, International, 2006.
2. Seader. J. D, E. J. Henley& D.Keith Roper, “SeparationProcesses Principles”, John Wiley & sons, New York, 2010.

17BT019 ADVANCED FERMENTATION TECHNOLOGY

Hours Per Week :

L	T	P	C
3	3	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The course offers knowledge on the methods employed in producing food products by fermentation. The objective of the course is to provide outline on fermentation processes for the production of primary and secondary metabolites of commercial importance.

Course Outcomes:

The student will be able to:

- *Explore the modes of production of traditional and modern Biotechnology products.*
- *Understand production of commercially important metabolites.*
- *Gain knowledge on production of fermented food products.*

SKILLS:

- ✓ Design media for fermentation.
- ✓ Generate probiotics.
- ✓ Generate recombinant proteins

ACTIVITIES:

- Produce and analyze antimicrobial activity of antibiotic compounds.
- Produce polyhydroxy butyrate.
- Produce enzymes and recombinant proteins

UNIT - I

FERMENTATION PROCESS: General requirements of fermentation processes, Basic design and construction of fermentor and ancillaries, Main parameters to be monitored and controlled in fermentation processes; An overview of aerobic and anaerobic fermentation processes and their application in the biotechnology industry, solid-substrate, slurry fermentation and its applications, whole cell immobilization, behaviour of microbes in different reactors (air lift, fluidized, batch, continuous and fed batch condition).

UNIT - II

BIOPROCES OPTIMIZATION: Nutrient requirement for fermentation process- macro and micronutrients, renewable energy sources (carbon and nitrogen), Conventional optimization process (one variable at a time approach), need for statistical experimental desing, screening techniques-Plackett Burman design, response surface methodology-Box-Benken desing, central composite desing and self directing optimization

UNIT - III

PLANT AND ANIMAL CELL CULTIVATION: Plant and animal cells compared to microbial cultivation, Bioreactor considerations for plant cell-suspension culture, immobilazation culture and organized tissues. Methods used for cultivation of animal cells, Bioreactor conideration for animal cell culture-suspension culture, anchorage dependent cultivation. Imporant industrial products from plant and animal cell cultivation.

UNIT - IV

PRODUCTION OF METABOLITES: Outline of processes for the production of some commercially important organic acids, Amino acids, Alcohols, Antibiotics- beta-lactams (penicillin, cephalosporin etc.), Amino glycosides (streptomycin etc.), Macrolides (erythromycin); Vitamins and steroids.

UNIT - V

PRODUCTION OF BIOPRODUCTS: Production of industrial enzymes; Recombinant proteins, Biopolymers (xanthan gum, PHB etc.); Single cell protein production and its uses. Probiotic foods-curds, cheese and yogurt.

TEXTBOOK:

1. Stanbury P.F, Stephen J. Hall and Whitaker A - Principles of Fermentation Technology, 2nd edition, Butter Worth - Heinemann, An imprint of Elsevier, India pvt. Ltd., 2005.

2. Shuler, M.L. and Kargi - F. " *Bioprocess Engineering - Basic concepts* – Second Edition, Prentice Hall of India Pvt. Ltd., 2005.

3. L.E. Casida Jr, "Industrial Microbiology", 1st edition, New Age International (P) Ltd, 2007.

REFERENCEBOOKS:

1. W. Cruger and A. Cruger, "Biotechnology: A Textbook of Industrial Microbiology", 2nd edition, Panima Publishing Corporation, 2004.

2. A.H. Patel, "Industrial Microbiology", 1st edition, McMillan Publication, 2008.

17FT010 IMMUNOTECHNOLOGY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description and Objectives:

This course deals with the manoeuvring of host defence system and immune cells. The main intention of this course is to provide students ample knowledge on the principles of diagnostic kits and adopt informatics tools such as IMGT database to study immune susceptibility.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- Apply principles of immune system to develop nano-based diagnostic kits.
- Learn various immune techniques to evaluate deformities in immune system
- Isolate and purify immunoglobulins and antigens
- Predict epitope mapping through informatics tools and population susceptibility to diseases through HLA and KIR database.

SKILLS:

- ✓ Handling animal cells, CO2 incubator, ELISA and inverted microscope
- ✓ Immunization of lab animals
- ✓ Skills on immunodiffusion techniques
- ✓ Purification of IgG, IgY
- ✓ Nano-based immunodiagnostics

ACTIVITIES:

- Preparation of antigens and dose fixation
- Isolation of lymphocytes
- Harvesting antibodies
- Seminar presentation of immune-compromised case studies
- Development of nano-based Immunodiagnostic kits

UNIT - I

TYPES OF IMMUNITY & ANTIGENS: Innate and Adaptive Immune responses, Immune Cells: immune-competent, immune-accessory, immune-compromised and immune-conditioned cells. Lymph nodes and Organs of immune system, Antigens – epitopes, antigenicity, factors influencing antigenicity. Adjuvants, Haptens, Antigen processing and presentation, Major Histocompatiblity Complex (MHC),

UNIT - II

IMMUNOGLOBULINS AND TYPES OF IMMUNE RESPONSES: Isotypes, allotypes and idiotypes, Monoclonal antibodies and Chimeric antibodies - production and applications, Abzymes, Cytokines – types of immune response- Humoral and Cell mediated. Complement system.

UNIT – III

TECHNIQUES IN ANTIGEN ANTIBODY INTERACTIONS: Immunodiagnostics: Paper-based nanoparticle test kits- on RNA Virus Pandemics: detection of Dengue, Zica and Ebola, and on PSA and Pregnancy. Antibody affinity and avidity –precipitation, agglutination, Antibody harvest, ELISA, Western blot, Immunofluorescence, MLR,

UNIT - IV

T CELL & B CELL ACTIVATION: Isolation and primary culture of immune cells. Techniques for T-cell, B-cell, macrophage and WBCs isolation and differential count. T cell & B cell maturation, Autoimmunity, Inflammation. Hypersensitivity, Transplantation immunology.

UNIT – V

IMMUNOINFORMATICS: KIR and HLA gene database, Overview of bioinformatics tools for epitope prediction and epitope mimicry. Web based tools for vaccine design. IMGT database.

TEXT BOOKS:

1. Kenneth Murphy, Casey Weaver, Janeway's Immunobiology, Garland Science, 2016

REFERENCE BOOKS:

1. Goldsby, R. A., T. J. Kindt, and B. A. Osborne, "Kuby immunology", 4th Edition, New York: WH Freeman, 2000.

2. Darren R. Flower, "Immunoinformatics: Predictive Immunogenicity *insilico*", Humana Press, 2007.

3. http://imgt.cines.fr:8104

17BT012 COMPUTATIONAL BIOLOGY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description and Objectives:

This course deals with the various Bioinformatics techniques and tools. The main goal of the course is to inculcate knowledge on various biomolecules, sequences, structural and functional aspects and biomolecular interaction to students.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- Retrieve the biological sequences
- Predicting the 3 Dimensional structure of proteins
- Study the function of proteins
- Find the function of genes

SKILLS:

✓ Access and use databases

✓ Identification and retrieval of biological sequences

✓ Study of protein structures using visualization tools

✓ Study the biomolecular interactions

ACTIVITY:

- *Preparation of ball and stick model of protein*
- *Perform the sequence alignment*
- *Analysis of protein structure*
- *Seminar presentation on molecular modeling*
- *Seminar presentation on molecular dynamics*

UNIT - I

INTRODUCTION TO COMPUTATIONAL BIOLOGY: Introduction, Biomolecular sequence analysis – Nucleic acid sequences, Motifs – localization and extraction, Protein sequence analysis and prediction of secondary structural features.Basics of Microarray.

UNIT - II

PHYLOGENETIC ANALYSIS: Evolution, elements of phylogeny, methods of phylogenetic analysis, Phylogenetic tree of life, comparison of genetic sequence of organisms, phylogenetic analysis toolsPhylip, ClustalW.

UNIT – III

PROTEIN FOLDING AND STRUCTURE PREDICTION: Overview of protein structure, Protein folding *in vitro* and *in vivo*, Theoretical models of Folding, *In silico* folding and Protein structure prediction.

UNIT - IV

COMPUTATIONAL GENOMICS & DRUG DESIGN: Gene sequences, Open reading frames-prediction tools, Genome annotation- Eukaryotic and Prokaryotic genome annotation tools, Molecular docking methodology and programs Stages of Drug Discovery, Role of Bioinformatics in Drug Discovery.

UNIT - V

MOLECULAR DYNAMICS: Introduction, MD methodology, duration of the MD run, analysis of MD job, uses in drug designing, ligand protein interactions.

TEXT BOOKS:

1. Andrezej K Konopka and James C. Crabbe, “Compact Handbook of Computational Biology”, Marcel Dekker, USA, 2004.
2. Peter Clote,Rolf Backofen, “An Introduction Computational Molecular Biology”, John Wiley & Sons ltd.,
3. David W. “Sequences and Genome Analysis”, Mount Published, CSHL Press Science, 2004.

REFERENCE BOOKS:

1. Michael S Waterman, “Introduction to Computational Biology”, CRC Press.
2. C. Stain Tsai, “An introduction to Computational Biochemistry”, A John Wiley and Sons, Inc., publications.
2. S. Salzberg, D. Searls, and S. Kasif, “Computational Methods in Molecular Biology”, Edited by Elsevier Science, 1998.
3. Joao Setubal and Joao Meidanis, “Introduction to Computational Molecular Biology”, Publisher: PWS Publishing Company, Boston, 1997.
4. Rastogi, S. C. and Mendiratta and Rastogi, P. Bioinformatics; Methods and applications; Genomics, Proteomics and Drug Discovery.
5. Cynthia Gibas and Per Jambeck, “Developing Bioinformatics Computer Skills”.

17BT014 ENVIRONMENTAL BIOTECHNOLOGY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description and Objectives:

This course provides a fundamental knowledge of biological methods used in safeguarding the environment by waste treatment, energy production from waste and biological methods for minimum pollution formation.

Course Outcomes:

Upon successful completion of this course, the student will be able to

- *Undestand the types of effluent treatment processes*
- *Working principles of biological effluent process equipments*
- *Know about bio-remediation of toxic wastes and pollutants*
- *Learn the applications of biotechnology in large scale process industries*

SKILLS:

- ✓ Study about various types of pollution caused by industries
- ✓ Identification and analysis of optimum treatment of industrial effluents
- ✓ Study the working of treatment equipments
- ✓ Study the microbial interaction with the environment and its pollutants

ACTIVITY:

- Environmental monitoring of the pollutants from land and water.
- Bioremediation of pesticides
- Wasrewater treatment and analysis
- Calculation of COD and BOD
- Environmental risk assessment studies
- Seminar presentation on Environmental Biotechnology

.

UNIT - I

EFFLUENT TREATMENT – AEROBIC TREATMENT: Treatment of domestic and industrial waste waters – physical, chemical and biological, aerobic treatment methods – trickling filters, towers, RBC (rotating biological contactors), air sparged reactors, FBR (fluidized bed reactor), IFBBR (inverse fluidized bed biofilm reactory), expanded bed reactor, packed bed reactors, activated sludge process

UNIT - II

EFFLUENT TREATMENT – ANAEROBIC TREATMENT: Anaerobic digestion, anaerobic digesters, anaerobic filters, UASB (up flow anaerobic sludge blankets)

UNIT - III

BIOREMEDIATION: Introduction, biostimulation, bioaugmentation, insitu, exsitu, intrinsic and engineered bioremediation, solid phase bioremediation – land farming, prepared beds, soil piles, Phytoremediation, compositing bioventing, biosparging

UNIT - IV

XENOBIOTICS: Introduction to xenobiotics and their biodegradtion, biological detoxification, hazardous waste management of cyanide, oxalate, urea and phenols.

UNIT - V

APPLICATION OF BIOTECHNOLOGY IN MINING & FUELS INDUSTRY: Metal biotechnology of copper and iron, microbial transformation, accumulation and concentration of metals, metal leaching Production of non conventional fuels like hydrogen, alcohols and biogas, use of microorganisms in improvement of oil recovery

TEXT BOOKS:

1. L.E. Casida, JR. “Industrial Microbiology”, 2nd ed., New Age International (P) Ltd., New Delhi, 2006.
2. S.N.Jogdand, “Environmental Biotechnology”, 3rd ed.,Himalaya Publishing, 2007.
3. Pradipta Kumar Mohapatra, “Text book of Environmental Biotechnology”, IK International Publishing House (P) Ltd., New Delhi, 2006.

REFERENCE BOOKS:

1. Martin Alexander, “Biodegradation and Bioremediation” , Academic Press, 1999.
2. Foster C.F. John ware D.A. “Environmental Biotechnology”, Ellis, Honwood Ltd. 1987.
3. Karnely D. Chakrabarty K. Ovnen G.S. “Biotechnology and Biodegradation”, Advances in Applied Biotechnology series, Vol. Gulf Publications Co. London, 1989.

17BT016 INDUSTRIAL BIOTECHNOLOGY AND METABOLIC ENGINEERING

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course offers an introduction to Industrial biotechnology and Metabolic Engineering and their Applications. The objective of the course is to understand the production of commercially and therapeutically important metabolites and bioproducts like enzymes, recombinant proteins.

Course Outcomes:

The student will be able to:

- *Describe various Industrial biotechnology techniques, their applications and processing of metabolic engineering.*
- *Gain knowledge on industrial equipments operations and production.*
- *Summarize current processes involved in industrial biotechnology production from plants, animals and microorganisms.*
- *Understand the different methods and analyze the industrial oriented practical knowledge.*

SKILLS:

- ✓ *Applications of metabolic flux analysis.*
- ✓ *Estimate enzyme activity by colorimetric and spectroscopic methods.*
- ✓ *Immobilize enzymes for commercial applications.*

ACTIVITIES:

- *Isolate amylase/ peroxidase/ urease from various sources.*
- *Purify the enzyme by different methods.*
- *Estimate K_M and Vmax of different enzyme reactions.*
- *Immobilize peroxidase on various substrates cloth, fabric, glass bead and encapsulation.*

UNIT - I

INTRODUCTION & APPLICATIONS OF METABOLIC ENGINEERING: Identification of metabolic regulation is a key point in metabolic engineering. Basic concepts of Metabolic Engineering – Overview of cellular metabolism – Different models for cellular reactions, induction – Jacob Monod model and its regulation, Differential regulation by isoenzymes, Feedback regulation. Applications in pharmaceuticals, chemical bioprocess, food technology, and biomass conversion.

UNIT - II

PLANT METABOLIC ENGINEERING: Study of production processes for various classes of low molecular weight secondary metabolites: Importance of Secondary Metabolites: Biosynthesis of phenolic compounds, isoprenoids, alkaloids and flavonoids; Metabolism of nucleotides amino acids and vitamins; Bioproduction; biological treatment; and related natural and engineered systems.

UNIT - III

PRODUCTION OF COMMERCIALLY IMPORTANT ENZYMES & RECOMBINANT PROTEINS: Proteases, Amylases Lipases, Pectinases, and other commercially important enzymes for the food & pharmaceutical industries; Production of recombinant proteins (Insulin, Interleukin& Interferon's) having therapeutic and diagnostic applications; production of vaccines.

UNIT - IV

BIOCONVERSIONS & REGULATION OF ENZYME PRODUCTION: Applications of Bioconversions, Factors affecting bioconversions, Specificity, Yields, Co metabolism, Product inhibition, mixed or sequential bioconversions, Conversion of insoluble substances. Strain selection, Genetic improvement of strains, Gene dosage, metabolic pathway manipulations to improve fermentation, Feedback repression, Catabolite Repression, optimization and control of metabolic activities. The modification of existing - or the introduction of entirely new - metabolic pathways. Natural Biopreservatives (Nisin), and Biopolymers (Xanthan Gumand PHB); Single Cell Protein, Racemically-pure Drug Intermediates, Steroid Bioconversions; Bioconversion of Vegetable Oils.

UNIT V:

METABOLIC ENGINEERING WITH BIOINFORMATICS: Metabolic pathway modeling, Analysis of metabolic control and the structure metabolic networks, metabolic pathway synthesis algorithms. Metabolomics, metabolomics measurements using NMR, Spectrophotometry, LCMS, and metabolic product in fermentation.

TEXT BOOKS:

1. Wang.D.I.C Cooney C.L., Demain A.L., Dunnil.P. Humphrey, "Fermentation and Enzyme Technology", A.E. Lilly M.D., John Wiley and sons, 1980.
2. Stanbury P.F. and Whitaker A., "Principles of Fermentation Technology", Pergamon Press, 1984.
3. Zubay G., "Biochemistry, Macmillan Publishers", 1989.
4. Lee, S.Y. and Papoutsakis, E.T. "Metabolic Engineering". Marcel Dekker, 1998.
5. Voit, E.O. "Computational Analysis of Biochemical Systems: A Practical Guide for Biochemists and Molecular Biologists". Cambridge University Press, 2000.

REFERENCEBOOK:

1. Gregory N.Stephanopoulos, "Metabolic Engineering Principles and Methodologies"- Aristos et al-Elsevier.
2. Gerhard Gottschalk, Bacterial Metabolism, 2nd Edition, Springer Verlag, 1986 4. S.A. Teukolsky, W.T.Vellerling, B.P. Flannery, W.H. Press, Numerical Recipes in C, Cambridge University Press, 1993.
3. Stephanopoulos GN, Aristidou AA, Nielsen J (1998) Metabolic Engineering: principles and methodologies. Academic Press, San Diego.
4. Scheper, T. "Metabolic Engineering" Vol 73 (Advances in Biochemical Engineering Biotechnology) Springer, 2001.
5. Rehm, H.J. and G. Reed, "Biotechnology: Products of Primary Metabolism" Vol.6 and "Biotechnology: Products of Secondary Metabolism" Vol.7, VCH / Wiley, 1997.
   Warren John Ewens, Gregory R. Grant, Gregory Grant, R. "Statistical Methods in Bioinformatics", Springer, 2005.

17FT018 ADVANCED PROCESS ENGINEERING PRINCIPLES-II

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

***Course Description and Objectives*:**

This course mainly deals with the energy requirements and design of heat transfer equipments for bioprocesses. In addition it also provides insights into thermodynamic energy functions and solution thermodynamics. The objectives of the course are to impart knowledge of thermal energy concepts, estimation of thermodynamic properties and design of heat transfer equipment for required bioprocess.

Course Outcomes:

The student will be able to:

- Estimate properties of chemical compounds and biomass.
- Determine heat of reactions at different process conditions.
- Evaluate phase equilibrium in separation operations.
- Design heat transfer equipment for bioprocesses.

✓ Estimation of change in thermodynamic properties

✓ Calculation of heat requirements of reactions

✓ Determination of properties at phase equilibrium

✓ Estimation of heat transfer coefficients

ACTIVITY:

- Estimation of efficiency of heat engine and refrigerator.
- Calculation of heat changes in fermentation process.
- Determine equilibrium constant for a chemical reaction.
- Design of heat exchanger

UNIT - I

BASICS OF THERMODYNAMICS: The scope of thermodynamics, thermodynamic state and state functions, enthalpy, steady-state, steady-flowprocess, equilibrium, phase rule, reversible process, constant -V and constant – P process, heat capacity. Laws of thermodynamics, Calculation of Work, energy and property changes in reversible processes. The PVT behavior of pure substances, virial equations, ideal gas, applications of the virial equations.

UNIT - II

THERMODYNAMICS OF FLOW PROCESSES AND HEAT ENGINES: Principles of conservation of mass and energy for flow systems, analysis of expansion processes. Statements of the second law, heat engines, thermodynamic temperatures scales, Entropy, Entropy changes of an ideal gas, third law of thermodynamics, entropy from microscopic viewpoint.

UNIT - III

THERMODYNAMIC PROPERTIES OF FLUIDS AND SOLUTION THERMODYNAMICS: Estimation of thermodynamic properties using equations of state; Maxwell relationships and their applications; Calculation of flow processes based on actual property changes Partial molar properties; concepts of chemical potential and fugacity, Ideal & non ideal solutions; Gibbs Duhem equation; Excess properties of mixtures;Activity Coefficient.

UNIT - IV

HEAT TRANSFER BY CONDUCTION: Fourier's law, thermal conductivity, steady state conduction in plane wall & composite walls, compound resistances in series, heat flow through a cylinder, conduction in spheres, Typical heat exchange equipment, countercurrent and parallel current flows, energy balances, rate of heat transfer, overall heat transfer coefficient, logarithmicmean temperature difference, and individual heat transfer coefficients, fouling factors.

UNIT - V

HEAT EXCHANGE EQUIPMENT: General design of heat exchange equipment, heat exchangers, condensers, boilers and calendrias, extended surface equipment, heat transfer in agitated vessels, scraped surface heat exchangers, heat transfer in packed beds.

TEXT BOOKS :

1. J M.Smith, H.C. Van Ness andM.M.Abbott. "Introduction to Chemical Engineering Thermodynamics", McGrawHill.
2. K. V. Narayanan, "Chemical Engineering Thermodynamics", PHI, 2001.

REFERENCE BOOKS :

1. Y.V.C.Rao, "Engineering Thermodynamics", University Publications.
2. W.L. Mc Cabe and JC Smith, "Unit Operations of Chemical Engineering", 5th ed., Mc Graw Hill, 1993

17FT018 CANCER BIOLOGY AND THERAPY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course deals with the understanding of physiological and molecular behaviour of cancer cells. The main intention of this course is to acquaint students with the biological principles of cancer in human beings and its therapies. In addition, current concepts in cancer biology and cancer genetics will be introduced to students.

Course Outcomes:

Upon successful completion of this course, the student will be able to understand about

- *Fundamentals of cancer biology*
- *Tumor suppressor genes and oncogenes*
- *Different forms of cancer*
- *Principles of physical and chemical carcinogenesis; molecular cell biology of cancer and metastasis*
- *Screening and detection of cancer; and different cancer therapeutic approaches*

SKILLS:

✓ *Handling animal cells, CO_2 incubator*

✓ *Culturing cancer cell lines*

✓ *Passaging and trypsinization of cells*

✓ *Identification of cancer cells based on physical appearance*

✓ *Basic HE staining to differentiate cancer cells*

ACTIVITIES:

- Preparation of cell culture specific media
- Calculation and preparation of buffers
- Maintaining aseptic conditions of Laminar Flow chamber
- Inducing cancer in animal models
- Evaluation of anti-cancer activities of medicinal plants

UNIT - I

FUNDAMENTALS OF CANCER BIOLOGY: Regulation of cell cycle, mutations that cause changes in signal molecules, signal switches, tumour suppressor genes, modulation of cell cycle in cancer, different forms of cancers, diet and cancer. Cancer screening, early and advanced detection, Detection using biochemical assays, tumor markers, molecular tools for early diagnosis of cancer.

UNIT - II

PRINCIPLES OF CARCINOGENESIS: Theory of carcinogenesis, Chemical carcinogenesis, metabolism of carcinogenesis, principles of physical carcinogenesis, x-ray radiation-mechanisms of radiation carcinogenesis.

UNIT - III

PRINCIPLES OF MOLECULAR CELL BIOLOGY OF CANCER: Signal targets and cancer, activation of kinases; Oncogenes, identification of oncogenes, retroviruses and oncogenes, Oncogenes/proto oncogene activity. Growth factors related to transformation. Role of Telomerases in cancer.

UNIT - IV

PRINCIPLES OF CANCER METASTASIS: Clinical significances of invasion, metastatic cascade, basement membrane disruption, three step theory of invasion, proteinases and tumour cell invasion.

UNIT - V

NEW MOLECULES FOR CANCER THERAPY: Different forms of therapy-chemotherapy, radiation therapy, Gene therapy and immunotherapy. Use of signal targets towards therapy of cancer.

TEXT BOOKS :

1. Maly B.W.J, “Virology A Practical Approach”, IRLI Press,Oxford, 1987.
2. Dunmock N.J And Primrose S.B., “Introduction to Modern Virology”, Blackwell Scientific Publications, Oxford, 1988.
3. Franks, L.M. & Teich, N.M, “An Introduction to Cell and Molecular Biology of Cancer”, Oxford Medical Publications, First edition, 1991.

REFERENCE BOOKS:

1. Margaret A Knowlies, Peter J Selby - Introduction to the Cellular & Molecular Bioilogy of Cancer, Oxford, 4th Edition, 2005.
2. Raymond W. Ruddon - Cancer Biology, Wiley Publications, 4th Edition, 2007.
3. Robert T.A. Weinburg - The Biology of Cancer, Garland Science, First Edition, 2007.

Detailed Course Structure

I Year

Course Code	Course Title	L	T	P	C
I Semester					
17CS001	Advanced Database Management Systems	3	-	3	5
17CS003	Data Structures & Algorithms	3	-	3	5
17CS005	Embedded Systems	3	1	-	4
17CS007	Cloud Computing	3	1	-	4
II Semester					
17HS001	Research Methods	3	-	-	3
17HS002	Employment Orientation Program (EOP)	2	-	-	2
17CS002	Data Warehousing & Data Mining	3	-	3	5
17CS004	Cryptography and Network Security	3	-	3	5
17CS006	Internet of Things	3	1	-	4
17CS008	Big Data Analytics	3	-	3	5
Pool of Electives					
17CS009	Wireless Computer Network	3	1	-	4
17CS010	Artificial Intelligence	3	1	-	4
17CS011	Advanced Computer Architecture	3	1	-	4
17CS012	Artificial Neural Networks	3	1	-	4
17CS013	Biometrics	3	1	-	4
17CS014	Computer Vision	3	1	-	4
17CS015	Cyber Security	3	-	3	5
17CS016	Fundamentals of Image Processing	3	1	-	4
17CS017	Pattern Recognition	3	1	-	4
17CS018	Web Technologies	3	-	3	5
17CS019	Wireless Communication Networks	3	1	-	4

II Year

Course Code	Course Title	L	T	P	C
I Semester					
17PR001	Project/ Internship Phase - I				15
II Semester					
17PR001	Project/ Internship Phase - II				15

I YEAR	**COURSE CONTENTS**	
I SEMESTER	17CS001	Advanced Database Management Systems
	17CS003	Data Structures & Algorithms
	17CS005	Embedded Systems
	17CS007	Cloud Computing

17CS001 Advanced Database Management Systems

L	T	P	C
3	-	3	5

Course Description and Objectives:

This course presents in depth, databases and database management systems. Topics covered will include: the fundamental nature for how data is stored on electro-magnetic devices, database management system architecture, building complex database objects, establishing and maintaining database security and tuning databases for optimum performance. Provides the theory and practice of advanced database development and administration.

Course Outcomes

The student will be able to:

- ✓ Understand the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- ✓ Design Entity Relationship(ER) models to represent simple database application scenarios.
- ✓ Design and implement advanced queries using Structured Query Language
- ✓ Understand the Distributed database concepts
- ✓ Identify, describe, and categorize database objects.
- ✓ Understand the basic concepts of Mongo DB
- ✓ Explore non-relational database systems and structures

Skills

- ✓ Design a conceptual database using ER-Model.
- ✓ Convert ER- Model to RDBMS.
- ✓ Design and implement advanced queries using Structured Query Language
- ✓ Perform the database tuning
- ✓ Identify, describe, and categorize database objects.

UNIT - I

Conceptual database Design: Relational Model, Relational Algebra, Relational Calculus, ER Model, ER-Diagram, Normalization and SQL

UNIT - II

Physical database Design: Overview of Storage and Indexing, Physical Database design and Tuning

Unit III

Distributed Database Systems: Evolution of Distributed Database System, Distributed Database- Concepts, Design and Transaction Management

UNIT - IV

Object-Oriented Database Design: Introduction, Object-oriented Data Model, Object Databases Standards and Definitions.

UNIT - V

Bigdata: Introduction to MongoDB, The data Model, Installing MongoDB, Working with MongoDB.

Activities

- ✓ Design of ER diagram for the development of web applications
- ✓ Transformation of ER diagram into a relational schema.
- ✓ Creation of relations with entity and referential integrity constraints for a given relational schema
- ✓ Performing the database tuning techniques
- ✓ Creating complex database objects
- ✓ Installation of mongo DB
- ✓ Working with No SQL

Laboratory Experiments

List of Programs

1. Web application Database Design using ER Design tool (ex. ERDPlus, SmartDraw,TOAD)
2. Data Definition, Table Creation, Constraints, Insert, Select Commands, Update and Delete Commands.
3. Basic SQL Queries
4. Complex Queries and Join Queries
5. Views
6. Design and development of database using MYSQL
7. High level programming language extensions (Control structures, Procedures and Functions).
8. Triggers
9. Familiarization of MongoDB
10. Installation of MongoDB
11. Working on MongoDB using NoSQL
12. Case Study/ Database application project.

Text Books :

1. *C . J. Date*, *A. Kannan* and *S.Swamynathan*, Introduction to Database Systems, Pearson Education, 2006 (for Unit I)
2. *Raghu Ramakrishnan* and *Johannes Gehrke*, Database Management Systems, Third Edition, Mc Graw Hill (for unit II)
3. *Chhanda Ray*, Distributed Database Systems, Pearson Education India, 2009 (for Unit III)
4. *Jan L. Harrington*, Object-oriented Database Design Clearly Explained, Morgan Kaufmann, 2000 (for Unit IV)
5. David Hows, Peter Membrey Eelco Plugge and Tim Hawkins, The Definitive Guide to MongoDB, Third Edition, Apress, 2015. (for Unit V)

Reference Text Books:

1. Seyed M.M. Tahaghoghi, Hugh E. Williams, Learning MySQL-concepts and Techniques for working with Relational data, O'Reilly Media, Inc,2006.
2. David Hows, Peter Membrey Eelco Plugge and Tim Hawkins, The Definitive Guide to MongoDB, Third Edition, Apress, 2015.

17CS003 DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	-	3	5

Course description and objectives:

This course introduces students to the analysis and design of computer algorithms. The course is intended to provide the foundations of the practical implementation and usage of Algorithms and Data Structures. One objective is to ensure that the student evolves into a competent programmer capable of designing and analysing implementations of algorithms and data structures for different kinds of problems. The second objective is to expose the student to the algorithm analysis techniques, to the theory of reductions, and to the classification of problems into complexity classes like NP.

Course Outcomes:

Upon completion of this course, students will be able to do the following:

- ✓ Analyze the asymptotic performance of algorithms.
- ✓ Demonstrate a familiarity with major algorithms and data structures.
- ✓ Apply important algorithmic design paradigms and methods of analysis.
- ✓ Synthesize efficient algorithms in common engineering design situations.

SKILLS:

- ✓ Be able to Design and Analyse programming problem statements.
- ✓ Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- ✓ Be able to understand the necessary mathematical abstraction to solve problems.
- ✓ Be able to come up with analysis of efficiency and proofs of correctness
- ✓ To be able to comprehend and select algorithm design approaches in a problem specific manner.

Unit – I

Elementary Data Structures: Trees, binary heaps, Hashing, Balanced Search Trees - Properties and Abstract Data Types (ADT) of AVL, Red-Black and Splay Trees, Disjoint set data structure: Union-find

Unit – II

Introduction to Algorithm Analysis: Algorithm, Asymptotic Notation Recurrences: Substitution, Iteration and master method

Divide and Conquer: General method, Applications - Binary search, Merge sort, Quick sort, Strassen’s Matrix multiplication

Unit – III

Greedy Method: General method, Applications - Fractional knapsack problem, Minimum cost spanning trees, Single source shortest path problem

Graph Algorithms: BFS, Applications of BFS, bipartite graphs, Depth First Search(DFS), Application Of DFS like Topological Sort, Cycle Detection, Checking Whether a Digraph is Strongly connected or not,

Unit – IV

Dynamic Programming: General method, Applications - Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem and design, Longest Common Subsequence.

Unit – V

Backtracking: General method, Applications - N-queen problem, Sum of subsets problem
Intractability and NP-Completeness: The class NP, Satisfiability, NP-hard and NP-complete problems, proving a problem is NP-complete. Approximation algorithms for NP-hard problems

LABORATORY EXPERIMENTS

1. Implement stack ADT and write a program that reads an infix arithmetic expression of variables, constants, operators (+, -, *, /) and converts it into the corresponding postfix form. Extend the program to handle parenthesized expression also.
2. Write a program to implement the following operations:
   a) Traversal operation on a given binary search tree with given elements.
   b) Search for a key element in the above binary search tree.
   c) Delete an element from the above binary search tree.
3. Write a program to sort a given list of elements using quick sort and merge sort
4. Implement AVL Tree ADT and write a program that interactively allows
   a) Insertion b) Deletion c) Find_min d) Find_max
5. Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Write a C++ program that implements backtracking algorithm to solve the problem i.e. place eight non-attacking queens on the board.
6. Write a C++ program to implement dynamic programming algorithm to solve all pairs shortest path problem.
7. Write a C++ program to solve fractional 0/1 knapsack problem.
8. Write a C++ program to find the strongly connected components in a digraph.
9. Write a C++ program that uses dynamic programming algorithm to solve the optimal binary search tree problem.
10. Write a C++ program to solve traveling sales person problem.
11. Write a C++ program to find optimal ordering of matrix multiplication. (Note: Use Dynamic programming method).

Activities
1. Prepare a table for each sorting algorithm showing the elapsed system time (use standard clock function) of the sort for *at least* four different non-trivial array sizes. A non-trivial array size is one where the runtime is more than just a few milliseconds.
2. Design an array based data structure for two stacks called a DualStack The two stacks should share the same array in an efficient manner. If there are MaxSize entries in the array then the IsFull function should only return true is all the entries in the array are occupied. Your operations should all be constant time. Check such a nice data structure would be possible for 3 stacks or not
3. Design an algorithm based on depth-first search to determine if a graph is bipartite and if it is not return an odd length cycle in the graph. You algorithm should use the adjacency list representation of a graph. Your algorithm should run in linear time. Hint: there are two labels for marking 1 and 2. A new vertex visited from a vertex marked 1 is marked 2 and a new vertex visited from a vertex marked 2 is marked 1.
4. Some project planning applications use a labeled acyclic directed graphs to represent the jobs and job times on a project. A vertex in the graph represents a job and its label represents the time the job will take. A directed edge from one vertex to another represents the fact the job represented by the first vertex must be completed before the job represented by the second vertex. Assume we have a directed acyclic graph G =({1,2,...,n},E) with vertices labeled by non-negative integers c_1, c_2, ... ,c_n . The label

c_i represents the time job i will take. Assume futher that every vertex is reachable by some path from vertex 1, vertex 1 has in-degree 0, vertex n is reachable by some path from every vertex, and n has out degree 0. Vertex 1 represent the beginning of the project and vertex n represent the end of the project. The length of a path from 1 to n is the sum of the labels on the vertices along the path. Design an algorithm based on the topological sort algorithm to find the length of a longest path from 1 to n in the graph. The length of the longest path represents how long the entire project will take. Sometimes a longest path is called a critical path.

5. Design a Data Structure for web server to store history of visited pages. The server must maintain data for last n days. It must show the most visited pages of the current day first and then the most visited pages of next day and so on.
6. In biological applications, we often want to compare the DNA of two (or more) different organisms. A strand of DNA consists of a string of molecules called bases, where the possible bases are adenine, guanine, cytosine, and thymine. Representing each of these bases by their initial letters, a strand of DNA can be expressed as a string over the finite set A, C, G, T. One goal of comparing two strands of DNA is to determine how "similar" the two strands are, as some measure of how closely related the two organisms are. Similarity can be and is defined in many different ways. One way to measure the similarity of strands S1 and S2 is by finding a third strand S3 in which the bases in S3 appear in each of S1 and S2; these bases must appear in the same order, but not necessarily consecutively. The longer the strand S3 we can find, the more similar S1 and S2. Compute the similarity between ACCGGTCGAGTGCGCGGAAGCCGGCCGAA and GTCGTTCGGAATGCCGTTGCTCTGTAAA using dynamic programming approach.
7. Determine which of the following problems are NP-complete and which are solvable in polynomial time. In each problem you are given an undirected graph G = (V, E), along with:
   (a) A set of nodes $L \subseteq V$, and you must find a spanning tree such that its set of leaves includes the set L.
   (b) A set of nodes $L \subseteq V$, and you must find a spanning tree such that its set of leaves is precisely the set L.
   (c) A set of nodes $L \subseteq V$, and you must find a spanning tree such that its set of leaves is included in the set L.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni and Rajasekaaran "Fundamentals of Computer Algorithms", second edition, University press.
2. Sartaj Sahni, "Data Structures, Algorithms and Applications in java", University Press.

REFERENCE BOOKS:

1. T.H.Cormen, C.E.Leiserson, R.L.Rivest,and C.Stein, "Introduction to Algorithms", second edition ,PHI Pvt. Ltd.
2. Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson education.
3. Richard Johnson baugh and Marcus Schaefer , "Algorithm Design: Foundations, Analysis and Internet examples, Algorithms", Pearson Education.
4. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition by, Addison-Wesley.
5. Jon Kleinberg and Eva Tardos , "Algorithm Design", Pearson.

17CS003 EMBEDDED SYSTEMS

L	T	P	C
3	1	-	4

Course Description and Objectives:
This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies, in tune with the requirements of Industry. The objective of this course is to enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions.

Course Outcomes:
The student will be able to:
- ✓ Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
- ✓ Get familiarized with programming environment to develop embedded solutions.
- ✓ Program ARM microcontroller to perform various tasks.
- ✓ Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

Activities:
- ✓ Identify hardware and software components to build an embedded system.
- ✓ Demonstrate the interfacing of peripherals with 8051/ARM microcontroller.
- ✓ Porting of OS on to ARM processor board.
- ✓ Demonstrate Deadlock situation in RTOS.
- ✓ Demonstrate Inter-task communication methods in RTOS.

Skills:
- ✓ Programming the ARM processors.
- ✓ Design of microcontroller based embedded system.
- ✓ Interfacing of various peripherals with ARM processors.
- ✓ Expertise in writing multiple tasks under RTOS environment.
- ✓ To handle shared data issues in RTOS environment

Unit - I
Introduction to Embedded Systems: Definition, Applications of ES, Embedded Hardware Units and Devices, Embedded Software, Design Metrics in ES, Challenges in ES Design.

Unit- II
Architecture of 8051: 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts and Programming 8051.

UNIT –III
ARM- Embedded Processor: History, Architecture, Interrupt vector, Programming the ARM, ARM Assembly language, Instruction set, Conditional Execution, Arithmetic and Logical Compare.

UNIT – IV
ARM PROGRAMMING: Assembly programming, General structure of assembly language, Writing programs, Branch instructions, Loading constrains, load and store instructions, Read-only and read/write Memory, Multiple Register Load and Store.

UNIT – V

REAL TIME OPERATING SYSTEMS: Introduction, Tasks and Task States, Tasks and Data, Reentrancy, Semaphores and Shared Data, Inter Process Communication-Message Queues, Mailboxes and Pipes.

TEXT BOOKS:

1. Raj Kamal, "Embedded Systems", 2nd edition, Tata McGraw Hill, 2009.
2. Lyla B Das, "Embedded Systems an Integrated Approach", 1st edition, Pearson, 2012.
3. David E. Simon, "An Embedded Software Primer", 1st edition, Pearson Education, 2008.

REFERENCE BOOKS:

1. Wayne Wolf, "Computers as Components-principles of Embedded Computer system Design", 1st edition, Elseveir, 2009.
2. Labrosse, "Embedding system building blocks", 2rd edition, CMP Publishers, 2007.
3. Kenneth J. Ayala and Thomson, "The 8051 Microcontroller", 3rd edition, Thompson Delmar, Learning, 2008.
4. Frank Vahid, Tony Givargis and John Wiley, "Embedded System Design, Microcontrollers", 3rd edition, Pearson Education, 2008.
5. Michael J. Pont, "Embedded C", Addison Wesley, 2002

17CS005 CLOUD COMPUTING

L	T	P	C
3	1	-	4

Course Description and Objective:
This course gives an introduction to cloud computing and its techniques, issues, and its' services that will lead to design and development of a simple cloud service.

Course Outcomes:
Upon Completion of the course, the students will be able to
- ✓ Compare the strengths and limitations of cloud computing
- ✓ Identify the architecture, infrastructure and delivery models of cloud computing
- ✓ Apply suitable virtualization concept.
- ✓ Choose the appropriate Programming Models and approach.
- ✓ Address the core issues of cloud computing such as security, privacy and interoperability
- ✓ Design Cloud Services

Skills:
- ✓ Gain broad perceptive of cloud architecture and models
- ✓ Understand the concept of Virtualization and implements it.
- ✓ Understand the features of cloud simulator and simulate cloud environment
- ✓ Apply different cloud programming models.
- ✓ Learn and Design the trusted cloud computing system.

Activities:
- ✓ Identify various network devices in laboratory.
- ✓ Investigate various network topologies.
- ✓ Connect various workstations in Ethernet.
- ✓ Simulate the data link protocols.
- ✓ Design of detecting and correcting errors in data transmission.
- ✓ Identify the different classes of IP addresses.
- ✓ Study on functionalities of routers.
- ✓ Simulate routing algorithms.

UNIT I
Cloud History and Fundamentals: Cloud computing at a Glance, Historical Developments, Building cloud computing environments, Computing platforms and technologies, Cloud architecture, types of clouds, Economics of the cloud.

UNIT II
Virtualization: Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

UNIT III
Cloud Services and File System: Types of Cloud services: Software as a Service - Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –

Communication as services. Service providers: Google App Engine, Amazon EC2, Microsoft Azure, Sales force. Introduction to Map Reduce, GFS, HDFS, Hadoop Framework.

UNIT IV

Programming Model: Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments - Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

UNIT V

Security in the Cloud: Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw Hill Education, 2013
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
4. John Rittinghouse& James Ransome, "Cloud Computing Implementation Management and Strategy", CRC Press, 2010.(UNIT-III)
5. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.

I YEAR	**COURSE CONTENTS**	
II SEMESTER	17CS002	Data Warehousing & Data Mining
	17CS004	Cryptography and Network Security
	17CS006	Internet of Things
	17CS008	Big Data Analytics

17CS002 DATAWAREHOUSING & DATAMINING

L	T	P	C
3	-	3	5

Course Description and Objectives:

This course is aimed at offering data and information management, information retrieval, and knowledge discovery in modern organizations. Case studies of those organizations using technologies to support business intelligence gathering and decision making are explored. This course is designed to understand the issues relating to the feasibility, usefulness, effectiveness, and scalability of techniques used for the discovery of patterns hidden in large data sets and also characterizes the kind of patterns that can be discovered by association rule mining, classification and clustering

Course Outcomes:

Students are able to

- ✓ Learn the basic concepts of Database Technology Evaluation steps and also understood the need of data mining and its functionalities
- ✓ Explore the efficient and effective maintenance of Data Warehouses.
- ✓ Apply the data mining functionalities like Clustering, Classification, Association Analysis to real world data.
- ✓ Discover interesting patterns and association rules from huge volume of data used to do classifications and predictions.
- ✓ Gain knowledge on developing areas like Web Mining, Text Mining, and Spatial Mining.

Skills:

- ✓ Design and development of schema models for a data warehouse
- ✓ Extraction of hidden interesting association rules
- ✓ Implementation of various classification and clustering algorithms
- ✓ Extraction of knowledge from text databases

UNIT- I

Introduction: Why Data Mining, What is Data Mining, Kinds of Data, Kinds of Patterns, and Technologies used, Kinds of applications adopted, Major issues in Data Mining.

Data Warehousing and Online Analytical Processing: Basic Concepts, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction

UNIT– II

About Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT- III

Data Cube Technology: Preliminary Concepts, Data Cube Computation Methods, Processing Advanced Kinds of Queries by Exploring Cube Technology, Multidimensional Data Analysis in Cube Space

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods

Advanced Pattern Mining: Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining.

UNIT- IV
Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy
Advanced Classification: Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Classification Using Frequent Patterns, Lazy Learners, Other Classification Methods

UNIT- V
Cluster Analysis: Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering
Advanced Cluster Analysis: Probabilistic Model-Based Clustering, Clustering High-Dimensional Data

LABORATORY EXPERIMENTS

Course Outcomes:
Students can able

- ✓ To evaluate the different models of OLAP and data preprocessing.
- ✓ To enlist various algorithms used in information analysis of Data Mining Techniques.
- ✓ To demonstrate the knowledge retrieved through solving problems

.**List of Experiments**

1. Explore various commands given in PL/SQL in Oracle 8.0
2. Execute multi-dimensional data model using SQL queries.
3. Implement various OLAP operations such as slice, dice, roll up, drill up, pivot etc.
4. Implementation of Text Mining on the data warehouse
5. Explore the correlation-ship analysis between the data set
6. Evaluate attribute relevance analysis on a weather data warehouse
7. Evaluate Information Gain of an attribute in the student database
8. Experiment to predict the class using the Bayesian classification
9. Find out a weight & bias updating using the Back Propagation Neural Network
10. To perform various data mining algorithms on the give data base using WEKA

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber " Data Mining: Concepts and Techniques" 3rd edition ,Morgan Kaufmann, 2012

REFERENCE BOOKS :

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", First Edition,2012.
2. Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit", first edition John Wiley and Sons Inc., 2002.
3. Alex Berson, Stephen Smith, Kurt Thearling, "Building Data Mining Applications for CRM", first edition, Tata McGraw Hill, 2000.
4. Margaret Dunham, "Data Mining: Introductory and Advanced Topics", first edition, Prentice Hall, 2002.
5. Paulraj Ponnaiah, "Data Warehousing Fundamentals", first edition, Wiley Publishers, 2001.

17CS004 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	-	3	5

Course Description and Objective:
This course focuses on offering the knowledge of applying cryptographic algorithms for network security. It also deals with the understanding and controlling of malicious software like viruses and worms. The objective of this course is to enable the student to understand and apply various security algorithms in applications such as e-mail, web and other data transfer mechanisms.

Course Outcomes
The student will be able to:

- ✓ Understand and implement different types of conventional and modern cryptographic algorithms.
- ✓ Apply various encryption techniques for network security.
- ✓ Develop programs involving symmetric and asymmetric ciphers.
- ✓ Familiarize with web security and transport level security protocols.

Skills:

- ✓ Identify and resolve different types of security vulnerabilities.
- ✓ Differentiate classical encryption methods with modern encryption algorithms.
- ✓ Develop secured client/server environment.
- ✓ Apply different security mechanisms for different layers.
- ✓ Compare and evaluate different encryption algorithms.

Activities:

- ✓ Design and implementation of a network.
- ✓ Build secured applications using sockets and TCP/IP.
- ✓ Manage security In small business network applications.
- ✓ Application of S/MIME, PGP in e-mail security.

UNIT - I
Introduction: Security Trends, Security attacks, Security services, Security Mechanisms, A Model for Network Security Model, Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

UNIT - II
Block Ciphers and Data Encryption Standard: Block Cipher Principles, Data Encryption Standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Advanced Encryption Standard, Evaluation Criteria of AES,AES Cipher, Multiple encryption and Triple DES, Block Cipher Modes of Operation, RC4. Cast-128, Blowfish Algorithms

UNIT - III
Public - Key Encryption and Hash Functions: Principles of Public Key Cryptosystems, RSA Algorithm, Key Management ,Message Authentication and Hash Functions, Authentication Requirements, Authentication Functions, Message Authentication, Hash

Functions, Security of Hash Functions and MACs, Digital. Signatures, Authentication Protocols, Digital Signature Standard.

UNIT - IV

Network Security Applications: Kerberos, X.509Authentication Service, Public Key Infrastructure, Pretty Good Privacy, S/MIME , IP Security Overview, IP Security architecture, Authentication Header, Encapsulating Security Payload, Combining Security associations, Key Management.

UNIT - V

System Security: Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction, Intruders, Intrusion Detection, Password Management, Malicious Software, Firewalls, Trusted Systems.

LIST OF EXPERIMENTS

List of Programs

1. Implement substitution and transposition ciphers.
2. Develop simplified data encryption standard algorithm (S-DES).
3. Write a program to implement RSA algorithm.
4. Demonstrate the usage of wireshark to identify abnormal activity in network communication.
5. Demonstrate usage of NMAP (Zenmap) tool in network scanning.
6. Demo of eavesdropping attack and its prevention using SSH.
7. Configuration and deployment of firewall.

Text Books

1. Cryptography and Network security by William Stallings, Pearson Education, 4th ed.,

Reference Books

1. William Stallings, “Network Security Essentials Applications and Standards”, 2nd ed., Pearson Education, 2003.
2. Charlie Kaufman, Radis Perlman and Mike Speciner, “Network Security – Private Communication in a Public World” 2nd ed., Pearson Education, 2003.
3. Cyrus Piekari, Anton Chuvakin, “Security Warrior”, 2nd ed., Oreilly, 2005.
4. Peborab Russell, G.T. Gangeni Sr, “Computer Security Basics”, 2nd ed., Oreilly Publishers, 2006.

17CS006 INTERNET OF THINGS

L	T	P	C
3	1	-	4

Course description and objectives:
Students will be explored to the concepts and applications of Internet of Things, interconnection and integration of the physical world and the cyberspace. They are also able to design & develop IOT Devices and applications.

Course Outcomes:
- ✓ Able to understand the application areas of IOT
- ✓ Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- ✓ Able to understand building blocks of Internet of Things and characteristics.
- ✓ Learn Programing concepts using python
- ✓ Able to develop programs in python
- ✓ Able to design and develop IoT applications

Skills:
- ✓ Learn how IoT works in different domain applications by case studies.
- ✓ Learn Python programming language
- ✓ Learn how to sense or actuate devices using Raspberri Pi kits
- ✓ Learn how to create a successful product using IoT

Unit I
Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

Unit II
Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

Unit III
Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages

Unit IV
M2M & System Management with NETCONF-YANG: M2M, Difference between IOTand M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG.

Unit V
IOT Design Methodology, Case study using weather monitoring.IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming of IOT Devices.

TEXT BOOKS:

1. Vijay Madisetti, ArshdeepBahga," Internet of Things A Hands-On- Approach", 2014, ISBN:978 0996025515

REFERENCE BOOKS:

1. 1.Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013, ISBN: 978-1-118-43062-0
2. 2.DanielKellmereit, “The Silent Intelligence: The Internet of Things”. 2013, ISBN 0989973700

Activities

- ✓ Python programming with IDLE
- ✓ Program to sense or actuate devices in simulation environment
- ✓ Awarness how to use Raspberri Pi kits for development of IoT

17CS008 BIG DATA ANALYTICS

L	T	P	C
3	-	3	5

Course Description and Objectives:
This course gives an overview of Big Data, i.e. storage, retrieval and processing of big data. The focus will be on the "technologies", i.e., the tools/ algorithms that are available for storage, processing of Big Data and a variety of "analytics".

Course Outcome:
The student will be able to:
- Understand the theoretical issues involved in Big Data system design such as the curse of dimensionality.
- Familiarize with major approaches in Big Data Analytics.

Skills:
Upon completion of this course, students will be able to do the following:
- Students will to build and maintain reliable, scalable, distributed systems with Apache Hadoop.
- Students will be able to write Map-Reduce based Applications
- Students will be able to design and build applications using Hive and Pig based Big data Applications
- Students will learn tips and tricks for Big Data use cases and solutions

Activities:
- Install Hadoop and develop applications on Hadoop
- Develop Map Reduce applications
- Develop applications using Hive/Pig/Spark

Unit-I
Introduction to big data: Data, Characteristics of data and Types of digital data:, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data
Big data analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment

Unit-II
Introduction to Hadoop : Introducing Hadoop, need of Hadoop, limitations of RDBMS, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop , Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS (Hadoop Distributed File System) , Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Interacting with Hadoop Ecosystem

Unit-III
Introduction to MAPREDUCE Programming: Introduction , Mapper, Reducer, Combiner, Partitioner , Searching, Sorting , Compression, Real time applications using MapReduce, Data serialization and Working with common serialization formats, Big data serialization formats

Unit-IV

Introduction to Hive: Introduction to Hive, Hive Architecture , Hive Data Types, Hive File Format, Hive Query Language (HQL), User-Defined Function (UDF) in Hive.

Introduction to Pig: Introduction to Pig, The Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Piggy Bank, Word Count Example using Pig , Pig at Yahoo!, Pig versus Hive

Unit-V

Spark: Introduction to data analytics with Spark, Programming with RDDS, Working with key/value pairs, advanced spark programming

Text Books

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley
2. Learning Spark: Lightning-Fast Big Data Analysis, Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, O'Reilly Media, Inc.

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk derooset al. , "Understanding Big data ", McGraw Hill, 2012.
3. Tom White, "HADOOP: The definitive Guide", O Reilly 2012.
4. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packet Publishing 2013.

LABORATORY EXPERIMENTS

Getting Hadoop Up and Running in a cluster:

1. Setting up Hadoop on standalone machine.
2. Wordcount Map Reduce program using standalone Hadoop.
3. Adding the combiner step to the Wordcount Map Reduce program.
4. Using HDFS monitoring UI
5. HDFS basic command-line file operations.
6. Setting Hadoop in a distributed cluster environment.
7. Running the WordCount program in a distributed cluster environment.
8. Practice on Map Reduce monitoring User Interface
9. Sort operation using MapReduce
10. Simple analytics using Map Reduce.
11. Creation of Database using hive.
12. Practice of Hive Query Language operations.
13. Basic operations in pig
14. Implementation of Word count using Pig.
15. Simple programs using Spark.
16. Implementation of WordCount using Spark

Text Books

1. Hadoop Map Reduce Cookbook, Srinath Perera & Thilina Gunarathne, 2013, PACKT PUBLISHING.
2. Learning Spark: Lightning – Fast Big Data Analysis, Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia O'Reilly Media, Inc.
3. Tom White " Hadoop The Definitive Guide" O'Reilly 2012

COURSE CONTENTS FOR POOL OF ELECTIVES

17CS011	Advanced Computer Architecture
17CS010	Artificial Intelligence
17CS012	Artificial Neural Networks
17CS013	Biometrics
17CS014	Computer Vision
17CS015	Cyber Security
17CS016	Fundamentals of Image Processing
17CS017	Pattern Recognition
17CS018	Web Technologies
17CS009	Wireless Computer Network
17CS019	Wireless Communication Networks

17CS009 Wireless Computer Networks

L	T	P	C
3	1	-	4

Course Description and Objective:

This course covers major aspects of ad hoc networks, from design through performance issue to application requirements. The objective of the course is to enable the student to use MAC protocols and routing protocols in wireless ad hoc networks.

Course Outcomes:

The student will be able to:

- ✓ Understand the principles of mobile ad hoc networks (MANET)
- ✓ Understand the function and applications of routing protocols.
- ✓ Simulate the routing protocols using NS2.

Skills:

- ✓ Design and simulate an ad hoc network for real-time applications.
- ✓ Develop routing algorithms using NS2.
- ✓ Simulate MAC scheduling algorithms using NS2.
- ✓ Simulate applications for specific QoS parameters.

Activities:

- ✓ Design a MANET with different number of nodes.
- ✓ Design and develop a routing algorithm for a specified ad hoc network.
- ✓ Design a scheduling algorithm for energy saving for a specified ad hoc network.
- ✓ Design an adhoc network for the given application

Unit-I

Introduction: Mobile Communications and computing : Mobile Computing (MC)-Introduction to MC, novel applications, limitations, and architecture GSM – Mobile services , System Architecture , Radio interface, Protocols , Localization and calling , Handover, Security, and new data services.

Unit-II

Wireless Medium Access Control: Motivation for a specialized MAC, SDMA, FDMA, TDMA , CDMA. Mobile Network layer – Mobile IP: Goals , assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery , registration, tunneling and encapsulation, optimizations), Dynamic Host configuration Protocol (DHCP) . Mobile transport layer – traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ fast recovery, Transmission / timeout freezing , Selective retransmission, Transaction oriented TCP.

Unit-III

Mobile Ad Hoc Networks(MANET) : Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, Security in MANET protocols

Unit-IV

Wireless Application Protocol – WAP: Introduction, protocol architecture, and treatment of protocols of all layers, Bluetooth: User scenarios, physical layer, MAC layer, networking, security, link management.

Unit-V

Routing Protocols: Design issues, Goals and classification. Table driven routing protocols, On-demand routing protocols, Hybrid routing protocols, Hierarchical routing protocols and Power aware routing protocols.

Textbooks:

1. Jochen Schiller, Mobile Communications, Addison-Wesley, Second edition, 2008.
2. C.Siva Ram Murthy and B.S.Manoj, “Adhoc Wireless Networks Architectures and Protocols”, Pearson Education, 2nd edition, 2007.

Reference Books:

1. William Stallings, “Wireless Communications and Networks”, Prentice Hall of India / Pearson Education, 2nd edition, 2007.
2. Uwe Hansmann, Lothar Merk, Martin S Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer International, 2nd edition, 2007.
3. Raj Kamal, “Mobile Computing”, Oxford University Press, 2nd edition, 2007.
4. Dharma P Agarwal and Carlos Cordeiro, “Adhoc and Sensor Networks - Theory and Applications”, World Scientific Publications, 1st edition, 2007.

17C010 ARTIFICIAL INTELLIGENCE

L	T	P	C
3	1	-	4

Course Description and Objectives:
To familiarize students with Artificial Intelligence techniques for building well engineered and efficient intelligent systems. Pattern-directed inference systems and different types of truth maintenance systems will be discussed in length from both theoretical and applied point of view. Some cutting edge applications of these systems will also be discussed. Introduction to Artificial Intelligence Programming using Prolog will be provided to help students with the programming part of the course.

Course Outcomes:
Upon completion of this course, student should able to :

- ✓ Understand the basic concepts of search techniques in intelligent systems and game playing.
- ✓ Represent facts in propositional and first order logic and deduct the new sentence from old sentences.
- ✓ Formulate the planning problem as search problems and construct planning graph.
- ✓ Understand the concept of rule based system(expert system) and importance of knowledge in decision support systems.
- ✓ Understand the different types of learning concepts and construct the decision tree

Skills

- ✓ Apply the search techniques and gaming concepts
- ✓ Explore the facts and apply the inference mechanism
- ✓ Formulate the planning problem as search problem
- ✓ Understand the concepts of expert systems.
- ✓ Solving the different types of learning.

UNIT – I
Artificial Intelligence Introduction: Artificial Intelligence Agents, Problem Solving, Solving Problems by searching, informed Search Methods, Game Playing.

UNIT - II
Knowledge and reasoning: Agents that Reason Logically, First Order Logic, Building a Knowledge Base.

UNIT - III
Logical Reasoning Systems: Acting Logically, Practical planning. Planning and Acting.

UNIT - IV
Uncertain knowledge and reasoning: Uncertainty, Probabilistic Reasoning System, Making Simple Decisions

UNIT - V
Learning: Learning from Observations, Learning in Neural and Belief Networks, Reinforcement learning, Knowledge in Learning.

TEXT BOOKS :

1. Stuart J. Russell and Peter Norvig, “Artificial Intelligence A Modern Approach” Second Edition, Pearson Education.

REFERENCE BOOKS:

1. Jeff Heaton, “Artificial Intelligence for Humans”, Volume 1:
2. Ivan Bratko , “Fundamental Algorithms by Prolog Programming for Artificial Intelligence”, 4th Edition, AddisonWesley, 2011
3. Saroj Kaushik, “Logic And Prolog Programming”, first edition, 2002

Activities

- ✓ Solve the 8 puzzle Problem-using A* algorithm in Prolog.
- ✓ Write a program in prolog to solve Tower of Hanoi by using AO* algorithm
- ✓ Write a program to develop TIC-TAC-TOE game.
- ✓ Write a program using variables in Prolog. Write a Prolog program containing facts related to following predicates
  - Location (city, state)
  - Stays (person, city)
  - Display: (i) list of person, state and city (ii) Given person staying in which state.
- ✓ Write a program to implement Sussman Anomaly problem, In the problem, three blocks (labeled A, B, and C) rest on a table. The agent must stack the blocks such that A is atop B, which in turn is atop C. However, it may only move one block at a time.
- ✓ Write Prolog program of water jug problem.
  - Given a 4 - liter jug filled with water & an empty 3 - liter Jug, how can one obtain exactly 2 liters in 4 liters jug. There is no measuring mark on any of them.
- ✓ 7. Write a program to implement Missionaries and Cannibals problem.
  - There are three missionaries and three cannibals on the left bank of a river. They wish to cross over to the right bank using a boat that can only carry two at a time. The number of cannibals on either bank must never exceed the number of missionaries on the same bank, otherwise the missionaries will become the cannibals' dinner! Plan a sequence of crossings that will take everyone safely across.

17CS011 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
3	1	-	4

Course Description and objectives:
The objective of this course is to learn the fundamental aspects of parallel computer architecture with an emphasis on system design and analysis. The course focuses on processor design trends - instruction pipeline concepts, out-of-order execution, dynamic hardware scheduling, advanced branch prediction techniques, multiple issue superscalar processors, Multiprocessors and Multi computers.

Course Outcomes:
The student will be able to analysis issues related to advanced computer architectures:

- ✓ Understand the micro-architectural design of the processor
- ✓ Foundations of high speed computation
- ✓ Pipelining
- ✓ Data and resource dependencies
- ✓ Hazards and exceptions

Skills:

- ✓ Analysis on performance of computing using different architectures
- ✓ Know about the different architectures.
- ✓ Familiarity with pipelining concepts.
- ✓ Know how the control transfer based on the instructions.
- ✓ Case studies on MIMD architectures

UNIT - I

Introduction to parallel processing: Basic concepts, Types and Levels of parallelism, Classification of parallel architectures, Basic parallel techniques.

Introduction to IPL-processors: Evolution and overview of ILP processors, Dependencies between instructions, Instruction scheduling, Preserving sequential consistency.

UNIT - II

Pipelined processors: Basic concepts, Design space of pipelines, Overview of pipelined instruction processing, Pipelined execution of Integer and Boolean Instructions.

VLIW Architectures: Basic principles, Overview of proposed and commercial VLIW architectures.

Superscalar Processors: Introduction, Parallel decoding, Superscalar instruction issue, Shelving- The design space, Scope of shelving, Layout of the shelving buffers, Operand fetch policies, Instruction dispatch schemes

UNIT- III

Processing of Control Transfer Instructions: Introduction, Types of branches, How architectures check the results of operations, The branch problems, Performance measures of branch processing, Basic approaches to branch handling, Delayed branching,

Branch processing- The design space, Branch detection, Overview of Branch processing policies, Branch prediction schemes, Accessing the branch target path

UNIT - IV

Introduction to Data-parallel Architectures: Introduction, Connectivity, Alternative architectural classes.

SIMD architectures: Introduction, Design space-Granularity, Connectivity, Processor Complexity, Local autonomy

MIMD architectures: Architectural concepts, Problems of Scalable computers, Main design issues of scalable MIMD computers

UNIT -5

Distributed memory MIMD Architectures: Introduction, Design Space, Direct interconnection networks, Interconnection Topologies, Switching techniques, Routing

Shared Memory MIMD Architectures: Introduction, Dynamic interconnection networks, Shared path networks, Switching networks, Cache coherence problems, Hardware based protocols, Software based protocols.

Activities :

- ✓ Outline the design of a computer system to meet a performance requirement
- ✓ Evaluate performance of different architecture with respect to various parameters.
- ✓ Analyze performance of different ILP techniques.
- ✓ Identify cache and memory related issues in multi-processors.

TEXT BOOK:

1. *DezsoSima, Terence Fountain , Peter Kacsuk, "*Advanced computer architectures: *A Design space Approach*", Pearson Education India,1997.

REFERENCE BOOKS:

1. J.L. Hennessy, and D.A. Patterson "*Computer Architecture: A quantitative approach*, Fifth Edition, Morgan Kaufman Publication, 2012
2. Andrew S. Tanenbaum "Structured Computer Organization " Pearson, 6^{th}ed.2012
3. Sivaraama Dandamudi "Fundamentals of Computer Organization and Design " Springer Int Edition, 2003
4. Anjaneyulu, "Computer Organization" Himalaya Pub house, 2^{nd} edition, 2010
5. J.P. Shen and M.H. Lipasti, "Modern Processor Design", MC Graw Hill, Crow fords ville, 2005.

17CS012 ARTIFICIAL NEURAL NETWORKS

L	T	P	C
3	1	-	4

Course description and objectives:
On completion of this course the students will be able to expose themselves towards intelligence systems and knowledge based systems. It also provides knowledge of learning networks.

Course Outcomes:
Students can able to
- ✓ Understand the difference between biological neuron and artificial neuron
- ✓ Understand the application areas of neural networks
- ✓ Understand building blocks of Neural Networks.
- ✓ Develop neural network models
- ✓ Design and develop applications using neural networks.

Skills:
- ✓ Learn to design and build neural network models
- ✓ Learn to develop learning algorithms for machine learning

UNIT -I
Introduction to Artificial Neural Networks : Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.

UNIT - II
Fundamental Models of Artificial Neural Networks : Introduction, McCulloch - Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square(LMS)Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net.
Perceptron Networks : Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks.

UNIT - III
Adaline and Madaline Networks: Introduction, Adaline, Madaline.
Associative Memory Networks: Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory.

UNIT – IV
Feedback Networks: Introduction, Discrete Hopfiled Net, Continuous Hopfiled Net, Relation between BAM and Hopfiled Nets.
Feed Forward Networks: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).

UNIT – V
Self Organizing Feature Map : Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps, Learning Vector Quantization (LVQ),Max Net, Maxican Hat, Hamming Net

Adaptive Resonance Theory : Introduction, ART Fundamentals, ART 1, ART2

TEXT BOOKS:

1. Sivanandam, S Sumathi, S N Deepa; “Introduction to Neural Networks”, 2nd ed.,TATA McGraw HILL : 2005.

REFERENCES BOOKS:

1. Simon Haykin, “Neural networks A comprehensive foundations”, 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, “Artificial neural networks”, 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, “Neural networks in Computer intelligence”, 1st ed., TMH, 2003

17CS013 BIOMETRICS

L	T	P	C
3	1	-	4

Course Description and Objectives:

Biometrics has emerged as a specialized field in criminal forensics, public safety surveillance, user authentication and identification. Expansion of biometric modalities are ranged from fingerprint, face and other traits to multimodal biometric traits. Objectives of this course include scientific foundations needed for the design, implementation, and evaluation of large scale biometric identification systems.

Course Outcomes:

The Student will be able to

- ✓ Understand the technological uplifts with biometrics compared to traditional securing mechanisms.
- ✓ Gain knowledge in building blocks of research fields like Pattern Recognition, Image Processing and Machine Learning etc.
- ✓ Evaluate and Design security systems with biometrics.

Activities:

- ✓ Hands-on training to acquisited biometric data using different sensors
- ✓ Designing and development of different identification/ verification systems to validate the user identity
- ✓ Simulation of a multimodal biometric recognition system to know the challenges of Uni-modal system.

Skills:

- ✓ Design and develop a biometric security system
- ✓ Explore the challenges and limitations of Uni-modal biometric systems
- ✓ Solve the Identification/ Verification problems
- ✓ Explore different fusion scenarios at Information-level, fusion-level etc.,

Unit 1: Introduction

Person Recognition, Biometric Systems, Biometric Functionalities, Biometric System Errors, The Design Cycle of Biometric Systems, Applications, Security and Privacy issues.

Unit II: Fingerprint Recognition

Introduction, Friction Ridge Pattern, Fingerprint Acquisition, Feature Extraction, Fingerprint Matching, Fingerprint Indexing, Synthesis

Unit III: Face Recognition

Introduction, Acquisition, Face Detection, Feature Extraction and Matching, Advanced Topics

Unit IV: Iris Recognition

Introduction, Design of an Iris Recognition System, Image Acquisition, Iris Segmentation, Iris Normalization, Iris Encoding and Matching, Iris quality and performance evaluation.

Unit V: Multimodal Biometrics

Introduction, Sources of Multiple Evidence, Acquisition and Processing Architecture, Fusion levels.

TEXTBOOK:

1. Anil K. Jain, Arun Ross, and Karthik Nandakumar, “Introduction to Biometrics”, Springer, 2011.

REFERENCE BOOKS:

1. Anil K Jain, Patrick Flynn and Arun A Ross, “Handbook of Biometrics”, Springer, 2007. ISBN: 978-0-387-71040-2.
2. Nikolaos V Boulgouris, Konstatinos N Plataniotis and Evangelia Micheli Tzanakov,“Biometrics Theory, Methods and Applications”, IEEE & Wiley, 2009, ISBN: 978-0470-24782-2
3. John D Woodward, Nicholas M Orlans and Peter T Higgin, “Biometrics: The Ultimate Reference”, Dream Tech, 2009.

17CS014 COMPUTER VISION

L	T	P	C
3	1	-	4

Course description and objectives:

To introduce the fundamentals of image formation; Linear filtering methods, Edge detection and Segmentation based on Color and Texture and to provide the student with programming experience from implementing computer vision and object recognition applications in MATLAB.

Course Outcomes:

The Student will be able to:

- ✓ Understand the basic concepts of Camera and Projection system.
- ✓ Describe known techniques of Filters and edge detection Techniques.
- ✓ Understand the various Segmentation Techniques based on Color, Texture.
- ✓ Understand the design of a computer vision system for a specific problem learn how to apply their theoretical knowledge in practice.

Skills:

- ✓ Learn about various linear filters.
- ✓ Analyze various Edge detection Methods
- ✓ Analyze the various Segmentation techniques for specific applications.
- ✓ Study and implement of various Computer Vision Case studies

Activities:

- ✓ Design the smoothing filter with a Gaussian function.
- ✓ Implement using the Laplacian to detect edges.
- ✓ Design &Implement shot boundary detection.
- ✓ Implement segmentation using simple clustering methods.
- ✓ Implementation of the EM algorithm .
- ✓ Implement the linear filter response to additive Gaussian noise
- ✓ Implement the inverse Fourier transforms.

Unit – I

IMAGE FORAMTION AND IMAGE MODELS: CAMERA-pinhole cameras, camera with lenses, the human eye, sensing, geometric camera models-elements of analytical Euclidean geometry, camera parameters and the perspective projection, affine cameras and affine projection equations, color-human color perception, representing color, a model for image color.

Unit – II

FILTERING TECHNIQUES: linear filters-Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as templates, technique: normalized correlation and finding patterns, technique: scale and image pyramids.

Unit – III

EDGE DETECTION and TEXTURE: Noise- estimating derivatives, detecting edges, Texture-representing texture, analysis using oriented pyramids, application, shape from texture.

Unit – IV

SEGMENTATION: Segmentation by clustering-what is segmentation, human vision, applications, image segmentation by clustering pixels, segmentation by graph, segmentation by fitting a model-Hough transforms, missing data problems fitting and segmentation, the EM algorithm in practice.

Unit – V

APPLICATIONS: finding in digital libraries-organizing collection of information, summary representations of the whole picture, representing parts of picture, image based rendering-3d models from image sequences, transfer based approaches, the light filed

TEXT BOOKS:

1. Computer Vision – A Modern Approach, by D.Forsyth and J.Ponce hall Robot Vision, by B.K.P.Horn, McGraw-Hill.

REFERENCE BOOKS:

1. Computer Vision: Algorithms and applications, Richard Szeliksy.
2. computer &robot vision, Haralick & shaprio, vol ii.
3. Emerging Topics in Computer Vision ,GeradMedioni and sing bing kang.

17CS015 CYBER SECURITY

L	T	P	C
3	-	3	5

Course Description and Objective

This course focuses on cyber threats and cyber security, providing much needed awareness in the times of growing cybercrime. The objective of this course is to bring awareness to the student through simple practical tips and enable the student to understand and avoid becoming victims of cyber crime.

Course Outcomes

The student will be able to:

- ✓ Have an overview of cyber crime scenario and legal perspective on cyber crime.
- ✓ Understand different types of cyber attacks.
- ✓ Understand about tools and methods used in cyber crime.
- ✓ Understand the need of cyber laws.
- ✓ Understand and know how cyber forensics is used in cyber crime investigations.

Skills

- ✓ Identify different classification of cyber crimes.
- ✓ Performing cyber forensics.
- ✓ Know about vulnerabilities and scanning them.
- ✓ Usage of firewalls.

Activities

- ✓ To get information about computer systems on a network and the services running its open ports.
- ✓ Perform port scanning, transferring files, and port listening
- ✓ Sniffing router traffic.
- ✓ Using tools and methods of cyber crime.

UNIT - I

Introduction to cybercrime and cyber offences: Cybercrime definition and origins of the word, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes. How criminal plan the attacks, Social Engg, Cyber stalking, Cybercafe and Cybercrimes, Botnets, Attack vector, Cloud computing

UNIT - II

Tools and Methods Used in Cybercrime: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Steganography, DoS DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)

UNIT - III

Cybercrimes and Cyber Security: The Legal Perspectives, Need of Cyberlaw: The Indian Context, The Indian IT Act, Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario

UNIT - IV

Understanding Computer Forensics: Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to the Computer Forensics and Social Networking Sites: The Security/Privacy Threats, Forensics Auditing, Anti Forensics.

UNIT - V

Cyber Security: Organizational Implications, Cost of Cybercrimes and IPR Issues:Lesson for Organizations, Web Treats for Organizations: The Evils and Perils, Security and Privacy Implications from Cloud Computing, Social Media Marketing:Security Risk and Perils for Organization, Social Computing and the Associated Challenges for Organizations, Protecting People's Privacy in the Organization, Organizational Guidelines for Internet Usage, Safe Computing Guidelines and Computer Usage Policy, Incident Handling

LABORATORY EXPERIMENTS

List of programs

1. TCP scanning using NMAP
2. Port scanning using NMAP
3. TCP / UDP connectivity using Netcat
4. Perform an experiment to demonstrate sniffing of router traffic by using the tool wireshark.
5. Perform an experiment how to use dumpsec.
6. Perform an experiment to sniff traffic using ARP Poisoning
7. mplementing the Secure Sockets Layer (SSL v2/v3) and Transport Layer Security (TLS v1) network protocols
8. Setup a honey pot and monitor the honey pot on network.

TEXT BOOKS

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley

REFERENCE BOOKS

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
2. Nina Godbole, *Information Systems Security,* Wiley India, New Delhi
3. Cyrus Piekari, Anton Chuvakin, "Security Warrior", 2nd ed., Oreilly Publishers, 2005.

17CS016 FUNDAMENTALS OF IMAGE PROCESSING

L	T	P	C
3	1	-	4

Course description and objectives:
To introduce the fundamentals of image processing at Low Level and Mid-Level; and it covers Spatial and Frequency domain image enhancement, Edge detection, Segmentation, image compression and morphological image processing. And to provide the student with programming experience from enhance the image and object recognition applications in MATLAB.

Course Outcomes:
The Student will be able to:
- ✓ Understand the basic concepts of Image Acquisition system.
- ✓ Describe known techniques of enhancement of image using spatial and frequency domain.
- ✓ Understand the various Segmentation methods based on discontinuity and similarity of pixels.
- ✓ Understand the design of a image compressor system.

Skills:
- ✓ Learn about various enhancement techniques using GIMP and MATLAB
- ✓ Analyze both smoothing and sharpening filters.
- ✓ Analyze the various Segmentation techniques for specific applications.
- ✓ Understand the application of various morphological operations.
- ✓ Study and implement of various Image Compressor systems.

Activities:
- ✓ Design the smoothing filter with average or weighted average template.
- ✓ Implement using the Laplacian operator to detect thin edges.
- ✓ Design &Implementation of edge based segmentation for Building images
- ✓ Design & Implementation of region based segmentation for Medical images
- ✓ Design and Implementation of Loss-Less Image Compression System .

Unit – 1
Fundamentals of Image Processing: Fundamental steps in digital image processing, components of image processing system. A simple image formation model, image sampling and quantization, basic relationships between pixels. Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms-Walsh – Hadamard – Discrete Cosine Transform.

UNIT – II
Image enhancement in the spatial and frequency domains : Basic gray-level transformation, histogram processing, enhancement using arithmetic and logic operators, basic spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods, Frequency domain filters, homomorphic filtering. Image Restoration: Degradation Models, PSF, circulant and block - circulant matrices, DE convolution, restoration using inverse filtering.

UNIT – III
Image Segmentation : Segmentation and Edge detection region operations, basic edge detection, second order detection, crack edge detection, gradient operators, compass and

Laplace operators, edge linking and boundary detection, thresholding, region based segmentation, segmentation by morphological watersheds, color segmentation.

UNIT – IV

Image Compression: Fundamentals, image compression models, error-free compression, lossy predictive coding, image compression standards. Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms**.**

UNIT – V

Representation and Description: Chain codes, Polygonal approximation, Signature Boundary Segments, Skeletons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors

TEXT BOOKS:

1. Digital Image Processing, Rafeal C Gonzalez, Richard E.Woods, Third Edition, Pearson Education/PHI.

REFERENCE BOOKS:

1. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
3. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
4. Digital Image Processing using Matlab, RafealC.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education.
5. Digital Image Processing, William K. Prat, Wily Third Edition
6. Digital Image Processing and Analysis, B. Chanda, D. Datta Majumder, Prentice Hall of India, 2003.

17CS017 PATTERN RECOGNITION

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course deals with automated classification, identification, and/or characterization of unknown systems. The objective of the course is to enable the student to understand driven field, identification of pathological disorders from various biological indicators, hand written character recognition, finger print analysis, face recognition, iris scan based recognition and financial data predictions.

Course Outcomes:

The student will be able to:

- ✓ Understand the theoretical issues involved in pattern recognition system design such as the curse of dimensionality.
- ✓ Familiarize with major approaches in statistical and syntactic pattern recognition.
- ✓ Implement pattern recognition techniques.
- ✓ Design and develop a pattern recognition system.

Skills:

- ✓ Partition data objects by using different classification techniques.
- ✓ Group the data objects by applying different clustering techniques.
- ✓ Identify the data objects by using different feature selection approaches.
- ✓ Reduce the data objects by applying dimensionality reduction techniques.

Activities:

- ✓ Students are able to do different Estimation Techniques in real time applications\
- ✓ Students are able to apply different classification techniques
- ✓ Students are able to apply different dimensionality reduction techniques

UNIT - I

Introduction and Mathematical Preliminaries: What is pattern recognition?, Clustering vs. Classification, Applications, Linear Algebra, Vector spaces, Probability theory, Estimation techniques.

UNIT - II

Bayes Decision Theory: Discriminant Functions and Services, the Normal Distribution, Bayesian Classification, Estimating Probability Density Functions, Nearest Neighbor Rules, Bayesian Networks, Linear Classifiers: the Perceptron Algorithm, Least-Squares Methods

UNIT - III

Nonlinear Classifiers: Multilayer Perceptron's, Back Propagation Algorithm, Decision Trees, Combinations of Classifiers, Boosting.

Clustering: Sequential Algorithms, Hierarchical Algorithms, Functional Optimization-Based Clustering, Graph Clustering, Learning Clustering, Clustering High Dimensional Data: Subspace Clustering

UNIT - IV

Feature Selection: Data Preprocessing, ROC Curves, Class Separability Measures, Feature Subset Selection, Bayesian Information Criterion

UNIT - V

Dimensionality Reduction: Basis Vectors, Singular Value Decomposition, Independent Component Analysis, Kernel PCA, Wavelets

Additional Features And Template Matching: Texture, Shape and Size Characterization, Fractals, Features For Audio, Template Matching Using Dynamic Time Warping and Edit Distance

TEXT BOOKS :

1. S Theodoridis and K Koutroumbas, “Pattern Recognition”, 4th edition, Academic Press, 2009.
2. K Fukunaga, “Statistical pattern Recognition”, 1st edition, Academic Press, 2000.

REFERENCE BOOKS:

1. Christopher M.Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.
2. Marsland S, “Machine Learning: An Algorithmic Perspective”, 1st edition, CRC Press, 2009.
3. Bishop C M, “Neural Networks for Pattern Recognition”,1st edition,Oxford University Press,1995.
4. Hastie T, Tibshirani R and Friedman J, “The Elements of Statistical Learning”, Springer, 2001.
5. Koller D and Friedman N, “Probabilistic Graphical Models”, 1st edition, MIT Press, 2009.
6. R O Duda, P E Hart and D G Stork, “Pattern Classification”, 1st edition, John Wiley, 2001.

17CS018 WEB TECHNOLOGIES

L	T	P	C
3	-	3	5

Objective:

Students will be explored to standard design and development of web based solutions using multi-tier architecture. They should have good understanding of different technologies on client and server side components.

Course Outcomes:

- ✓ Students are able to design very good front end using HTML, CSS, JavaScript, AJAX.
- ✓ Students are able to develop applications on struts and hibernate frameworks.
- ✓ Students are able to develop applications to interact with database using connection pooling.

Skills:

- ✓ Learn MVC standard development of applications.
- ✓ Learn working with Integrated Development Environment.
- ✓ Learn internationalization concepts.
- ✓ Learn web services concepts.

Activities:

- ✓ Ask the students to install the following software if not installed and work with configuration files to identify port number and integration.
  - i. JDK current version
  - ii. apache tomcat server
  - iii. MYSQL/Oracle software
  - iv. Eclipse/My Eclipse/Net beans ID's Add struts, hibernate JARS
- ✓ Develop a university website and deploy in free hosting server.
- ✓ Develop a personnel website and host in free hosting server.
- ✓ Develop 2 applications one is bus ticket booking another one is for service provider and provide communication between these using web services.

UNIT I

Client Side Technologies: Overview of HTML - Common tags, XHTML, capabilities of HTML5, Cascading Style sheets, CSS3 enhancements, linking to HTML Pages, Classes in CSS, Introduction to JavaScripts, variables, arrays, methods and string manipulation, BOM/DOM (Browser/Document Object Model), accessing elements by ID, Objects in JavaScript, Dynamic HTML with JavaScript and with CSS, form validation with JavaScript, Handling Timer Events Simplifying scripting with JQuery, JASON for Information exchange.

UNIT II

Introduction to Java Servlets: Introduction to Servlets, Lifecycle of a Servlet, Reading request and initialization parameters, Writing output to response, MIME types in response, Session Tracking: Using Cookies and Sessions, Steps involved in Deploying an application, Database Access with JDBC and Connection Pooling. Introduction to XML, XML Parsing with DOM and SAX Parsers in Java, Ajax - Ajax programming with JSP/Servlets, creating XML Http Object for various browsers, Sending request, Processing response data and displaying it, Introduction to Hibernate.

UNIT III
Introduction to JSP: JSP Application Development: Types of JSP Constructs (Directives, Declarations, Expressions, Code Snippets), Generating Dynamic Content, Exception Handling, Implicit JSP Objects, Conditional Processing, Sharing Data Between JSP pages, Sharing Session and Application Data, Using user defined classes with jsp:useBean tag, Accessing a Database from a JSP

UNIT IV
Introduction to Struts Framework: Introduction to MVC architecture, Anatomy of a simple struts2 application, struts configuration file, Presentation layer with JSP, JSP bean, html and logic tag libraries, Struts Controller class, Using form data in Actions, Page Forwarding, validation frame work, Internationalization.

UNIT V
Service Oriented Architecture and Web Services: Overview of Service Oriented Architecture – SOA concepts, Key Service Characteristics, Technical Benefits of a SOA, **Introduction to Web Services–** The definition of web services, basic operational model of web services, basic steps of implementing web services.
Core fundamentals of SOAP – SOAP Message Structure, SOAP encoding, SOAP message exchange models, Describing Web Services –Web Services life cycle, anatomy of WSDL, Introduction to Axis– Installing axis web service framework, deploying a java web service on axis. Web Services Interoperability – Creating java and .Net client applications for an Axis Web Service.

LABORATORY EXPERIMENTS

List of Programs

1. Write a HTML page including user name: text box, password: Password box, age: text box, mail id: text box. Write a java script to validate HTML page user name: should not be empty password: 1. should not be empty 2. should have one upper case letter 3. one lower case letter 4. one special character 5. one integer. Age: should be between 0 to 99. mail should be valid mail. If all the details are true then display valid user else display corresponding error message.
2. Write an HTML page. That contains a selection box with a list of 5 countries. When the user selects a country its states should be printed in the next list. Use the AJAX properties.
3. Create an XML document that contains 10 users information. Write a java program, which takes user Id as input and returns the user details by taking the user information from the XML document using a)DOM parser and b)SAX parser.
4. Implement the following web applications using struts and hibernate
   i. A user validation web application, where the user submits the login name and password to the server. The name and password are checked against the data available in database and if the data matches, a successful login page is returned. Otherwise a failure message is shown to the user.
   ii. Modify the above program use XML instead of database.
5. A web application takes a name as input and on submit it shows a hello <name> at the top right corner of the page and provides a logout button. On clicking this button, it should show a logout page with thank you <name> message with the duration of usage (hint: use session to store name and time)

6. Develop a library management system using struts and hibernate.
7. Develop a student attendance monitoring system using struts and hibernate.
8. Develop an e-commerce application.

Text Books:

1. Chris Bates, "Web Programming, building internet applications", Willey, 3rd edition, 2007.
2. Herbert Schild. "The Complete Reference Java", McGraw-Hill/Osborne, 7th edition, 2005.
3. Hans Bergsten, "Java Server Pages", O'Reilly, 3rd edition, 2009
4. James Goodwill, Richard Hightower, "Professional Jakarta Struts" , John Willey & Sons, 1st edition, 2004.
5. R. Nagappan, R. Skoczylas, R.P. Sriganesh, "Developing Java Web Services", Wiley India, 2nd edition– 2008.
6. Eric Newcomer and Greg Lomow, "Understanding SOA with Web Services", Pearson Edition – 2009
7. James McGovern, Sameer Tyagi et al., "Java Web Service Architecture", Elsevier - 2009

Reference Books:

1. R.W.Sebesta, "Programming the world wide web", Pearson,4th edition, 2008
2. Marty Hall and Larry Brown "Core SERVLETS ANDJAVASERVER PAGES", Pearson, 2nd edition, 2009.
3. I Dietel and Nieto "Internet and World Wide Web – How to program" , PHI/Pearson, 4th edition, 2007.

17CS019 Wireless Communication Networks

L	T	P	C
3	1	-	4

Course Description and Objective:

The course addresses the fundamentals of wireless communications and provides an overview of existing and emerging wireless communications networks. It covers radio propagation and fading models, fundamentals of cellular communications, multiple access technologies, and various wireless networks, including past and future generation networks. Simulation of wireless systems under different channel environments will be integral part of this course.

The objective of the course is to introduce the students to the fundamentals of wireless communications and the evolution of wireless networks from the first generation to LTE and LTE advanced.

Course Outcome:

The student will be able to:

- ✓ Understand the basic concept of wireless system design and get familiar with various wireless networks
- ✓ Understand the new trends in mobile/wireless communications networks.
- ✓ Understand multiple radio access techniques.
- ✓ Analyze various routing algorithms used in mobile/wireless networks.
- ✓ Identify the issues in transport and application layers.

Skills:

- ✓ Identify and simulate the medium access control mechanisms suitable for given applications.
- ✓ Develop ad-hoc network applications using appropriate algorithms/protocols.
- ✓ Identify the impact of improvements made to TCP in mobile/wireless networks.
- ✓ Identify the need of mobile IP and simulating mobile IP network.

Activities

- ✓ Choose medium access control mechanism for a given application.
- ✓ Distinguish among various wireless networks.
- ✓ Simulate the calling mechanism used in GSM.
- ✓ Design and simulate a simple wireless network.
- ✓ Analyze the customization of TCP in wireless network.

Unit-I

Overview of Wireless Communications and Systems: Review of digital communications, Cellular systems from 1G to 3G Wireless 4G systems, Radio propagation and propagation path-loss model, Free-space attenuation, Multipath channel characteristics, Signal fading statistics, Path-loss models.

Unit-II

Fundamentals of Cellular Communications: Hexagonal cell geometry, Co-channel interference, Cellular system design, Sectoring using directional antennas.

Unit-III

Multiple Access Techniques: Frequency division multiple access (FDMA), Time division multiple access (TDMA), Code division multiple access (CDMA), Space division multiple access (SDMA), Orthogonal frequency division multiplexing (OFDM), Multicarrier CDMA (MC-CDMA), Random access methods.

Unit-IV
Wide-area Wireless Networks (WANs): GSM – IS-136 IS-95, UMTS Cdma2000, Long Term Evolution Technologies (LTE), and OFDM MIMO channels, Space Time Codes LTE Advanced.

Unit-V
Other Wireless systems: IEEE 802.11, WLAN (WiFi) WiMAX

Textbook:
1. Mischa Schwartz, "Mobile Wireless Communications," Cambridge University Press, Paperback, 2013, ISBN: 9781107412712.

References:

1. Ian F. Akyildiz, David M. GutierrezEstevez, Elias Chavarria Reyes, "The evolution to 4G cellular systems: LTE-Advanced," Elsevier-Physical Communication, 2010.
2. Vijay K. Garg, Wireless Communications and Networking, Morgan Kaufmann Publishers, 2007, ISBN 978-0-12-373580-5.
3. Jochen Schiller, Mobile Communications, Addison-Wesley, Second edition, 2008.

I YEAR	**COURSE CONTENTS FOR COMMON COURSES**	
II SEMESTER	17HS001	Research Methods
	17HS002	Employment Orientation Program (EOP)

17HS001 Research Methods

L	T	P	C
3	-	-	3

Objective of the Course:
Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I
Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondary data, probability and non-probability sampling techniques.

UNIT-II
Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III
Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion, measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminate analysis, cluster analysis, conjoint analysis

UNIT-IV
Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V
Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copy rights.

Text Books:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17HS002 Employment Orientation Program

L	T	P	C
2	-	-	2

Preamble

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.
ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.
iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

Assessment:

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- ✓ 5 Marks for attendance
- ✓ 5 Marks for formative assessment
- ✓ 40 Marks for summative assessment

Detailed Course Structure
I Year

Course Code	Course Title	L	T	P	C
I Semester					
17ES001	Microcontrollers for Embedded System	3	-	3	5
17ES003	Embedded System Design Concepts	3	1		4
17ES005	Embedded Programming	3	-	3	5
17ES007	Embedded Networking	3	1	-	4
II Semester					
17ES002	Ad-hoc Sensor Networks	3	-	3	5
17ES004	Design of IoT systems	3	-	3	5
17ES006	Embedded Linux	3	1	-	4
17ES008	Embedded System Design with FPGA	3	1		4
17HS001	Research Methods	2	-	-	2
17HS002	Employment Orientation Program	2	-	-	2
Pool of Electives					
17ES009	Introduction To Internet Of Things	3	1	-	4
17ES011	Soft Computing	3	1	-	4
17ES013	Adaptive Signal Processing	3	1	-	4
17ES015	System On Chip Design	3	1	-	4
17ES017	Digital Image And Video Processing	3	1	-	4
17ES019	Data Communications	3	1	-	4
17ES021	Neural Networks & Fuzzy Systems	3	1	-	4
17ES023	Scripting Languages(Common To Vlsi)	3	1	-	4
17ES010	Risc Processors Architecture And Programming	3	1	-	4
17ES012	Micro Electro Mechanical System	3	1	-	4
17ES014	Dsp Processors	3	1	-	4
17ES016	Computer Architecture And Parallel Processing	3	1	-	4
17ES018	Robotics And Automation	3	1	-	4
17ES020	Cryptography And Network Security	3	1	-	4
17ES022	Smart Instrumentation	3	1	-	4
17ES024	Wireless Communications And Networks	3	1	-	4

II Year

Course Code	Course Title	L	T	P	C
I Semester					
17PR001	Project/ Internship Phase - I				15
II Semester					
17PR001	Project/ Internship Phase - II				15

I YEAR	COURSE CONTENTS				
17ES001	Microcontrollers for Embedded System	3	-	3	5
17ES003	Embedded System Design Concepts	3	1		4
17ES005	Embedded Programming	3	-	3	5
17ES007	Embedded Networking	3	1	-	4

17ES001 MICROCONTROLLERS FOR EMBEDDED SYSTEMS

L	T	P	C
3	-	3	5

Objective of the Course:

This course is the Microcontrollers and Applications. The objective of this course is To study the fundamentals of Microcontrollers and design of embedded systems by using Microcontrollers.

Course Outcomes:

Understand the Architecture of Microcontrollers, Programming the Microcontrollers, Interfacing various real data collection sensors to Microcontrollers and design and developing a prototype embedded systems using Microcontrollers.

SKILLS ACQUIRED:

1. Design a 8051 microcontroller based embedded system.
2. To do case study experiences for microcontroller based Design synchronous and applications
3. Gain knowledge on ARM based system design.

ACTIVITIES:

1. Make some programs with 8051 and ARM

Unit-I

(overview of 8051) **L12**

8051 Microcontroller Architecture:

Architecture-memory organization -addressing modes- instruction set – Timers - Interrupts – I/O ports- serial communication. Arithmetic – logical - bit operations –time delays using Timers / Counters – Interrupts – serial Communication.

Unit-II **L12**

ARM Architecture & Programming:

ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupt and Vector Table, ARM Processor Families. Instruction set: Data Processing Instructions, Addressing Modes, Branch, Load- Store instructions, PSR instructions, and Conditional instructions.

Unit-III **L12**

ARM Cortex-M3: Introduction- Background of ARM and ARM Architecture- Instruction Set Development- The Thumb-2 Technology and Instruction Set Architecture. - **Overview of the Cortex-M3:** Fundamentals – Registers - Operation Modes.

Unit-IV **L12**

ARM Thumb Instruction & Programming:

Thumb Instruction set: Register usage, Branch instructions, Data Processing Instructions, ingle-Register and Multi Register Load-Store instructions, stack, software Interrupt Instructions. Interrupts, Interrupt handling schemes.

Unit-V **L12**

Interfacing &Applications: Interfacing of LCD, Seven Segment display, keypad, stepper motor, DC motor. Generating pulses like PWM for motor control, Sensors (Temp, Pressure, Humidity, etc) interfacing and data acquisition using ADC/DAC. Developing simple applications by using Zigbee, Bluetooth, GPS and GPRS Modules (Any Two)

TEXTBOOKS:

1. Andrew N. SLOSS, Dominic SYMES, Chris WRIGHT "ARM System Developer's Guide: Designing and Optimizing System Software" Elsevier
2. Kenneth J Ayala " The 8051 Microcontroller Architecture, Programming and Applications", Delmar Cengage Learning; 3rd edition.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.McKinlay "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson.
4. Joseph Yiu , "The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors" 2014

REFERENCE BOOKS:

1. Myke Predko , "Programming and Customizing the 8051 Microcontroller" , McGraw Hill, 2000.
2. Steve Furber, "ARM System-on-Chip Architecture ", Second Edition, Pearson Education.
3. ARM Architecture Reference Manual.

MICROCONTROLLERS LAB

Course Learning Outcomes:

- To be able to learn about accessing various documents such as device manuals, board manuals, schematics etc.
- To be able to understand importance of C and assembly programming languages.
- To be able to understand about importance of various CPU architectures.

Note:

- At least 5 modules must interface with 8051 and 5 modules with ARM7.
- At least 10 experiments are to be carried out, at least 5 experiments must be coded in 'embedded c' and 5 in 'Assembly Language'.

List of Experiments (based on ARM cortex-M series)

1. Calculator type keyboard
2. 4-Digit,7-segment LED Display
3. Dual DAC
4. TXDR Interface Using PT100 with ADC
5. Stepper Motor
6. Elevator Interface
7. 4*4 Matrix Hex Keypad
8. Temp Sensor
9. 16 Channel 8-bit ADC
10. Logic Controller
11. Traffic Lights
12. Musical Tone Generator
13. Opto Isolated Input Interface
14. Opto Isolated Output Interface
15. DC Motor

17ES003 - EMBEDDED SYSTEM DESIGN CONCEPTS

L	T	P	C
3	1	-	4

Course Description and Objectives:

- To study the overview of Embedded System Architecture
- To focus on distributed Embedded Architecture and its accessing protocols
- To understand about the design methodologies in hardware and software design

Course Outcomes:
Upon successful completion of this course student should be able to:

- Explain various embedded system applications and design requirements
- Construct embedded system hardware
- Develop software programs to control embedded system
- Generate product specification for embedded system
- Outline validation and testing methodologies for embedded system

SKILLS ACQUIRED:

- Able to analyze design requirements.
- Able to design new hardware and software for different applications.
- Able to test and validate the different embedded system applications.

ACTIVITIES:

- Able to analyze design requirements.
- Able to design new hardware and software for different applications.
- Able to test and validate the different embedded system applications.

Unit – I **L-12**

An Introduction to Embedded Systems: An Embedded system, processor in the system, other hardware units, and software embedded into a system, Exemplary embedded systems, embedded system – on – chip (SOC) and in VLSI circuit. Processor and memory organization –Structural Units in a Processor, Processor selection for an embedded system, memory devices, memory selection for embedded systems, allocation of memory to program cache and memory management links, segments and blocks and memory map of a system, DMA, interfacing processors, memories and Input Output Devices.

Unit – II **L-12**
Embedded Design Life Cycle: Introduction, Product Specification, Hardware/ software partitioning, Iteration and Implementation, Detailed hardware and software design, Hardware/Software integration, Product Testing and Release, Maintaining and upgrading existing products.
Selection Process: Packaging the Silicon, Adequate Performance, RTOS Availability, Tool chain Availability, Other issues in the Selection process.
Partitioning Decision: Hardware/Software Duality, Hardware Trends, ASICs and Revision Costs.

Unit – III **L-12**

Development Environment: The Execution Environment, Memory Organization, System Startup.**Special Software Techniques:** Manipulating the Hardware, Interrupts and Interrupt service Routines (ISRs), Watchdog Times, Flash Memory, Design Methodology. **Basic Tool Set:** Host – Based Debugging, Remote Debuggers and Debug Kernels, ROM Emulator, Logic Analyzer. **Debugging Techniques:** Background Debug Mode (BDM), Joint Test Action Group (JTAG) and Nexus.

Unit - IV **L-12**

Testing: Why Test? When to Test? Which Test? When to Stop? Choosing Test cases, Testing Embedded Software, Performance Testing, Maintenance and Testing, The Future. **Writing Software for Embedded Systems:** The compilation Process, Native Versus Cross-Compilers, Runtime Libraries, Writing a Library, Using alternative Libraries, using a standard Library.

Unit-V **L-12**

Buffering and Other Data Structures: What is a buffer? Linear Buffers, Directional Buffers, Double Buffering, Buffer Exchange, Linked Lists, FIFOs, Circular Buffers, Buffer Under run and Overrun, Allocating Buffer Memory, Memory Leakage. Memory and Performance Trade-offs.

TEXTBOOKS:

1. Raj Kamal, "Embedded Systems Architecture Programming and Design", 2nd Edition Tata McGra-Hill.
2. Arnold S. Burger, "Embedded System Design – Introduction to Processes, Tools, Techniques", CMP Books.
3. Steve Heath, "Embedded Systems Design", 2nd Edition, Newnes.

REFERENCEBOOKS:

1. Butter worth Heinemann, Steve Heath; "Embedded systems design: Real world design", Newton mass, USA 2002.
2. David E. Simon, An embedded software primer, Addison Wesly-1999.

17ES005 Embedded Programming

L	T	P	C
3	-	3	5

Course Description and Objectives:

This course is an exploration of various programming techniques and constructs used to develop reliable software systems capable of responding in real time. An overview of the platforms, tools, and processes used in developing software for embedded systems will empower you to successfully create software which consumes less memory usage. This course is highly intended for designers who want to use C language to program microcontrollers

Course Outcomes:

Upon successful completion of this course, students should be able to:

a. Ability to do Embedded programming in C,
b. Ability to understand Embedded control and applications

SKILLS ACQUIRED:

1. Trace out the problems if any through testing.
2. Design fault tolerant systems.

ACTIVITIES:

1. Programming using C and C++ for different applications

Unit-I

Embedded Programming: C and Assembly - Programming Style - Declarations and Expressions - Arrays, Qualifiers and Reading Numbers - Decision and Control Statements - Programming Process - More Control Statements - Variable Scope and Functions - Advanced Types – Simple Pointers - In-line Assembly.

Unit-II **L12**

C Programming Toolchain in Linux: C Preprocessor - Stages of Compilation - Debugging and Optimization- Introduction to GCC - Debugging with GDB - The Make utility - Building and Using Libraries -Profiling using gprof-Memory Leak Detection with valgrind.

Unit-III **L12**

Real Time Operating Systems

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task States, Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency, Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use.

Unit-IV **L12**

Embedded C and Embedded OS

Adding Structure to 'C' Code: Object oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts. Creating embedded operating system: Basis of a simple embedded OS, Introduction to sEOS, Using Timer 0 and Timer 1, Portability issue, Alternative system architecture, Important design considerations when using SEOS.

Unit-V **L12**

Memory Management

Dynamic memory allocation, Fixed size memory management, Blocking vs Non Blocking Memory functions, Hardware memory management units, synchronizing and communication. Case Studies of RTOS: VxWorks, Free RTOS.

TEXTBOOKS:

4. Jane W.S.Liu, Real Time Systems, Pearson Education.
5. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

REFERENCEBOOKS:

1. Embedded /Real-Time Systems: concepts, Design and Programming—
   The Ultimate Reference, Prasad K.V.K.K, DREAMTECH PRESS, NEW DELHI
2. VxWorks Programmers Guide
3. VxWorks Reference Manual
4. Free RTOS Programmers Guide
5. Free RTOS Reference Manual

Embedded Programming Lab

Course Learning Outcomes:

- To be able to learn about various C Programming tools
- To be able to learn about Arduino in detail.

1. Introduction to C Programming tools
2. Using Standard I/O
3. Using Conditionals
4. Using Loops
5. Intro to Addresses, Pointers and Handles
6. Interfacing with Arduino
7. Arduino Digital Output
8. Arduino Digital Input
9. Arduino Analog Input
10. Arduino Reaction Timer
11. Arduino Reaction Timer Redux
12. Arduino Analog Output via PWM
13. Arduino Event Counter
14. Arduino Arbitrary Waveform Generator

17ES007 Embedded Networking

L	T	P	C
3	-	3	5

Course Description and Objectives:

This course is an exploration of Embedded Networking used to study and develop reliable communication protocols. An overview of the Embedded networking concepts is provided here. This course is highly intended for designers who want to use Ethernet, Can Protocols USB and other networking concepts

Course Outcomes:

Upon successful completion of this course, students should be able to:

a. Ability to work with CAN bus
b. Ability to understand and implement Firewalls and Protocols

SKILLS ACQUIRED:

1. Building a network using various components
2. Trace out the problems if any through testing.
3. Knowledge on various network Protocols.

ACTIVITIES:

1. RS232 based data transfer between two devices using cross connected cable and suitable application using C language or other
2. Data transfer using CAN protocol on a CAN bus
3. Modbus based data transfer along with application layer development for message interpretation
4. TCP/IP based data transfer with socket programming in C language or other
5. Implementation of a network address translator NAT
6. Implementation of a firewall

Unit-I

EMBEDDED COMMUNICATION BASICS

Introduction to Embedded Networking - Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS422 - RS485 – Synchronous and Asynchronous Communication - Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port Interface -ISA/PCI Bus protocols

Unit-II **L12**

USB, CAN BUS and FRAMING

USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types –Enumeration –Descriptors – CAN Bus – Introduction – CAN Identifier, Deterministic Transmissions on CAN - Framing –Bit stuffing –Error Control Coding – Baseband Transmissions – RZ and NRZ methods

Unit-III **L12**

ETHERNET

Elements of a network – Bus and Star Topologies, CSMA/CD protocol, IEEE802.3 and versions of it, Inside Ethernet – Building a Network Hardware options – Cables, Connections and network speed – Ethernet Addressing, Hubs, switches and Bridges

Unit-IV **L12**

INTERNETWORKING

Internet Protocol IPv4, IP addressing, IPv6, Routing Concepts and Protocols, Distance Vector Routing, Link State Routing, Network Address Translator (NAT), Firewall.

Unit-V **L12**

TRANSPORT AND APPLICATION LAYER PROTOCOLS

TCP, UDP, DNS, HTTP, HTML Language, Cryptography concepts, Security Services and mechanisms, Symmetric cryptography and public key cryptography, DES, AES and RSA algorithms.

TEXTBOOKS:

1. Introduction to Data Communications and Networking- Wayne Tomasi, DeVry Institute Pearson 2005
2. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002
3. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003
4. Computer Networks : A.Tanenbaum -5th Edition Prentice hall
5. Data and Computer Communications- William Stallings,9th edition. Prentice Hall, 2013.

REFERENCE BOOKS:

1. Frank Vahid, Givargis ‘Embedded Systems Design: A Unified Hardware/Software Introduction’, Wiley Publications .
2. Jan Axelson, ‘Parallel Port Complete’ , Penram publications.
3. Dogan Ibrahim, ‘Advanced PIC microcontroller projects in C’, Elsevier 2008.
4. Jan Axelson ‘Embedded Ethernet and Internet Complete’, Penram publications .
5. Bhaskar Krishnamachari, ‘Networking wireless sensors’, Cambridge press 2005 .

Embedded Programming LAB

1. Digital FIR filter design and simulation.
2. Fixed Point Implementation of Digital FIR Filter.
3. Interrupt driven data transfer from ADC.
4. Implementation Of Digital Fir Filter On 8051 Microcontroller.
5. Serial Communication Between Micro Controller And Pc.

I YEAR COURSE CONTENTS

17HS001	Research Methods	3	-	-	3
17ES002	Ad-hoc Sensor Networks	3	-	3	5
17ES004	Design of IoT systems	3	-	3	5
17ES006	Embedded Linux	3	1	-	4
17ES008	Embedded System Design with FPGA	3	1		4

17HS001 Research Methods

L	T	P	C
3	0	0	3

Objective of the Course:

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondary data, probability and non-probability sampling techniques.

UNIT-II

Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III

Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion, measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminate analysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copy rights.

Text Books:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17ES002 Ad hoc Sensor Networks

L	T	P	C
3		3	5

Course Description and Objectives:
The objective of this course is to study the fundamentals of Adhoc and Sensor Networks useful in data acquisition and IoT systems

Course Outcomes:
- Appreciate the importance of Adhoc and sensor networks for applications like environment monitoring, habitat monitoring, health care and data acquisition systems.
- Understanding of data transmission technologies of the Adhoc and sensor devices with focus on channel access routing and security.
- Appreciate the need and importance of converged networks, ubiquitous environment and 'Internet of things' in the context of Adhoc and sensor networks.
- Capable of model building ,new protocol design and strategies simulation of the systems that include the above.

SKILLS ACQUIRED:
1. Developing New Routing Protocols.
2. To do case study experiences for Adhoc sensor networks
3. Gain knowledge on Mica Motes.

ACTIVITIES:
1. Simulation of DSDV algorithm AODV algorithm and DSR algorithm along with the comparison with respect to the delay cost
2. Simulation of leach and Pegasis algorithm
3. Simulation of S-MAC algorithm
4. Simulation of SMac algorithm
5. Simulation of TEEN and APTEEN algorithms

Unit-I **L12**

Introduction to Adhoc Networks:
Overview and Communication aspects of Manet, Challenges, Topologies, Routing classification approaches, Proactive, Reactive, Position based and Other Routing Protocols

Unit-II **L12**

Broadcasting, Multicasting and Geocasting in Manets
Introduction, The Broadcast Storm - Broadcasting in a MANET, Flooding-Generated Broadcast Storm, Redundancy Analysis, Rebroadcasting Schemes, Multicasting - Issues in Providing Multicast in a MANET, Multicast Routing Protocols, Comparison, Geocasting - Geocast Routing Protocols, Comparison..

Unit-III **L12**

Wireless Sensor Network
Introduction, The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications of Sensor Networks.

Unit-IV **L12**

Data Retrieval in Sensor Networks

Introduction, Classifications of WSNs, MAC layer Design issues and Protocols, Routing Protocols of Sensor Networks - Network Structure Based Routing, Flat versus Hierarchical Routing, Multipath and Query Based Routing, Location-Based Routing, Transport Layer, High-Level Application Layer Support, Adapting to the Dynamic Nature of WSNs.

Unit-V **L12**

Security and Connectivity to other Networks

Introduction, Security in Ad Hoc Networks, Distributed Systems Security, Key Management, Secure Routing, Cooperation in MANETs, Security of Wireless Sensor Networks, Intrusion Detection Systems, Ingredients of a Heterogeneous Architecture, Protocol Stack, Comparison of the Integrated Architecture.

TEXTBOOKS:

1. Carlos Cordeiro and Dharma P Agarwal, Ad hoc sensor networks-Theory and Applications by World Scientific publications March 2006.
2. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.

REFERENCE BOOKS:

1. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
2. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

Ad hoc sensor Networks LAB

Course Learning Outcomes:

- To be able to understand importance of Microcontroller Programming and assembly programming languages.
- To be able to understand about importance of various Interfaces.

Note:

- At least 10 experiments are to be carried out from the below.

LIST OF EXPERIMENTS

Simulation Experiments

1. AODV
2. DSDV
3. DSR
4. Multicast Protocol
5. Other Routing Protocols

Microcontroller Programming

1. Glowing LEDs.
2. Toggling LED’s.
3. Transmitting a string through UART.
4. Controlling LEDs blinking pattern through UART
5. Echo each character typed on HyperTerminal.

RF Experiments

1. Point to point communication of two C-Motes over the radio frequency.
2. Multi-point to single point communication of C-Motes over the radio frequency.

TEXTBOOKS:

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1 st Edition, VPT, 2014

REFERENCE BOOKS:

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1 st Edition, Apress Publications, 2013
2. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493- 9357-1.

17ES004 Design of IoT System (IoT)

L	T	P	C
3	-	3	5

Course Description and Objectives:

- Students will be able to design & develop IOT Devices.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Able to programs for IoT applications
- Able to design the framework necessary for IoT applications
- Able to develop prototypes for IoT devices and app

SKILLS ACQUIRED:

- Able to understand IoT Concepts
- Able to design the different IoT system applications.

ACTIVITIES:

- *design various simple IoT Applications*

Unit – I **L-12**

Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages, IoT Physical Servers and Cloud Offerings: introduction to cloud sotrage models and communication APIs, Python Web Application Framework - Django, SkyNet IoT Messaging Platform.

Unit – II **L-12**

Design Principles for Connected Devices: Design Principles for Connected Devices, Calm and Ambient Technology, Magic as Metaphor, Privacy, Web Thinking for Connected Devices, Affordances

Unit – III **L-12**

Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Open Source versus Closed Source, Tapping into the Community

Prototyping Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, BeagleBone Black, Electric Imp, Other Notable Platforms

Unit - IV **L-12**

Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols

Techniques for Writing Embedded Code: Memory Management, Performance and Battery Life, Libraries, Debugging

Unit-V **L-12**

Case Studies Illustratign IoT Design: Introduction, Home automation-smart lighting-home intrusion detection, Cities-smart parking, Environment-Air pollution monitoring, Agriculture-smart irrigation, productivity appliances-IoT printer,Data Analytics for IoT: Introduction

TEXTBOOKS:

1. Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On- Approach",2014,
2. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013,
3. Microsensors, MEMS, and Smart Devices, Julian W. Gardner, Vijay K. Varadan Osama O. Awadelkarim, 2001, John Wiley & Sons Ltd

REFERENCE BOOKS:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013.
2. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493- 9357-1.

Internet of Things (Lab)

Course Learning Outcomes:

- To be able to understand importance of Python Programming and its usage.
- To be able to understand and work with Raspberry Pi and Arduino

LIST OF EXPERIMENTS

1. Familiarization with Python programming, use of various functions
2. Create python code to understand the tendency of users on social media platform
3. Storing the local data to cloud using Python
4. Sending Messages over internet using python
5. Familiarization with raspberry pi board
6. Python Programming for the Raspberry Pi and interfacing with web
7. Familiarization with Arduino board
8. Python Programming for Arduino and interfacing with web
9. Controlling lights remotely using Raspberry Pi
10. Detecting the movement of objects and sending caution signals remotely using Raspberry Pi

17ES006 EMBEDDED LINUX

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course provides

- The fundamentals of operating system.
- The basic understanding of Linux operating system.
- The basic knowledge on board support packages and device drivers.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand the concept of operating system.
- Understand the complexities of Embedded Linux Distributions in embedded systems.
- Understand the concept of Board support package
- Understand about different drivers used in embedded system.

SKILLS ACQUIRED:

- To learn how to configure, boot and test Embedded Linux distributions and applications running on Embedded Linux target systems.
- Build embedded systems using Embedded Linux operating systems

ACTIVITIES:

1. Doing projects using Embedded Linux for different applications.

Unit – I **L-12**

Fundamentals of Operating Systems: Overview of operating systems, Process and threads, Processes and Programs, Programmer view of processes, OS View of processes, Threads, Scheduling, Non preemptive and preemptive scheduling, Real Time Scheduling, Process Synchronization, Semaphores, Message Passing, Mailboxes, Deadlocks, Synchronization and scheduling in multiprocessor Operating Systems

Unit – II **L-12**

Linux Fundamentals: Introduction to Linux, Basic Linux commands and concepts, Logging in, Shells, Basic text editing, advanced shells and shell scripting, Linux File System, Linux programming, Processes and threads in Linux, Inter process communication, Devices, Linux System calls.

Unit – III **L-12**

Introduction to Embedded Linux

Embedded Linux-Introduction, Advantage, Embedded Linux Distributions, Architecture, Linux kernel architecture, User space, Linux startup sequence, GNU cross platform Tool chain.

Unit – IV **L-12**

Board Support Package and Embedded Storage

Inclusion of BSP in kernel build procedure, Boot loader Interface, Memory Map, Interrupt Management, PCI Subsystem, Timers, UART, Power Management, Embedded Storage, Flash Map, Memory Technology Device (MTD) –MTD Architecture, MTD Driver for NOR Flash, The Flash Mapping drivers, MTD Block and character devices, mtdutils package, Embedded File Systems, Optimizing storage space – Turning kernel memory.

Unit – V **L-12**

Embedded Drivers and Application Porting

Linux serial driver, Ethernet driver, I2C subsystem, USB gadgets, Watchdog timer, Kernel Modules, Application porting roadmap, Programming with threads, Operating System Porting Layer, Kernel API Driver, Case studies RTLinux – uClinux.

TEXTBOOKS:

1. P. Raghavan ,Amol Lad , Sriram Neelakandan, 'Embedded Linux System Design and Development', Auerbach Publications 2006

REFERENCE BOOKS:

1. Dhananjay M. Dhamdhere, 'Operating Systems A concept based Approach', Tata Mcgraw-Hill Publishing Company Ltd
2. Matthias Kalle Dalheimer, Matt Welsh, 'Running Linux', O'Reilly Publications 2005
3. Mark Mitchell, Jeffrey Oldham and Alex Samuel 'Advanced Linux Programming' New Riders Publications
4. Karim Yaghmour, 'Building Embedded Linux Systems', O'Reilly Publications 2003
5. Abott,Linux for Embedded and real time applications,newness,3rdedition.

17ES008- EMBEDDED SYSTEM DESIGN WITH FPGAS

L	T	P	C
3	1	-	4

Course Objectives:

The basic objective of this course is to understand how a FPGA and the Hardware Description Language (HDL) can be used in the design of embedded digital systems. Simulation and synthesis of HDL code of digital logic using HDL, for a given FPGA device and processor-based FPGA devices.

Course Outcomes:

At the end of the course, the students should be able to:

1. Understand the fundamentals of embedded systems from both hardware and software perspective,
2. Understand how to design digital circuits with VHDL.
3. Understand how to design complex state machines in VHDL and also verify the designs using Modelsim simulator.
4. Prototype digital design on an FPGA.
5. Understand logic simulation and synthesis for FPGA.
6. Understand basic aspects of embedded processors (ARM) and Bus Interfaces

SKILLS ACQUIRED:

Student is able to write code synthesize and implement

- basic digital circuits in HDL using data flow, behavioral and structural modeling styles
- Embedded cores in modern FPGAs.
- Input/output interfacing principles, bus architectures and standard interfaces.
- Embedded system design with HDL cores.

UNIT – I

Introduction

Introduction to Embedded System Overview, Hypothetical Robot Control System, Digital Design Platforms - Microprocessor-based Design, Single-chip Computer/Microcontroller-based Design, Application Specific Standard Products (ASSPs), Design Using FPGA; Organization of the Book;

Hardware Description Language: Verilog

Software and Hardware Description Languages, Let's Use Verilog as Our HDL, Design Examples Using Verilog - Gate Level Model, Combinational Circuits Using Data Flow Modelling, Behavioural Logic, Finite State Machine (FSM), Arithmetic Using HDL, Pipelining, Module Instantiation and Port Mapping, Use of Pre-designed HDL Codes, Simulating Digital Logic Using Verilog - EDA Tool Flow for Simulation, Creating a Test Bench for HDL-based Digital Logic, Post Place and Route Simulation, Simulation of Algorithm Using Pre-designed Codes.

UNIT – II

FPGA Devices

FPGA and CPLD, Architecture of a FPGA - FPGA Interconnect Technology, Logic Cell, FPGA Memory, Clock Distribution and Scaling, I/O Standards, Multipliers, Floor Plan and Routing, Timing Model for a FPGA, FPGA Power Usage.

FPGA-based Embedded Processor

Hardware–Software Task Partitioning, FPGA Fabric Immersed Processors, Soft Processors, Hard Processors, Tool Flow for Hardware–Software Co-design, Interfacing Memory to the Processor, Interfacing Processor with Peripherals, Types of On-chip Interfaces, Wishbone Interface, Avalon Switch Matrix, OPB Bus Interface, Design Re-use Using On-chip Bus Interface, Creating a Customized Microcontroller, Robot Axis Position Control.

UNIT – III

FPGA-based Signal Interfacing and Conditioning

Serial Data Communication, Physical Layer for Serial Communication, RS-232-based Point-to-Point Communication, RS-485-based Multi-point Communication, Serial Peripheral Interface (SPI), Signal Conditioning with FPGAs.

UNIT – IV

Motor Control Using FPGA

Introduction to Motor Drives, Digital Block Diagram for Robot Axis Control, Position Loop, Speed Loop, Power Module, Case Studies for Motor Control - Stepper Motor Controller, Permanent Magnet DC Motor, Brushless DC Motor, Permanent Magnet Rotor (PMR) Synchronous Motor, Permanent Magnet Synchronous Motor (PMSM).

UNIT – V

Prototyping Using FPGA

Prototyping Using FPGAs, Test Environment for the Robot Controller, FPGA Design Test Methodology, UART for Software Testing, FPGA Hardware Testing Methodology.

TEXTBOOKS:

1. " Introduction to Embedded System Design Using Field Programmable Gate Arrays", Rahul Dubay, © 2009 Springer-Verlag London Limited
2. Frank Vahid & Tony Givargis, "Embedded System Design, A Unified Hardware/Software Introduction", ISBN 978-0-471-38678-0

REFERENCE BOOKS:

VHDL and FPLDs, by Zoran Salcic, Kluwer,1998

Computers as Components, Principles of Embedded Computing System Design, by Wayne Wolf, Morgan Kauffman, 2001

A VHDL Primer, by Jayaram Bhasker. Prentice Hall, 1998

HDL Chip Design, by Douglas J. Smith, 1999

VHDL Analysis and Modeling of Digital Systems, by Z. Navabi, McGraw-Hill, 1993

http://www.ece.rutgers.edu/node/1528

http://www.ece.iastate.edu/~morris/388/syllabus_388x.html

COURSE	CONTENTS FOR POOL OF ELECTIVES				
17ES009	Introduction To Internet Of Things	3	1	-	4
17ES011	Soft Computing	3	1	-	4
17ES013	Adaptive Signal Processing	3	1	-	4
17ES015	System On Chip Design	3	1	-	4
17ES017	Digital Image And Video Processing	3	1	-	4
17ES019	Data Communications	3	1	-	4
17ES021	Neural Networks & Fuzzy Systems	3	1	-	4
17ES023	Scripting Languages(Common To Vlsi)	3	1	-	4
17ES010	Risc Processors Architecture And Programming	3	1	-	4
17ES012	Micro Electro Mechanical System	3	1	-	4
17ES014	Dsp Processors	3	1	-	4
17ES016	Computer Architecture And Parallel Processing	3	1	-	4
17ES018	Robotics And Automation	3	1	-	4
17ES020	Cryptography And Network Security	3	1	-	4
17ES022	Smart Instrumentation	3	1	-	4
17ES024	Wireless Communications And Networks	3	1	-	4

17ES009 Introduction to Internet of Things (IoT)

L	T	P	C
3	1	-	4

Course Description and Objectives:

- Students will be explored to the interconnection and integration of the physical world and the cyber space.
-

Course Outcomes:
Upon successful completion of this course student should be able to:

- Able to understand the application areas of IOT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics

SKILLS ACQUIRED:

- *Able to understand IoT Concepts*
- *Able to design the different IoT system applications.*

ACTIVITIES:

- *design various simple IoT Applications*

Unit – I **L-12**

Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels

Unit – II **L-12**
Internet Principles: Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols
Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

Unit – III **L-12**
M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

Unit - IV **L-12**
Sensors and Actuators: Micro sensors: Introduction, Thermal Sensors, Radiation Sensors, Mechanical Sensors, Magnetic Sensors, Bio(chemical) Sensors,

Unit-V **L-12IOT**
Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices

TEXTBOOKS:

1. Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On- Approach",2014,
2. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013,
3. Steve Heath, "Embedded Systems Design", 2nd Edition, Newnes.

REFERENCE BOOKS:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013.
2. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493- 9357-1.

17ES011 SOFT COMPUTING

L	T	P	C
3	1	-	4

Course Description and Objectives:

- To review the fundamentals of ANN and fuzzy set theory
- To make the students understand the use of ANN for modeling and control of non-linear system and to get familiarized with the ANN and FLC tool box.
- To make the students to understand the use of optimization techniques.
- To familiarize the students on various hybrid control schemes, P.S.O and get
- To familiarized with the ANFIS tool box.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Will be able to know the basic ANN architectures, algorithms and their limitations.
- Will be able to know the different operations on the fuzzy sets.
- Will be capable of developing ANN based models and control schemes for non-linear system.
- Will get expertise in the use of different ANN structures and online training algorithm.
- Will be knowledgeable to use Fuzzy logic for modeling and control of non-linear systems.

SKILLS ACQUIRED:

- *Familiarization with ANN Tool Box*
- *Familiarization with ANFIS Tool Box*
- *Familiarization with FLC Tool Box*

Unit – I

Review of fundamentals - Biological neuron, Artificial neuron, Activation function, Single Layer
Perceptron – Limitations – Multi Layer Perceptron – Back propagation algorithm (BPA); Fuzzy
set theory – Fuzzy sets – Operation on Fuzzy sets - Scalar cardinality, fuzzy cardinality, union and
intersection, complement (yager and sugeno), equilibrium points, aggregation, projection, composition, decomposition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

L-14

Unit - II

Modeling of non linear systems using ANN- NARX,NNSS,NARMAX - Generation of training data - optimal architecture – Model validation- Control of non linear system using ANN Direct and Indirect neuro control schemes- Adaptive neuro controller – Case study - Familiarization of Neural Network Control Tool Box.

L-14

Unit – III

Modeling of non linear systems using fuzzy models(Mamdani and Sugeno) –TSK model - Fuzzy

Logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification-
Adaptive fuzzy systems- Case study - Familiarization of Fuzzy Logic Tool Box.

L-12

Unit - IV

Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other search techniques like Tabu search, Ant-colony search and Particle Swarm Optimization.

L-12

Unit-V

Fuzzification and rule base using ANN–Neuro fuzzy systems-ANFIS –Optimization of membership function and rule base using Genetic Algorithm and Particle Swarm Optimization - Case study–Introduction to Support Vector Regression – Familiarization of ANFIS Tool Box.

Activities:

2. Performing simple experiments using ANN Tool Box
3. Performing simple experiments using FLC Tool Box
4. Performing simple experiments using ANFIS Tool Box

TEXTBOOKS:

1. Laurene V.Fausett, “Fundamentals of Neural Networks, Architecture, Algorithms, and Applications”, Pearson Education, 2008.
2. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, Wiley, Third Edition, 2010.
3. David E.Goldberg, “Genetic Algorithms in Search, Optimization, and Machine Learning”, Pearson Education, 2009.

REFERENCE BOOKS:

1. W.T.Miller, R.S.Sutton and P.J.Webrose, “Neural Networks for Control”, MIT Press, 1996.
2. George J.Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic: Theory and Applications”, Prentice HalI, First Edition, 1995.
3. N.P Padhy, S.P. Simon “Soft Computing With MATLAB Programming”,OXFORD print Feburary 2015.

17ES5013 - ADAPTIVE SIGNAL PROCESSING

L	T	P	C
3	1	-	4

Course Description and Objectives:

Adaptive signal processing concerns with processing of signals where the processing parameters are adjusted continuously to suit time varying signal environmental conditions. The study of adaptive signal processing involves development of various adaptation algorithms and assessing them in terms of convergence rate, computational complexity, robustness against noisy data, hardware complexity, numerical stability etc. This course demonstrates the design of important class of adaptive filters, LMS, RLS and Kalman filters.

Course Outcomes:
Upon successful completion of this course student should be able to:

- Explain the importance of signal processing in non-stationary environment.
- Explain the role and importance of adaptive signal processing in communications signal processing
- List and apply the various mathematical models to adaptive signal processing.
- Understand the problem of finding the minimum error criteria.
- Use computer based simulation tools to understand the theoretical concepts of adaptive signal processing in various communication applications.

SKILLS ACQUIRED:

- *Able to analyze statistical properties of a signal.*
- *Able to design different adaptive filters for different applications.*
- *Able to use different algorithms such as LMS, NLMS, RLS for designing adaptive filters.*

ACTIVITIES:

- *Design of linear prediction filter using MATLAB*
- *Design of LMS filter using MATLAB*
- *Design of RLS filter using MATLAB*
- *Design of Kalman filter using MATLAB*

Unit – I
L12
Introduction: The filtering problem, Adaptive filters, linear filter structures, approaches to the development of linear adaptive filter algorithms, real and complex forms of adaptive filters, non linear adaptive filters, Applications.
Stationary Processes and Models: Partial characterization of a discrete time stochastic process, mean ergodic theorem, correlation matrix, correlation matrix of sine wave plus noise, stochastic models, wold decomposition, asymptotic stationarity of an auto regressive process. Yule-Walker equations. Selecting the model order. Complex Gaussian process.

Unit – II **L-12**

Wiener Filters: Linear optimum filtering problem statement, principle of orthogonality, minimum mean squared error, wiener – hopf equations, error– performance surface. Channel equalization. Linearly constrained minimum variance filter , generalized side lobe cancellers.

Unit – III **L12**

Linear Prediction: Forward Linear Prediction, backward Linear Prediction, Levinson-Durbin algorithm, properties of prediction error filters, Schur-Cohntest, auto regressive modeling of a stationary stochastic process, Cholesky factorization, lattice predictors, joint process estimation, block estimation.

Method of steepest descent: Steepest descent algorithm, stability of the Steepest descent algorithm.

Unit – IV **L12**

Least Mean Square (LMS) Algorithm: Over view of the structure and operation of the Least Mean square Algorithm, Least Mean square adaptation Algorithm, stability and performance analysis of the LMS algorithm. Normalized Least Mean Square (NLMS) Algorithm, Concept of method of least squares,

Recursive Least Squares (RLS) Algorithm: The matrix inversion lemma, the exponentially weighted RLS algorithm, update recursion for the sum of weighted error squares. Convergence analysis of the RLS algorithm.

Unit-V **L12**

Kalman Filters: Recursive minimum mean square estimation for scalar random variables, statement of the Kalman filtering problem, the innovations process, estimation of the state using the innovations process, filtering, initial conditions, variants of the Kalman filter, extended Kalman filtering.

TEXTBOOKS:

1. Adaptive Filter Theory, S. Haykin, Prentice-Hall, 4-th edition, 2001.
2. Fundamentals of Adaptive Filtering, Ali H. Sayed, John Wiley, 2003.

REFERENCE BOOKS:

1. Monson H. Hayes , "Statistical Digital Signal Processing And Modeling", Wiley India, 2008.
2. John G. Proakis, Dimitris G.Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson Education / PHI, 2007.
3. B. Farhang-Boroujen, "Adaptive Filters: Theory and Applications", John Wiley and Sons, 2013.

17ES5015 - SYSTEM ON CHIP DESIGN

L	T	P	C
3	1	-	4

Course Objectives:

- To understand the concepts of System on Chip Design methodology for Logic and Analog Cores.
- To understand the concepts of System on Chip Design Validation.
- To understand the concepts of SOC Testing.

Course Outcomes:

- Upon successful completion of this course student should be able to: Able to understand about SoC Design Methodology.
- Ability to understand the design of different embedded memories.
- SoC Design Validation and Testing Concepts can be understood.

SKILLS ACQUIRED:

- Can able to design various embedded memories

ACTIVITIES:

To perform PSOC based mini projects

UNIT – I

Introduction- System tradeoffs and evolution of ASIC Technology- System on chip concepts and methodology – SoC design issues -SoC challenges and components.

UNIT – II

Design Methodological For Logic Cores- SoC Design Flow – On-chip buses –Design process for hard cores –Soft and firm cores – Core and SoC design examples.

UNIT – III

Design Methodology for Memory and Analog Cores- Embedded memories –Simulation modes Specification of analog circuits – A to D converter –Phase locked loops –High I/O.

UNIT – IV

Design Validation- Core level validation –Test benches –SoC design validation – Co simulation –hardware/ Software co-verification. Case Study: Validation and test of systems on chip.

UNIT – V

SocTesting- SoC Test Issues –Cores with boundary scan –Test methodology for design reuse–Testing of microprocessor cores – Built in self-method –testing of embedded memories. Case Study: Integrating BIST techniques for on-line SoC testing.

TEXTBOOKS:

1. RochitRajsunah, System- on - a -chip: Design and Test, Artech House, 2007.
2.PrakashRaslinkar, Peter Paterson &Leena Singh, System-on-a-chip verification: Methodology and Techniques, Kluwer Academic Publishers, 2000.

REFERENCEBOOKS:

1. M.Keating, D.Flynn, R.Aitken, A, GibbonsShi, Low Power Methodology Manual for System-on-Chip Design Series: Integrated Circuits and Systems, Springer, 2007.
2. L.Balado, E. Lupon, Validation and test of systems on chip, IEEE conference on ASIC/SOC,1999.
3.A.Manzone, P.Bernardi, M.Grosso, M. Rebaudengo, E. Sanchez, M.SReorda, Centro Ricerche Fiat, Integrating BIST techniques for on-line SoC testing, IEEE Symposium on On-Line testing, 200

17ES017- Digital video processing

L	T	P	C
3	1	-	4

Course Description and Objectives:

1. To learn basic operations on Images.
2. To learn advanced digital image processing techniques related to segmentation and recognition.
3. To learn fundamentals of digital video processing.
4. To lean video compression techniques.

Course Outcomes:

Upon successful completion of this course student should be able to:

1. Able to apply basic mathematical tools on images to perform filtering
2. Acquire ability to interpret and analyze 2D signals in the frequency domain through the Fourier transforms.
3. Able to do further research in video processing.

SKILLS ACQUIRED:

1. To program operations on images
2. Object detection using image processing
3. Basic operations on video signals

ACTIVITIES:

1. Smoothening of image using filters.
2. Sharpening of image by using filters.
3. Implementation of wavelet transforms.

UNIT-I

L12

Fundamentals steps of Image processing: Components of an Image processing system, Image sampling and quantization, relationship between the pixels. Gray level transformation, Histogram processing, Smoothing and sharpening spatial filters, Smoothing and sharpening frequency domain filters

UNIT-II

L12

Image compression and segmentation: Compression models, Error free coding, lossycoding, compression standards.Image segmentation: Edge linking and boundary detection, Thresholding, Region based segmentation

UNIT-III

L12

Video Representation : Video formation, perception and representation: Color perception and specification, Video capture and display, Analog video raster, Analog color TV systems, Digital VideoVideo Sampling: Basics of lattice theory, sampling over lattice, Sampling of video signals, filtering operations, Conversion of signals sampled on different lattices, Sampling rate conversion of video signals.

UNIT-IV
L12
Video Modeling: Camera model, illumination model, object model. Scene model, Two dimensional motion models 2-D motion estimation: Optical flow, General methodologies, Pixel based motion estimation, Block matching algorithm, Mesh-based motion estimation, Global motion estimation. Application of motion estimation in video coding

UNIT-V
L12
Video Coding: Information theory, Binary encoding, Scalar quantization, Vector quantization, Waveform based video coding: Block based transform coding, Predictive coding, Object based scalability, Wavelet Transform based coding

TEXTBOOKS:

1. Digital Image Processing 3e by Rafael C. Gonzalez Richard E. Woods Pearson Education India; Third edition (23 June 2016)
2. Video Processing and Communications (Prentice-Hall Signal Processing Series) by Yao Wang JornOstermannYa-Qin Zhang Pearson (27 September 2001)

REFERENCEBOOKS:

1. Digital Video Processing (Prentice-Hall Signal Processing Series) by A. Murat TekalpPrentice Hall; 2 edition (18 June 2015)
2. Handbook of Image and Video Processing (Communications, Networking and Multimedia) 2nd ,Kindle Edition by Alan C. BovikAcademic Press; 2 edition (21 July 2010)

17ES019-Data Communications

L	T	P	C
3	1	-	4

Course Description and Objectives:

The objective of the course is to ensure that students have the necessary networking skills to design, implement, and analyze data communication networks

Course Outcomes:

- To be able to understand the concepts of data communication and networks
- To be able to understand different protocols that are require at various layers of the network model
- To be able to analyze the given network and know its performance for various situations.

Skills Acquired:

- Gain knowledge on Data Communication Networks,
- Design of Various Networks
- Simulation of Routing Protocols

Activities:

1 simulation of distance vector algorithm
2 simulation of link state algorithm
3 simulation of RIP algorithm
4 simulation of IGRP and EIGRP routing protocols
5 Spanning Tree algorithm and bridging
6 implementation of HTML http web pages and hosting it to server

UNIT – I

Data Communication Systems

History of data communications, Network architecture, Protocols and standards, Layered network architecture, Open systems interconnection, Network topologies, LAN, WAN and MAN, Data communication hardware, DTE and DCE, Serial interfaces, Network interface card, Modem, Digital data digital signals, Digital data analog signals, Circuit switching vs. Packet switching

UNIT – II

Local Area Networks

Transmission formats – Baseband vs Broadband, LAN topologies, Collision vs broadcast domains, Connectivity devices, Medium access control and Logical link control sublayers, Channel access problem, MAC addressing, Ethernet - evolution of Ethernet, Variants of Ethernet.

UNIT – III

Internetworking
TCP/IP Protocol suite, Comparison with ISO suite, IP address notation, IP address classes, Address masking, Introduction to subnetting, Subnet masking for Class A, B, and C, Supernetting, Classless IP addressing, Classless interdomain routing , Address resolution protocol, Hardware addresses vs IP addresses, IP datagram, Different fields of IP header

UNIT - IV

IPv6 and Routing
Internet protocol version 6, Advantages of IPv6, IPv6 Addressing format, IPv6 header, Routing in Internets, Static vs Dynamic routing, Routing Tables, Distance Vector Routing, Link State Routing, Hierarchical routing, Broadcast Routing, Multicast Routing

UNIT – V

Transport and Application Layers
Transport layer protocols, Introduction to transport layer, Port address, User datagram protocol- UDP, Transmission control protocol-TCP, Header of TCP, Various fields of TCP header, TCP connection establishment and termination, TCP error control and Flow control, Domain name system-DNS, Dynamic host configuration protocol-DHCP

TEXT BOOKS:

1. Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education
2. A S Tanenbaum, "Computer Networks", 5th Edition, PHI

REFERENCE BOOKS:

1. James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown Approach Featuring", 3/e, Pearson Education.
2. Forouzan, "Data Communications and Networking", 4th Edition, McGraw Hill
3. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000

Scripting Languages Lab

Course Description and Objectives:

- This course provides an introduction to the script programming paradigm
- Introduces scripting languages such as Perl and Python.
- Learning TCL

Course Outcomes:

- Comprehend the differences between typical scripting languages and application programming languages.
- Acquire programming skills using scripting languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Python and select an appropriate language for solving a given problem.

17ES021 - NEURAL NETWORKS & FUZZY SYSTEMS

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course aims at introducing the fundamental theory and concepts of computational intelligence methods, in particular neural networks, fuzzy systems, genetic algorithms and their applications in the area of machine intelligence.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand the fundamental theory and concepts of neural networks, neuro-modeling, several neural network paradigms and its applications.
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic control and other machine intelligence applications of fuzzy logic.
- Understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems

SKILLS ACQUIRED:

- *Evaluate the learning strategies and learning rules*
- *Designing of feed forward and feedback network*
- *Familiarized with different logical components*
- *Ability to solve different Fuzzy logic based problems*
- *Knowledge to apply various learning strategies and learning rules*

ACTIVITIES:

1. Multi-layer feedforward networks: Matlab Implementation
2. Applications using matlab
3. Design and implement a neural network simulation (with two modes ofoperation: learning and processing) using a high-level language C++.
4. A Matlab based simulation study to neuro-fuzzy system.
5. Assess the power and usefulness of artificial neural networks in severalapplications including speech synthesis, diagnostic problems, business andfinance, robotic control, signal processing, computer vision and many otherproblems that fall under the category of pattern recognition

Unit – I

Introduction to Neural Networks: Introduction, Organization of the Brain, testing. Biological and Artificial Neuron Models, Integrate-and-Fire Neuron Model, McCulloch-Pitts Model, Characteristics of ANN, Potential Applications of ANN. Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN -– Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application..

L-14

Unit - II

Single Layer & Multi-layer Feed forward Neural Networks: Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the

Perceptron Model, Applications. Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

L-14

Unit - III

Associative Memories: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

Neural network applications: Process identification, control, fault diagnosis and load forecasting.

L-12

Unit - IV

Classical & Fuzzy Sets : Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

L-12

Unit-V

Fuzzy Logic System Components: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods. Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEXTBOOKS:

3. Rajasekharan and Rai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications”, PHI Publication.
4. S.N.Sivanandam, S.Sumathi, S.N.Deepa, “Introduction to Neural Networks using MATLAB 6.0 “TMH, 2006

REFERENCE BOOKS:

1. James A Freeman and Davis Skapura, “Neural Networks”, Pearson Education, 2002.
2. Simon Hakins, “Neural Networks”, Pearson Education
3. C.Eliasmith and CH.Anderson, “Neural Engineering”, PHI
4. Bart Kosko, “Neural Networks & Fuzzy systems”.
5. Driankov D., Hellendoorn H. & Reinfrank M.,..An Introduction to Fuzzy Control., Narosa Publications ,1993

17ES023-Scripting Languages

Course Description and Objectives:

- This course provides an introduction to the script programming paradigm
- Introduces scripting languages such as Perl and Python.
- Learning TCL

Course Outcomes:

- Comprehend the differences between typical scripting languages and application programming languages.
- Acquire programming skills using scripting languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Python and select an appropriate language for solving a given problem.

SKILLS ACQUIRED:

- Able to implement any program using scripting language.
- Able to resolve security issues in internet programming.
- Write a program of employs list of a company using perl.
- Write a programming of security issues on operative systems in perl.
- Write a program to store the data using TCL.
- Execute a program on addition by using eval function.
- Design a window and widget using TK.

UNIT – I

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages,Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT – II

Advanced perl Finer points of looping, pack and unpack, filesystem, eval, datastructures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Isses.

UNIT – III

TCL TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , PerlTk.

UNIT - IV

Python Introduction to Python langauge, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python,Exception Handling. Integrated

UNIT – V

Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

TEXT BOOKS:

1. The World of Scripting Languages , David Barron,Wiley Publications.
3. Python Web Programming, Steve Holden and David Beazley ,New Riders Publications.

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache,MySQL,Perl and PHP,J.Lee and B.Ware(Addison Wesley) Pearson Education.
2. Programming Python,M.Lutz,SPD.
35. Core Python Programming,Chun,Pearson Education.
6. Guide to Programming with Python,M.Dawson,Cengage Learning.
7. Perl by Example,E.Quigley,Pearson Education.
8. Programming Perl,Larry Wall,T.Christiansen and J.Orwant, O'Reilly, SPD.
9. Tcl and the Tk Tool kit,Ousterhout,Pearson Education.
10. 11. Perl Power,J.P.Flynt,Cengage Learning.
12. PHP Programming solutions,V.Vaswani,TMH.

Scripting Languages Lab

Course Description and Objectives:

- This course provides an introduction to the script programming paradigm
- Introduces scripting languages such as Perl and Python.
- Learning TCL

Course Outcomes:

- Comprehend the differences between typical scripting languages and application programming languages.
- Acquire programming skills using scripting languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Python and select an appropriate language for solving a given problem.

1. Write a script that calculates the average performance score and prints out the members of the groups meeting the following criteria (each criterion should produce one group, rather than identifying a group that meets all four criteria):
   (a) native language is English (b) age is greater than 20 (c) age is greater than 20 and native language is English (d) performance score is greater than 70
2. Suppose you're given the following arrays containing participant information: @firstnames = ("Sarah", "Jareth", "Ludo", "Hoggle"); @lastnames = ("Williams", "King", "Beast", "Dwarf"); Write a script that asks the user whether the names should be sorted by first or last names, and whether the names should be sorted alphabetically or reverse alphabetically. Then, sort the participant list this way, and print out the sorted list of participants. Look at sort names reverseABC.pl for an example of sorting these names reverse alphabetically.

3. Suppose you're given the following arrays containing participant information: @firstnames = ("Sarah", "Jareth", "Ludo", "Hoggle"); @lastnames = ("Williams", "King", "Beast", "Dwarf"); @ages = (15, 39, 33, 43); @nativelanguages = ("English", "English", "Romanian", "English"); @performancescores = (85, 99, 35, 75);
4. Suppose you're given the following arrays containing participant information: @usernames = ("Sarah1", "Sarah2", "sarah3", "sArah4"); @scores = (10, 7, 42, 3);
   Write a program that outputs the participant information, sorted in one of the following ways: (a) ASCII-betical by participant username (b) case-insensitive ASCII-betical by participant username (c) numerical order by participant score (lowest to highest) (d) reverse numerical order by participant score (highest to lowest) The user should be able to choose which sorting order is preferred (default ASCIIbetical on username) using a command line option. If you get stuck, have a peek at sort revnum.pl for an example of sorting this information reverse numerically.
5. Write a program on Recursive Procedures in TCL?
6. Write a program on Procedures with Variable Arguments in TCL?
7. Write a program on how to create a namespaces in TCL?
8. Write a program on regular expressions in TCL?
9. Design widget using TK?
10. Write a program on tuples in python?
11. Write a program on how to create strings?
12. Write a program on how to send one e-mail using Python script.

17ES010 - RISC Processors Architecture and Programming

L	T	P	C
3	1	-	4

Course Description and Objectives:

The RISC concept has led to a more thoughtful design of the microprocessor. Among design considerations are how well an instruction can be mapped to the clock speed of the microprocessor (ideally, an instruction can be performed in one clock cycle).The ARM architecture is the industry's leading 16/32-bit embedded RISC processor solution. ARM Powered microprocessors are being routinely designed into a wider range of products than any other 32-bit processor. This wide applicability is made possible by the ARM architecture, resulting in optimal system solutions at the crossroads of high performance, low power consumption and low cost.

- To understand the embedded system based on ARM processor and itshardware (ARM processor Core).
- To understand the techniques and rules for writing efficient C code andoptimizing ARM assembly code.
- To discuss various Cache technologies and Architecture that surrounds theARM cores and MMU.
- To Understand the architecture of ARM CORTEX-M3

Course Outcomes:

Upon successful completion of this course student should be able to:

- Design an embedded system using ARM processor.
- Write source code that will compile more efficiently in terms of increasedspeed and reduced code size.
- Develop an embedded system with optimized key subroutines to reduce
- system power consumption and clock speed needed for real time operation

SKILLS ACQUIRED:

- 16/32 bit assembly language programming for ARM processor
- 16/32 bit C language programming for ARM processor
- Difference between RISC and CISC

ACTIVITIES:

1. Multi byte(32/64/128) addition by using arm assembly language/C
2. 64 bit multiplication by ARM assembly language/C
3. Keypad interfacing with ARM processor
4. LOAD and STORE operations (Address verifications)

UNIT –I **L09**

ARM Architecture

ARM Design Philosophy, Registers, Program Status Register, InstructionPipeline, Interrupts and Vector Table, Architecture Revision, ARM ProcessorFamilies.

UNIT –II **L09**

ARM Programming Model – I

Instruction Set: Data Processing Instructions, Addressing Modes, Branch,Load -Store Instructions, PSR Instructions, Conditional Instructions.

UNIT –III **L09**

Thumb Instruction Set: Register Usage, Other Branch Instructions, DataProcessing Instructions, Single-Register and Multi Register Load-StoreInstructions, Stack, Software Interrupt Instructions

UNIT –IV **L09**

ARM Programming

Simple C Programs using Function Calls, Pointers, Structures, Integer andFloating Point Arithmetic, Assembly Code using Instruction Scheduling,Register Allocation, Conditional Execution and Loops. Exception Handling ,Interrupts , Interrupt handling schemes, Firmware and boot loader.

UNIT –I **L09**

ARM Cortex-M3

ARM Cortex-M3 Processor –Architecture- Instruction Set Development-TheThumb-2 Technology and Instruction Set Architecture-CORTEX-M3Applications.

TEXTBOOKS:

1. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield ‘ARM System Developer’s Guide Designing and Optimizing System Software’, Elsevier 2007
2. John H. Davies, “MSP430 Microcontroller Basics”, Newnes (Elsevier Science), 2nd Edition, 2008.
3. ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000,Addison Wesley Professional.
4. The indefinite guide to ARM CORTEX-M3.
5. Joseph Yiu “The Definitive Guide to the ARM Cortex-M0”, Newnes, (Elsevier), 2011.

REFERENCEBOOKS:

1. Steve Furber, ‘ARM system on chip architecture’, Addision Wesley
2. ARM Architecture Reference Manual
3. LPC213x User Manual
4. ARM System developers guide-ELSEVIER publications

17ES012 - Micro Electro Mechanical System

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course is an introduction to Micro Electro Mechanical Systems and is intended for Post Graduate students. Silicon-based integrated MEMS promise reliable performance, miniaturization and low-cost production of sensors and actuator systems with broad applications in data storage, biomedical systems, inertial navigation, micromanipulation, optical display and micro fluid jet systems. The course covers such subjects as materials properties, fabrication techniques, Mechanical sensor packaging, mechanical transduction techniques, pressure sensors, Force, torque and internal sensors.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand the different materials-Substrates used in MEMS manufacture.
- To acquire knowledge on different fabrication techniques.
- To acquire different mechanical transduction techniques.
- Understand the different techniques used in pressure sensors and different types of pressure sensors.
- To understand the functional and usages of various sensors like, electro static thermal, force, torque and inertial sensors.
- To understand the functional and usages of various actuators like, electro static thermal and etc,.

SKILLS ACQUIRED:

- Understand future applications of MEMS.
- Be able to apply all these skills to the design of a MEMS system.
- The above can be applied to understand the design and fabrication of NEMS.

ACTIVITIES:

1. Design and Simulation of Inertia Sensors.
2. Design and Simulation of Pressure Sensors.
3. Design and Simulation of Electrostatic Actuators.
4. Design and Simulation of Piezo resistive Actuators.

Note: To perform the above mentioned activities FEM based MEMS design software tools like, Intellisuite / coventorware / Comsol Multi physics are required.

UNIT I: INTRODUCTION L-12

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators –- Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis –

Flexural beam bending- Torsional deflection, Broad response of MEMS to mechanical, thermal and electrical stimuli.

UNIT II: MICROMACHINING **L- 12**

Introduction to Micro fabrication –Photo lithography-Deposition techniques-Chemical vapour deposition, physical vapour deposition- Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants –Basic surface micromachining processes – Structural and Sacrificial Materials

UNIT III : Electrostatic and Thermal Sensors And Actuators **L-12**

Electrostatic sensors – Parallel plate capacitors – Applications – Inter digitated Finger capacitor – Comb drive devices – Thermal Sensing and Actuation – Thermal expansion– Thermal couples – Thermal resistors – Applications

UNIT IV : Piezo-Resistive and Piezo-Electric Sensors And Actuators **L-12**

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia,Tactile and Flow sensors.

UNIT V : POLYMER MEMS **L-12**

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors.

TEXTBOOKS:

1. ***Chang Liu***, 'Foundations of MEMS', Pearson Education Inc., 2006.
2. **Tai Ran Hsu**, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.
3. ***Stephen D.Senturia*** "Microsystem Design" Springer International Edition,2010
4. ***Julian w. Gardner, Vijay k. varadan, Osama O.Awadelkarim***, "Micro Sensors, MEMS and Smart devices", John Wiley & son LTD,2002
5. **Steeve P Beeby, G Ensel**, "MEMS Mechanical Sensors" Architect House.
6. Marc J Madou " Fundamentals of Micro Fabrication", CRC Press, 2011

REFERENCE BOOKS:

1. ***Nadim Maluf***, "An introduction to Micro electro mechanical system design", Artech House, 2000.
2. ***Mohamed Gad-el-Hak***, editor, "The MEMS Handbook", CRC press Baco Raton, 2000
3. ***James J.Allen***, "Micro Electro Mechanical System Design", CRC Press published in 2005

17ES014 - DSP PROCESSORS

L	T	P	C
3	1	-	4

Course Description and Objectives:

Digital Signal Processing (DSP) is being used very widely in applications that include telecommunication equipment, multimedia systems, electronic and biomedical instrumentation, automotive systems and many military and weapon systems. DSP chips, general processors or dedicated ASIC chips, are now able to process wide bandwidth signal of all sorts in real-time.

The objectives of the course are:

- Architecture of a Real time Signal Processing Platform
- Digital Signal Processor Architecture
- Difference in the complexity of programs between a General PurposeProcessor and Digital Signal Processor
- Apply previous signal processing knowledge in real-time digitalsignal processing systems.
- Learn to program a DSP processor.
- Prepare students with multi disciplinary competency

Course Outcomes:

At the end of the course, students should be able to:

- Define digital signal processor (DSP)
- Comprehend performance enhancements provided by DSP in theareas: memory architecture, pipelining, parallel execution, cache use, direct memory access, addressing methods, hardware loop control etc.
- Different Errors introduced during A-D and D-A converter stage
- Develop tools and methods for DSP.

SKILLS ACQUIRED:

- Knowledge of signals and systems, convolution methods, digital signal processing concepts must be known.

ACTIVITIES:

- Implementation of CODEC interface circuit
- Implementation of sensors with DSP Processors
- FFT implementation on DSP Processor.

UNIT – I **L-09**

Architectures for Programmable Digital Signal Processing Devices Introduction, Basic Architectural Features, DSP Computational BuildingBlocks, Bus Architecture and Memory, Data Addressing Capabilities, AddressGeneration Unit, Programmability and Program Execution, Speed Issues, Features for External Interfacing.

UNIT – II **L-09**

Programmable Digital Signal Processors

Introduction, Commercial Digital Signal-processing Devices, Data AddressingModes of TMS320C54xx Digital Signal Processors, Data Addressing Modesof TMS320C54xx Processors, Memory Space of TMS320C54xx Processors,Program Control.

UNIT – III **L-09**

DSP Programming and Operations

TMS320C54xx Instructions and Programming, Programming for IIR, FIR, FFTetc., On-Chip peripherals, Interrupts of TMS320C54xx Processors, PipelineOperation of TMS320C54xx Processors.

UNIT – IV **L-09**

Interfacing Memory and Parallel I/O Peripherals to Programmable DSPDevices Introduction, Memory Space Organization, External Bus Interfacing Signals,Memory Interface, Parallel I/O Interface, Programmed I/O, Interrupts and I/O, Direct Memory Access (DMA)

UNIT – V **L-09**

Interfacing Serial Converters to a Programmable DSP Device

Introduction, Synchronous Serial Interface, A multi-channel Buffered SerialPort (McBSP), McBSP Programming, A CODEC Interface Circuit, CODECProgramming, A CODEC-DSP Interface Example.

TEXTBOOKS:

6. Lapsley et al., "DSP Processor Fundamentals, Architectures & Features", S. Chand & Co, 2000.
7. "Digital Signal Processing", A. Singh & S. Srinivasan, Thomson Learning.

REFERENCE BOOKS:

1. B. VenkataRamani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", TMH, 2004.
2. Jonatham Stein, "Digital Signal Processing", John Wiley, 2000
3. Embedded Dsp Processor Design Application Specific Instruction Set Processorsby LiuShroff (2008)

17ES016 - COMPUTER ARCHITECTURE AND PARALLELPROCESSING

L	T	P	C
3	1	-	4

Course Description and Objectives:

Includes the organization and architecture of computer systems hardware; instruction set architectures; addressing modes; register transfer notation; processor design and computer arithmetic; memory systems; hardware implementations of virtual memory, and input/output control and devices. This course covers the architecture and enabling technologies of parallel and distributed computing systems and their innovative applications. To understand the concepts of computer architecture. To understand the concepts of pipelined and parallel processing.

Course Outcomes:
Upon successful completion of this course student should be able to:

- Describe the principles of computer design
- Describe the operation of performance enhancements such as pipelines, dynamic scheduling, branch prediction, caches, and vector processors.
- Describe modern architectures such as Super Scalar, vector processors .
- Develop applications for high performance computing systems.

SKILLS ACQUIRED:
- *Understand the design and architectures of different systems*
- *Understand the concept of parallel processing*

Activities
- *design and Develop the architectures of different systems*

UNIT - I **L - 10**
Theory of Parallelism Parallel Computer models – the state of computing, Multiprocessors and Multicomputers and Multivectors and SIMD computers, PRAM and VLSI models, Architectural development tracks, Program and network properties – Conditions of parallelism.

UNIT - II **L - 10**
Partitioning and Scheduling Program partitioning and scheduling, Program flow mechanisms, System interconnect architectures, Principles of scalable performance – performance matrices and measures, Parallel processing pplications, speedup performance laws, scalability analysis and approaches.

UNIT - III **L - 10**
Hardware Technologies Processor and memory hierarchy advanced processor technology, superscalar and vector processors, memory hierarchy technology, virtual memory technology, bus cache and shared memory – backplane bus systems, cache memory organizations, shared memory organizations, sequential and weak consistency models.

UNIT - IV **L - 10**

Pipelining and Superscalar Technologies Parallel and scalable architectures, Multiprocessor and Multicomputers, Multivector and SIMD computers, Scalable, Multithreaded and data flow architectures.

UNIT - I **L - 10**

Software and Parallel Processing Parallel models, Languages and compilers, Parallel program development and environments, UNIX, MACH and OSF/1 for parallel computers.

TEXT BOOKS:

1. Kai Hwang "Advanced Computer Architecture". McGraw Hill International 2001

2. Carl Homacher, Zvonko Vranesic, Sefwat Zaky, "Computer Organisation", 5th Edition, TMH, 2002.

REFERENCES:

1. Dezso Sima, Terence Fountain, Peter Kacsuk, "Advanced computer Architecture – A design Space Approach". Pearson Education,2003.
2. David E. Culler, Jaswinder Pal Singh with Anoop Gupta "Parallel Computer Architecture" ,Elsevier, 2004.
3. John P. Shen. "Modern processor design Fundamentals of super scalar processors", Tata McGraw Hill 2003.
4. Sajjan G. Shiva "Advanced Computer Architecture", Taylor & Francis, 2008.

17ES018 - Robotics and Automation

L	T	P	C
3	1	-	4

Course Description and Objectives:

Automation, control and robotics are pervasive enabling technologies found in almost every modern technical system, particularly in manufacturing and production. They combine the diverse and rapidly expanding disciplines of automation, control, mechanics, software and signal processing.
This course is ideal if you wish to develop comprehensive knowledge and understanding of • classical and modern control theory • industrial automation • systems analysis • design and simulation • robotics.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand basic concepts of robotics.
- Enhances practical applications of sensors and actuators in robotic systems.
- Design and model robotic manipulator.
- Design and develop dynamic control systems with related to robotics

SKILLS ACQUIRED:

- *Ability to design robot model*
- *Ability to apply principles of modelling*
- *Ability to distinguish classical and modern control concepts and controller design packages in various areas of industry*
- *Ability to design and exploit automation and robotic systems in a range of manufacturing and industrial applications.*
- *Familiarization with machine vision for image processing applications with robot*

Activities:

1. *Design dynamics of robots*
2. *Calculation of torques and selection of motors*
3. *Selection of sensors*
4. *Integration of mechatronic systems*
5. *Motion planning and control*
6. *Design of a robot using CAD*

Unit – I **L12**

Introduction: Brief History - Past, Present status and Future trends in robotics - Uses of robots – Robot Anatomy: Overview of Robot subsystems - Concept of Workspace - Mechanisms and Transmission - Types of Robots - Issues in Designing and Controlling Robots: Resolution, Repeatability, Accuracy and Compliance.

Unit – II **L12**

Effectors: Different types of Grippers and Tools - Vacuum and other methods of gripping, Actuators: Pneumatic, Hydraulic and Electric Actuators – Sensors: Internal and External sensors - Position, Velocity and Acceleration Sensors - Proximity Sensors

- Force Sensors - Laser range finder - Camera. Micro-controllers, DSP, Real time operating systems.

Unit – III **L12**

Positions, Orientations and Frames - Mappings: Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and Inverse Kinematics of Six DOF Robot Arm - Robot Arm dynamics.

Unit – IV **L12**

Robot Control: Independent joint control - PD and PID feedback - Actuator models - Nonlinearity of Manipulator models - Issues in nonlinear control - Force feedback - Hybrid control - Motion planning and Obstacle avoidance: Road map methods, Graph search algorithms, Potential field methods - Robot languages -.Computer Control and Robot software.

Unit –V **L12**

Robot Vision - Camera model and Perspective transformation - Image processing fundamentals for Robotic applications - Image acquisition and preprocessing - Segmentation and region characterization - object recognition by image matching and based on features - Problem of bin-picking - Futuristic topics in Robotics.

TEXT BOOKS:

5. Groover M P, "Industrial Robotics", Pearson Publications.
6. Mittal R K &Nagrath I J, "Robotics and Control", Tata McGraw Hill Publications.
7. Ghosal A, "Robotics: Fundamental Concepts and Analysis", Oxford University Press

REFERENCE BOOKS:

8. Fu K S, "Robotics", McGraw Hill Publications
9. P. Coiffet and M. Chaironze, "An Introduction to Robot Technology", Kogam Page Ltd. London, 1983.
10. Richard D. Klafter, "Robotic Engineering", Prentice Hall India Limited.
11. John J Craig, "Introduction to Robotics", Pearson Education publications.
12. Mark W. Spong and M. Vidyasagar, "Robot Dynamics & Control", John Wiley & Sons (ASIA) Pvt. Ltd.

17ES020 Cryptography and Network Security

L	T	P	C
3	1	-	4

Course Description and Objectives:

The objective of the course is to ensure that students have the necessary networking skills to design, implement, and analyze data communication networks.

Course Outcomes:

Upon successful completion of this course student should be able to:

To be able to understand the concepts of security in Networks
To be able to understand different attacks
To be able to analyze the given network and know its performance for various situations

SKILLS ACQUIRED:

Understand various Network attacks, Protocols
Understand the Internet threats
Analysation of the Different Protocols

Unit – I **L-14**

Introduction

Introduction, Services, Attacks, Security model, OSI security architecture and mechanisms, Internet standards and RFC, Buffering,

Unit – II

Encryption algorithms

Principles, Conventional algorithms, Key distribution, AES ,Diffie Hellman, N-parity Deffie Hellman, Elliptic curve and Elliptic curve cryptography,X.509 directory ,Authentication services, Hash functions secure hash

L-14

Unit - III

IP security

IP security overview , Architecture,IPV6 authentication header ,Encapsulation Security payload, ESP, Web security requirements.

L-12

Unit – IV

Transport layer security

SNMP, SNMPv1, SNMPv3, Intruders, Viruses, Threats , Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction. SYSTEM SECURITY Intruders – Intrusion Detection – Password Management – Malicious Software - Firewalls – Trusted Systems.

L-12

Unit-V

Public Key Infrastructure

Digital Certificates, Private Key Management, The PKIX Model, Public Key Cryptography Standards, XML, PKI and Security. Internet Security Protocols: Basic Concepts, Secure Socket Layer, SHTTP, Time Stamping Protocol, Secure Electronic Transaction, SSL versus

SET, 3-D Secure Protocol, Electronic Money, E-mail Security, Wireless Application Protocol (WAP) Security, Security in GSM

Activities:

1. To create basic Networks and configure them
2. To check the robustness of networks on various attacks
3. To implement basic cryptographic Algorithms using open source tools

TEXTBOOKS:

1. Cryptography and Network Security – by Atul Kahate – TMH.

2. Data Communications and Networking- by Behourz A Forouzan

3. William Stallings, "Cryptography and Network security", 4th ed., Pearson Education, 2010.

4. William Stallings "Network Security Essentials Applications and Standards", 2nd ed.,Pearson Education, 2009**.**

REFERENCE BOOKS:

1.James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown.Approach Featuring",3/e, Pearson Education.

2. Forouzan, "Data Communications and Networking", 4th Edition,McGraw Hill

3. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000

17ES022 - SMART INSTRUMENTATION

L	T	P	C
3	1	-	4

Course Description and Objectives:

The evolution from simple pneumatic to sophisticated smart instruments has been driven by user demands for better performance, easier maintenance, and more uptime. Smart instruments have met these demands and more, albeit with increasing complexity. But once smart instruments are understood and deployed, the payoff is less complexity, better performance, and reduced costs throughout the balance of the process control and information system lifecycles. The course is extensively hands on, giving participants considerable practical experience of the devices typically found in industry.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Identify various sensors, Transducers and their brief Performance specifications.
- Understand principle of working of various types of signal contiditioning, processing and transmitter
- Make comparative study of various protocol.
- Understand applications of Instrumentation in Emmebedded system(Real Time Interface)

SKILLS ACQUIRED:

- *Evaluate the different types of errors*
- *Understand the design of sensors*
- *Understand the working and applications of transmitters*

ACTIVITIES:

- *Designing simple sensors*
- *Designing Transmitters of different type*

UNIT I **L - 12**

General concepts and terminology of measurement systems, static and dynamic characteristics, errors, standards and calibration.

UNIT II **L - 12**

Introduction, principle, construction and design of various active and passive transducers. Introduction to semiconductor sensors and its applications, Design of signal conditioning circuits for various Resistive, Capacitive and Inductive transducers and piezoelectric transducer.

UNIT III **L - 12**

Introduction to transmitters, two wire and four wire transmitters, Smart and intelligent Transmitters. Design of transmitters.

UNIT IV **L - 12**

Introduction to EMC, interference coupling mechanism, basics of circuit layout and grounding, concept of interfaces, filtering and shielding. Safety: Introduction, electrical hazards, hazardous areas and classification, nonhazardous areas, enclosures – NEMA types, fuses and circuit breakers. Protection methods: Purging, explosion proofing and intrinsic safety.

UNIT V **L - 12**

Field bus, Mod bus, GPIB, IEEE-488, VME, VXI, Network buses – Ethernet – TCP/IP protocols; CAN bus- basics, Message transfer, Fault confinement.

TEXT BOOKS:

1. John P. Bentley, Principles of Measurement Systems, Third edition, Addison Wesley Longman Ltd., UK, 2000.
2. Doebelin E.O, Measurement Systems - Application and Design, Fourth edition, McGraw-Hill International Edition, New York, 1992.

REFERENCES:

1. M. Sze, “Semiconductor sensors”, John Wiley & Sons Inc., Singapore, 1994.
2. Noltingk B.E., “Instrumentation Reference Book”, 2nd Edition, Butterworth Heinemann, 1995.
3. L.D.Goettsche, “Maintenance of Instruments and Systems – Practical guides for measurements and control”, ISA, 1995.
4. Yang Xiao, “Communication and Networking in Smart Grids”, CRC Press

17ES024 - Wireless Communications and Networks

L	T	P	C
3	1	-	4

Course Description and Objectives:

This course provides
As wireless communication systems are fast replacing the wired communication systems studying the technologies of wireless communication and networks became more important.
· Aim of this course is to offer the knowledge in wireless communication technologies and networking of wireless devices

Course Outcomes:

Upon successful completion of this course student should be able to:

- To be able to appreciate the need and importance of wireless networks
- · Familiarity with protocols used for wireless environment in comparison with wired networks.
- Application of this knowledge to incorporate wireless network technologies into
- embedded devices..

SKILLS ACQUIRED:

- Good understanding of various wireless communication technologies for long range and short range communications

ACTIVITIES:

1. Creation of WLAN and other Network Topologies
2. Implementation of WLL

Unit – I **L-12**

Fundamentals of Wireless Communications

The concept of spread spectrum, Frequency hopping spread spectrum, Direct sequence spread spectrum, Multiple access Techniques for Wireless Communications, Generation of spreading sequences**.**

Unit – II **L-12**

Cellular Networks

Principles of Cellular Networks, First Generation Analog, Second Generation TDMA, Second Generation CDMA, 2.5 G Wireless Networks, Third Generation Systems, LTE

Unit – III **L-12**

Cordless, WiLL and Broadband Systems

Cordless systems, Paging system, Cellular Telephone system, The Cellular Concept-System Design fundamentals, Wireless local loop, IEEE 802.16 fixed broadband wireless access standard, Mobile IP, Wireless application protocol.

Unit – IV **L-12**
Wireless LANs
Infrared LANs, Spread spectrum LANs, Narrowband microwave LANs, IEEE 802 Protocol architecture, IEEE 802.11 Architecture and services, IEEE 802.11 Medium access control, IEEE 802.11 Physical layer

Unit – V **L-12**
Bluetooth
Bluetooth overview, Radio specification, Baseband specification, Link manager specification, Logical link control and adaptation protocol.

TEXTBOOKS:

1.William Stallings, “Wireless communications and Networking”, Prentice Hall,India

2. T S Rappaport, “Wireless Communications: Principles and Practice”, 2nd Edition, Prentice

Hall, India

REFERENCE BOOKS:

6. Kamilo Feher, “Wireless Digital Communications”, Prentice Hall, India
7. Dharma Prakash Agarwal, Qing- An Zeng, “Introduction to Wireless and Mobile Systems”, Thomson , 2006
8. Garry J .Mullet, “Introduction to Wireless Telecommunication systems and Networks”, cenage learning
9. Simon Haykin, Michael Moher, “Modern wireless Communications”, Pearson,2005

I YEAR	COURSE CONTENTS FOR COMMON COURSES
II SEMESTER	**17HS001 Research Methods** **17HS002 Employment Orientation Program (EOP)**

17HS001 Research Methods

L	T	P	C
3	0	0	3

Objective of the Course:

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondary data, probability and non-probability sampling techniques.

UNIT-II

Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III

Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion, measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminate analysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copy rights.

Text Books:

4. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
5. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
6. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

8. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
9. Bennet, Roger, Management Research, ILO, 1983.
10. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
11. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
12. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
13. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
14. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17HS002 Employment Orientation Program

L	T	P	C
2	0	0	2

Preamble

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.
ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.
iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term "academic development" refers to development of multiple aspects of a student's personality under this EOP for M.Tech students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. "Development" in the engineering education according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and get things accomplished through management of men and materials. This programme will improve student's overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

Assessment:
The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- ✓ 5 Marks for attendance
- ✓ 5 Marks for formative assessment
- ✓ 40 Marks for summative assessment

I

YEAR

M.Tech.

MACHINE DESIGN

I SEMESTER

- 17MD001 - Advanced Mechanisms
- 17MD003 - Advanced Mechanics of Solids
- 17MD005 - Creep, Fatigue and Fracture Mechanics
- 17MD007 - Advanced Finite Element Analysis
- Elective Course - I
- Elective Course - II

II SEMESTER

- 17HS001 - Research Methods
- 17HS002 - Employment Orientation Program (EOP)
- 17MD002 - Computer Aided Design
- 17MD004 - Mechanical Vibrations
- 17MD006 - Design synthesis
- 17MD008 - Optimization techniques
- Elective Course - III
- Elective Course - IV

COURSE CONTENTS

I SEM & II SEM

17MD001 ADVANCED MECHANISMS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description and Objectives:

The study of Kinematics of mechanisms are composed of one or more mechanisms, involves analysis of geometry of motion. Different components of any mechanism move relative to the each other following certain constraints to produce the desired motion. Kinematic analysis is of prime importance in design of mechanisms and machines.

For kinematic design of a mechanism analysis is done for positions of points on a solid body and the time derivatives of the position. The first derivative of position with respect to time is velocity, the second derivative is acceleration and further derivatives can be analyzed according to the design requirements. Similarly for angular position there is angular velocity and angular acceleration.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Understand common mechanisms that are used in machines in everyday life.
- Understand Mobility Criterion for Planar mechanisms and manipulators
- Understand various function generation methods like Rotocenter method, Overlay method, Velocity pole method
- Understand Synthesis of Four-bar Mechanisms for prescribed extreme values of the Angular velocity of driven link.
- Understand Analytical and graphical determination of Bobillier's Construction

SKILLS :

- Compute degrees of freedom in different types of mechanisms
- Determine velocity and acceleration at different points on links in a mechanism. Determine the D-H parameters which are indispensible in design of Industrial robots like PUMA
- Compute Jacobian matrix for plan serial manipulator

ACTIVITIES:

- Guiding a body through three distinct positions and four distinct positions.
- Construction of Bobiller curve graphically
- Construction of Hartmann's

UNIT –I

Cams: Definitions, Types of cams and followers, types of follower motion, generation of cam profiles for uniform velocity, uniform acceleration and simple harmonic motion. Maximum velocity and maximum acceleration, analysis of roller follower and circular cam with straight flanks.

UNIT –II

Gears: Friction wheels and toothed gears- types-law of gearing, condition of constant velocity ratio for transmission of motion- cycloidal and involute teeth profiles, velocity of sliding-interference -condition for minimum number of teeth to avoid interference-expressions for arc of contact and path of contact.

UNIT –III

Laws of kinematic friction , friction of a body lying on a rough inclined plane, efficiency of inclined plane , screw friction , screw jack , torque required to lift and lower the load by screw jack , efficiency of screw jack, over hauling and self-locking screws , efficiency of self-locking screws.

UNIT –IV

Introduction to control system , types of control system , block diagrams , lag in response , transfer function, overall transfer function , transfer function with viscous damped output , open and closed transfer function

UNIT – V

Manipulator kinematics:D-H notation, D-H convention of assignment of co-ordinate frames and link parameters table; D-H transformation matrix ; Direct and Inverse kinematic analysis of Serial manipulators: Formulation of Jacobian series for planar serial manipulator

TEXTBOOKS:

1. JeremyHirschhorn, "Kinematics andDynamics ofPlaneMechanisms", 3rd Edition, McGraw- Hill, 2005.
2. L. Sciavicco and B. Siciliano, "Modelling and control of Robot manipulators", 2nd Edition, Springer– Verlag, London,2000.
3. Amitabh Ghosh and Ashok Kumar Mallik, "Theory of Mechanisms and Machines", E.W.P. Publishers.

REFERENCE BOOKS:

1. AllenS.HallJr.,"KinematicsandLinkageDesign",4th Edition,PHI,1964.
2. J.E.ShigleyandJ.J.UickerJr.,"TheoryofMachinesandMechanisms",McGraw-Hill,2015.
3. MohsenShahinpoor, "A Robot Engineering TextBook", 5th Edition, Harper & Row Publishers, NewYork,2012.
4. JosephDuffy, "Analysis of mechanisms and Robot Manipulators", 4th Edition, Edward Arnold, 2010.

17MD003 ADVANCED MECHANICS OF SOLIDS

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	36	-	-	-	-	-	-

Course Description and Objectives:

To analyze and predict the mechanical behavior of deformable solid bodies like beams; columns; plates and non circular shafts using techniques of engineering mechanics and applied mathematics.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Understand the concept of unsymmetric bending and find the deflection of beams undergoing unsymmetrical bending and location of the shear centre of given cross section.
- Evaluate the shear stress distribution of non circular shaft and determination of torque transmitted of a solid or hollow thin walled shaft of any cross section.
- Design the structures of rail roads etc. using the concept of elastic foundation; long; and short beams.
- Design and Analyze curved beam structures.

SKILLS :

Unsymmetrical bending and Shear Centre torsion of non-circular shafts.

- Design of Rotating Discs
- Beams on Elastic foundation
- Design of Rotating Discs
- Curved Beam Theory

ACTIVITIES:

- *Design of C clamp for Crane*
- *Evaluate the shear center location for a given thin wall section*
- *Analyze stress induced in rotating discs of a rotar system*

UNIT – I

UNSYMMETRICAL BENDING AND SHEAR CENTRE

Introduction; product of inertia – parallel axes theorem for product of inertia – principal axes and principal moments of inertia; bending stresses in beams due to unsymmetrical bending; deflection of straight beams due to unsymmetrical bending. Concept of shear center; determination of shear center for symmetrical and unsymmetrical sections.

UNIT – II

TORSION OF NON CIRCULAR SHAFTS

Introduction; Membrane Analalogy; torsion of non-circular solidsections; thin wall tubular sections; thin-walled multi-cell sections.

UNIT – III

BEAMS ON ELASTIC FOUNDATION

General theory; infinite beam subjected to concentrated load at its end boundary conditions; infinite beam subjected to a distributed load; semi-infinite beam with point load near its end; short beams.

UNIT – IV

DESIGN OF ROTATING DISCS

Introduction to Centrifugal stresses- Rotating ring; flat discs-Disc of uniform thickness and Disc of uniform strength.

UNIT – V

CURVED BEAM THEORY

Winkler bach formula for circumferntial stresses – Limitations; corrections factors – Radial stress in curved beams – closed rings subjected to concentrated and uniform loads.

TEXT BOOKS:

1. Boresi, “Advanced Mechanics of Materials”, 6th Edition, John Wiley and Sons, 2003.
2. Timoshenko and S. Woinowsky - Krieger, “Theory of Plates and Shells”, 2nd Edition, Tata Mc Graw Hill, 2010.

REFERENCE BOOKS:

1. J.P. Den Hartog, “Advanced Strength of Materials”, 1st Edition, Dover Publications, 1987.
2. L.S. Srinath, “Advanced Solid Mechanics”, 3rd Edition, Tata Mc Graw Hill, 2009.
3. R.K. Rajput, “Strength of Materials”, 3rd Edition, S. Chand Publications, 2007.
4. B.C. Punmia, “Strength of Materials and Theory of Structures”,12th Edition, Lakshmi Publications, 2004.

17MD005 CREEP, FATIGUE AND FRACTURE MECHANICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

The course helps us understanding the most common failure modes. Understanding the modes of failure is the most fundamental necessity of designing machine elements. Whenever we are dealing with cyclic loading at elevated temperatures, the failure occurs much less than the static strength. Such failure mode is known as creep. It will be elaborately discussed in this subject. Small crack tends to propagate whenever they are subjected to cyclic loading. For understanding these phenomena we need to understand the concepts of fracture mechanics. This course aims to provide basic insights in such areas

Course Outcomes:

Upon successful completion of this course student will be able to:

- Understand the effect of stress concentrators and flaws in cyclic loading.
- Acquire clear insight on linear elastic fracture mechanics, Elastic- Plastic fracture mechanics.
- Predict the fatigue life under given conditions Gain insights on fatigue of welded structures
- Design machine elements considering the effect of creep, fatigue and fracture.

SKILLS:

- Calculation of energy release rate Calculation of stress intensity factor
- Calculation of effective crack length Prediction of effect of overload
- Prediction of the effect of stress on creep curves

ACTIVITIES:

- *Evaluate stress intensity factors of surface cracks of the specimens prepared from casting and various types of welding.*

UNIT – I

Theoretical cohesive strength of metals – Ductile brittle transition of metals - Ductile fracture - Brittle fracture.

Modes of fracture failure - Early concepts of stress concentrators and flaws. Inglis solution to stress round an elliptical hole - Surface energy – Griffiths analysis - Energy release rate - Crack resistance - Stable and Unstable crack growth - R-Curve.

Stress intensity factor for a crack. Stresses and displacement in Cartesian and polar coordinates. Critical stress intensity factor - K_{1C} testing.

UNIT – II

Linear Elastic fracture mechanics - Elastic plastic fracture mechanics - Plastic zone shape for plane stress and plane strain – Effective crack length – Irwin plastic zone correction – Dugdole approach - Effect of plate thickness.

Elastic plastic analysis through J – Integral - Path Independence – J_{1C} testing. Crack tip opening displacement

UNIT – III

FATIGUE : Importance of Fatigue in engineering applications – Low cycle fatigue – Coffin Mansonrelation – Strain life equation – Structural features of fatigue – Fatigue crack propagation – High cycle fatigue – Basquin's law. Cumulative fatigue damage.

Effect of Metallurgical variables on fatigue – Design for fatigue –Corrosion fatigue – Effect of temperature on fatigue.

UNIT – IV

Crack growth and application of fracture mechanics to fatigue. Paris erdogan law – Effect of an overload – Crack closure – Variable ampliture fatigue load. Cycle counting methods – Reservoir Method – Rainflow Method.

Fatigue of welded structures – Factors affecting the fatigue lives of welded joints.

UNIT – V

CREEP: Time dependent mechanical behaviour – Creep curve – Effect of stress on creep curves – Stress rupture test – Structural changes during creep – Creep under combined stresses – Creep fatigue interaction.

TEXT BOOKS:

1. Prashant kumar, "Elements of Fracture Mechanics", 2nd Edition, Tata Mc Graw Hill, 2009.
2. George E.Dieter, "Mechanical Metallurgy", 3rd Edition, Mc Graw Hill Publication, 2007.

REFERENCE BOOKS:

1. Anderson T.L, "Fracture Mechanics: Fundamentals and Applications", 2nd Edition, Taylor & Francis Publications, 2005.
2. Broek.D- Martinus, "Elementary Engineering Fracture Mechanics", 1st Edition, Nijhoff publishers, 1982.V.M. Radha Krishnan, "Welding Technology & Design", 2nd Edition, New Age International Publications, 2006

17MD007 ADVANCED FINITE ELEMENT ANALYSIS

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course explores the fundamental concepts of finite element method to find the approximate solutions of various field problems. The objective of this course is to emphasize analysis and provide solutions using FEM for thermal and structural problems.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Understand the concept of plane stress and plane strain.
- Recognize the behavior and usage of each type of elements covered perform numerical integrations in FE methodologies.
- Analyze and solve field problems using appropriate packages.

SKILLS:

- Convert partial differential equations to linear algebraic equations. Implement energy method concepts to solve beam problems. Identify displacements, stresses of 1D structural problems
- Formulate iso-parametric elements.
- Provide solutions for thermal and structural problems.

ACTIVITIES:

- o Solve 1D problems in bars.
- o Solve 2D problems in structures visualized as assembly of springs
- o Solve beam problems
- o Solve vibration problems
- o Solve heat transfer in fins problems

UNIT – I

Introduction- comparison of various FEA methods (Weight Residual, Displacement approach, Potential Energy approach, Galerkin approach, Virtual work approach, Rayliegh Ritz approach), Mathematical preliminaries of variational formulations and integral formulations.

UNIT – II

Second – order differential equation in 1-D: Finite element models Basic steps of FEA for a boundary value problem, Applications in solid mechanics, heat transfer and fluid mechanics.

UNIT – III

FEA applications: Plane trusses, Euler – Bernoulli Beam Elements, Application problems.

UNIT – IV

Dynamic considerations : Formulation for point mass and distributed masses, element mass matrix ofone dimensional Bar element. Eigen vectors, Applications to Bars, Stepped Bars. Natural Frequencies, mode shapes

UNIT – IV

Single variable problems in 2-D: Introduction to Boundary Value Problems (BVP). Solution of plane stress and plane strain problems, Conductive and convective heat transfer using triangular elements.

TEXTBOOKS:

1. J N Reddy, An Introduction To The Finite Element Method, Mcgraw-Hill, New York, 2013

REFERENCEBOOKS:

1. R D Cook, D S Malkus and M E Plesha, Concepts And Applications Of Finite Element Analysis, 3d Ed., John Wiley, New York, 2009.
2. K J Bathe, Finite Element Procedures in Engineering Analysis, Prentice-Hall, Englewood Cliffs, Nj, 2012.
3. T J T Hughes, the Finite Element Method, Prentice-Hall, Englewood Cliffs, Nj, 1986
4. O C Zienkiewicz And R L Taylor, The Finite Element Method, 3d Ed. Mcgraw-Hill, 2011

17HS001 RESEARCH METHODS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Objective of the Course

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondary data, probability and non-probability sampling techniques.

UNIT-II

Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule

UNIT – III

Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion, measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminate analysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copy rights.

Text Books:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17MD002 COMPUTER AIDED DESIGN

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To impart fundamental knowledge to students in the latest technological topics on Computer Aided Design, Computer Aided Engineering Analysis and to prepare them for taking up further research in the areas

Course Outcomes:

Upon successful completion of this course the student will be able to:

- Apply the concept of CAD in developing solutions or to do research in the areas of Design and simulation in Mechanical Engineering.
- Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
- Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
- Design and validate technological solutions to defined problems and communicate clearly and effectively for the practical application of their work.

SKILLS :

- Model a Part.
- Create an assembly of part. Create a detailed drawing.
- Use parametric 3D CAD software tools.
- Redesign in CAD and evaluate a mechanical product by making components in the mechanical workshop for design validation.
- Able to exchange data in different format for different software packages.

UNIT – I COMPUTER AIDED DESIGN

Introduction, Need of CAD, conventional design v/s CAD, CAD system architecture,Hardware and software for CAD. Role of computer in CAD, CAD Module,

Raster scan graphics: Line drawing algorithms – DDA & Bresenham algorithms, circle generation algorithms, displaying lines.

UNIT – II UNIT-II GEOMETRIC TRANSFORMATIONS

2D and 3D; transformations of geometric models like Translation,Scaling, Rotation, Reflection, Shear; Homogeneous Representations, Concatenated Representation;

LINE CLIPPING: Simple visibility algorithm, Cohen-Sutherland subdivision line clipping algorithm, midpoint sub division algorithm.

UNIT – III MATHEMATICAL REPRESENTATION OF CURVES

Curve representation, parametricrepresentation of analytic and synthetic curves

MATHEMATICAL REPRESENTATION OF SURFACES

Surface models, Surface representations, parametric representation of analytic and synthetic surfaces.

UNIT – IV MATHEMATICAL REPRESENTATION OF SOLIDS

Solid models, Classification ofmethods of representations, boundary representation, CSG, sweep representations.

ASSEMBLY MODELLING

Representation, mating conditions, representation schemes, Assembly Modelling Methods: Top-down Approach & Bottom-up

UNIT – V OVERVIEW OF MODELLING SOFTWARE

Like Solid Works, Autodesk Inventor, AutoCAD, PRO/E, CATIA: Capabilities, Modules, Coordinate Systems, Sketching Tools, Solid Modeling Tools, Surface Modeling Tools, expression/parameters toolbox, Data Exchange standards like IGES, STEP, Model storage.

LIST OF EXPERIMENTS:

The following wire frame surface and solid models can be created by using any commercial modelling package (CREO, SOLID WORKS, CATIA, Etc.)

1. Practice of Orthographic/ Isometric Projections.
2. Creation of Surface Models.
3. Creation of solid models.
4. Assembling of Mechanical CAD components
5. Simulation of assembly models

TEXTBOOKS:

1. ZEID, “CAD/CAM Theory & Practice”, 2nd Edition, Tata Mc Graw Hill, 2009.
2. Dieter George, Engineering Design – A materials and processing approach, McGraw Hill Publishers, 2000
3. Chris McMahon and Jimmie Browne, CAD/CAM – Principle Practice and Manufacturing Management, Addison Wesley England, Second Edition, 2000.

REFERENCE BOOKS:

1. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989.
2. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.
3. Groover M.P. and Zimmers E. W., CAD/CAM: Computer Aided Design and Manufacturing, Prentice Hall International, New Delhi, 1992.
4. Dr. Sadhu Singh, Computer Aided Design and Manufacturing, Khanna Publishers, New Delhi, Second Edition, 2000.

17MD004 MECHANICAL VIBRATIONS

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Objectives

A course in linear and non-linear mechanical vibrations where students acquire the ability to

- Formulate mathematical models of problems in vibrations using Newton's second law or energy principles
- Determine a complete solution to mechanical vibration problems using mathematical or numerical techniques
- Determine physical and design interpretations from the results

Outcomes:

Students will be able to

- Construct the equations of motion from free-body diagrams.
- Solve for the motion and the natural frequency of free vibrations of (single degree of freedom) damped and undamped motion.
- Construct the governing differential equation and its solution for a vibrating mass subjected to an arbitrary force.
- Solve for the motion and the natural frequency of forced vibrations of (single degree of freedom) damped and undamped motion.
- Obtain the complete solution for the motion of a single degree of freedom vibratory system (damped or undamped) that is subjected to non-periodic forcing functions.
- Solve vibration problems that contain multiple degrees of freedom.
- Obtain design parameters and indicate methods of solution for a complicated vibratory problem. Solve non-linear vibration problems

Skills:

- Analyze single and multiple DOF system problems
- Effectively utilize energy methods
- Estimate modes and mode shapes of vibratory systems
- Analyze non-linear vibratory systems
- Explain different vibration measurement instruments

UNIT – I **8 hr**

Single Degree of Freedom Systems: Equation of motion, Natural Frequency, Energy method, Rayleigh method, Viscously damped free vibration, damping models, underdamped, overdamped and critically damped vibrations, Logarithmic decrement, Forced harmonic vibrations, Magnification factor, Rotor unbalance, Transmissibility, Vibration Isolation, Equivalent viscous damping, Sharpness of resonance.

UNIT – II **12 hr**

Two Degrees of Freedom Systems: Generalized and Principal coordinates, derivation of equations of motion, Semi-definite system, Lagrange's equation, Coordinate coupling, Forced Harmonic vibration, Vibration absorber, Tuned absorber and damped absorber, determination of mass ratio.

UNIT – III **10 hr**

Multi Degrees of Freedom Systems: Derivation of equations of motion, influence coefficient method, flexibility and stiffness matrices, Maxwell reciprocal theorem, Modal analysis: undamped and damped systems, Calculation of natural frequencies: Matrix method, Matrix iteration method, Stodola method, Holzer method, Dunkerley method, Rayleigh method, Torsional vibration: Simple systems with one or two rotor masses, Geared rotor system.

UNIT – IV **8 hr**

Continuous systems: Closed form solutions, Vibration of strings, Longitudinal and torsional vibration of rods, Transverse vibration of beams: equations of motion and boundary conditions, Transverse vibration of beams: natural frequencies and mode shapes Continuous systems: Approximate solutions, Rayleigh method, Rayleigh-Ritz method, Galerkin method.

UNIT – V **10 hr**

Vibration Measurement: Vibration measurement system, Vibration transducers: working of displacement transducer, vibrometer, accelerometer; Signal amplifiers, Signal processing: FFT, windowing in FFT, vibration signature analysis, predictive maintenance.

EXPERIMENTS:

1. Determination of natural frequency of single DOF systems
2. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils.
3. Determination of steady state amplitude of a forced vibratory system.
4. Static balancing using steel balls.
5. Determination of the magnitude and orientation of the balancing mass in dynamic balancing.
6. Field balancing of the thin rotors using vibration pickups.
7. Determination of the magnitude of gyroscopic couple, angular velocity of precession, and representation of vectors.
8. Determination of natural frequency of given structure using FFT analyzer.

TEXT BOOKS:

1. L. Meirovitch, "Fundamentals of Vibration", 3rd Edition, McGraw Hill, 2001.
2. G. K. Grover, "Mechanical Vibrations", 8th Edition, Nem Chand and Bros, 1996.

REFERENCE BOOKS:

1. S. S. Rao, "Vibration of Continuous Systems", John Wiley & Sons, 2007.
2. J. S. Mehta & A. S. Kailey, "Mechanical Vibrations", 1st Edition, S Chand, 2012.

17MD006 DESIGN SYNTHESIS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description and Objectives:

Success of a product depends on many factors. They are cost , reliability, safety and simplicity in the product. With the globalization , manufacturers need to adopt high end techniques to remain competent in the current market. It is only possible by adopting methods to reduce time for design and reliable product design , reduction of number of sub assemblies, enhancement in quality with better manufacturing techniques. The basic objective of this course is to acquire the concepts of the product design process and integrating design for manufacturing and design for assembly to arrive at a good quality product in a cost effective way.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Analyze various stages involved in the design process
- Apply tolerances and surface finish to design a product
- Select a manufacturing process for different types of components
- Design the product keeping in view assembly , dismantling, maintenance and inspection Apply optimization methods for design problems

SKILLS :

1. Need identification and market survey techniques
2. Concept generation and evaluation
3. Manufacturing technique selection based on product
4. Product design based on ergonomics
5. Designing products based on maintenance and inspection

UNIT–I

Design process – Considerations of a Good design – Detailed description of design process – Need identification - Concept Generation – Decision making and concept selection - Embodiment design– Standardization and its application in design.

UNIT–II

Material selection – Performance characteristics of materials – Material selection process

Tolerances from process and function - Interchangeability and selective assembly - Selection off its for different design situations - Surface finish.

StrengthConsiderations inproductdesign -Strengthbaseddesign–Rigiditybaseddesign Designingforuniformstrength.Lightweightandrigidconstructions.

UNIT–III

Design for Manufacturing –Design of cast, forged, sheet metal parts and welded constructions. Design for Machining - Design for turning – Design for drilling – Design for milling

UNIT–IV

Design for assembly and dismantling - Design for inspection and maintenance – Design for fasteners. Ergonomic considerations in design - Design of controls and displays.

Modern approaches to product design – Concurrent design – Quality function deployment - rapid prototyping.-

Liquid, solid and powder based techniques.

UNIT–V

Optimization in design – Engineering applications of optimization -Problem formulation for design optimization - Classification of optimization problems - Linear programming – Non linear programming - Geometric programming - Application to machine design problems.

TEXT BOOKS:

1. GeorgeE.Dieter, “Engineering Design - A Materials & Processing Approach”, 4thEdition, Mc Graw Hill Publishers, 2015
2. S.S.Rao,”Engineering Optimization”,4thEdition,John Willey & Sons, 2009.

REFERENCE BOOKS:

1. Kevin Otto, Kristion Wood, ”Product Design”, 1st Edition, Pearson Publications, 2006.
2. A.K.Chitale, R.C.Gupta, “Product design and Manufacturing”, 3rd Edition, PHI Publications,

ACTIVITIES:

- Preparation of market survey for a new automobile design.
- Concept generation and evaluation for a domestic electric appliances like refrigerator, washing machine , sewing machine etc.
- Ergonomic design for a machine tool keeping controls and levers
- House of quality preparation for an industrial product.
- Optimum design of gear box for automobile application.

17MD008 OPTIMIZATION TECHNIQUES

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description and Objectives:

Optimization is the process of obtaining the best result under given circumstances. In design, construction and maintenance of any engineering system, engineers have to take many technological and managerial decisions at several stages. The ultimate goal of all such decisions is either to minimize the effort required or to maximize the desired benefit. A number of optimization methods have been developed for solving different types of optimization problems. This course is designed to familiarize the students with the modeling of mechanical engineering systems and obtaining the optimum solution.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Formulate optimization problems;
- Apply the concept of optimality criteria for various type of optimization problems;
- Solve various constrained and unconstrained problems in single variable as well as multivariable;
- Apply the methods of optimization in real life situation.

SKILLS:

- To identify and resolve real life optimization problem the knowledge about various optimization techniques
- To know about various nontraditional optimization techniques like Genetic algorithm, Fuzzy Logic, ANN

PRE REQUISITE:

Before opting for this subject the student should have sound knowledge on Linear Algebra

Solution of systems of Linear equation Calculus

UNIT-I

Introduction &Linear Programming Problem:

Introduction: Terminology, Design Variables, Constraints, Objective Function, Problem Formulation. Engineering applications of optimization, classification of optimization problems.

Linear Programming Problem: :Standard formof linear programming (LP) problem, Canonical form of LP problem, Elementary operations, Graphical method for two variable optimization problem, Simplex method, Applications of linear programming, Two-phases of simplex method, Big-M method.

UNIT-II

Application of LPP

Transportation Problems: Definition, Formulation, IBFS of TP, Optimality test for transportation Problem.

Assignment Problem: Definition, Formulation, mathematical Modelling of AP, Hungarian method to solve AP, Special Cases in AP- Restricted Assignment, Maximization type, Travelling Salesman Problem.

UNIT-III

Non-Linear Programming Problem

Single Variable objective function with or without constraints: Optimality Criterion, Interval Halving Method, Fibonacci Search Method, Golden Section Method. Gradient Based Methods: Newton-Raphson Method, Bisection Method, Secant Method.

UNIT-IV

Non-Linear Programming Problem

Multi Variable objective function with or without constraints: Solution by method of constrained variation method of Lagrange multipliers, Kuhn – Tucker conditions, Univariate method Pattern Direction, Gradient of a function, Steepest descent method, Newton's method.

UNIT-V

Non – traditional optimization algorithms: Genetic algorithms(GA) – working principle, reproduction, crossover, mutation, advanced GA operators. GA for constrained optimization, multi-modal function optimization.

Simulated annealing, working principle, Metropolis algorithm, differences and similarities between conventional and non-conventional algorithms. Introduction to Neural networks and fuzzy logics as optimization tool.

TEXT BOOKS:

1. S.S.Rao,"Engineering Optimization", 3rd Edition, New Age Publishers, 2008.
2. Kalyanmoy Deb,"Optimization for Engineering Design",1st Edition,PHI Publishers, 2009.

REFERENCE BOOKS:

1. Jasbir Arora,"Optimal Design",McGrawHill (International) Publishers.
2. D.E.Goldberg, "Genetic algorithms in Search, Optimization and Machine Learning",1st Edition, John Wiley Publishers, 2009

Activities:

1. Find the dimension of a beam of rectangular CS to be cut from a log having a circular cross-section of diameter a. The beam has to be used as a cantilever beam to carry a concentrated load at the free end. Find the dimension of the beam that corresponds to the maximum bending stress carrying capacity.
2. A traveling saleswoman has to cover n towns. She plans to start from a particular town numbered 1, visit each of the other n-1 towns before returning to the distance between towns I and j given by . Formulate the problem of selecting sequence in which the towns are to be visited to minimize the total distance traveled.

17HS002 EMPLOYMENT ORIENTATION PROGRAM

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Course Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.

ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.

iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

Assessment:

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- 5 Marks for attendance
- 5 Marks for formative assessment
- 40 Marks for summative assessment

17MD009 MECHANICS OF COMPOSITE MATERIALS

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and objectives:

Composite materials are being increasingly used in engineering structures as load bearing elements. The main objective of this subject is to provide knowledge about stress distribution, calculation of stresses, stress transfer and failure theories associated with fiber reinforced composite laminates. The extent of the material science information required to reach this objective is also covered in the content.

Course Outcomes:

Upon successful completion of the course student will be able to:

- Understand the basic elements in a composite and the difference between various types of composites.
- Suggest the suitable type of composite materials for given applications.
- Acquire knowledge on failure theories used in composite analysis.
- Apply the concepts of hygro-thermal stresses and ways to minimize these stresses.
- Analyze the damage progression in the laminate

Skills:

- Estimation of the composite properties from the constituent element properties.
- Acquire knowledge on laminates and the dependence of laminate properties on stacking sequence.
- Laminate strength calculation.
- Estimation of the variation of the laminate elastic/rength
- characteristics with off-axis angles.
- Characterization of the lamina and laminate

UNIT- I

Introduction, classifications of composites, particulate composites, fiber composites, sandwich structures, applications, geometric andphysical definitions, classification of fibers, classification of matrices, types and classification of FRPs, applications, production methods.

UNIT-II

Micromechanics and macromechanics, stress strain diagrams, fiber, matrix, composite. Micro mechanical estimation of elastic properties of lamina, different modes of failures, factors influencing the strength and stiffness, experimental characterization of composites.

UNIT-III

Hooke's law for orthotropic materials, relations between engineering constants and elements of stiffness and compliance matrices, restrictions on elastic constants, stress strain relations for lamina with arbitrary orientation, transformation of engineering constants.

UNIT-IV

Strength of an orthotropic lamina subjected to biaxial stress field, theories of failures, failure envelop, importance of sign of shear stress on strength of composites, multi directional laminates, stress - strain relations, load deformation relations, different types of laminates, compliances, laminate engineering properties.

UNIT-V

Stress analysis and safety factors for first - plyfailure of laminates, computational procedure for stress and failure analysis of general multidirectional laminates, hygrothermal stresses micromechanics of progressive failure, stiffness reduction, ultimate laminate failure, inter laminar stresses, edge effects.

TEXT BOOKS:

1. Isaac and M Daniel, "Engineering Mechanics of Composite Materials", 2^{nd} Edition, Oxford University Press,2006.

REFERENCE BOOKS:

1. B.D. Agarwal and L.J.Broutman,"Analysis and performance of fibre Composites", 3^{rd} Edition, Wiley - Inter science New York, 2006.
2. R.M.Jones,"Mechanics of Composite Materials", 2^{nd}Edition,Taylor and Francis Publications, 1999.

Activities:

Calculation of the principle stresses from body coordinate stresses. Transformation of stresses from on-axis to off-axis or vice versa.

17MD011 PRESSURE VESSEL DESIGN

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Objective and Description:

Pressure vessel design involves fundamentals of various component designs. This subject provides basic knowledge required for an engineer to design and to analyze the behaviour of pressure vessels.

Course Outcomes:

Upon successful completion of the course student will be able to:

- Understand the basic concepts of pressure vessels.
- Suggest the suitable type of pressure vessels for given applications.
- Acquire knowledge on failure theories used in pressure vessel design.
- Apply the concepts of principal stresses and ways to minimize these stresses.
- Analyze the damage progression in pressure vessel.

Skills:

- Estimation of stresses build in pressure vessel.
- Acquire knowledge on failure modes of pressure vessel.
- Design pressure vessel.

UNIT-I

Introduction: Material - shapes of Vessels - stresses incylindrical, spherical and arbitary, shaped shells. Cylindrical Vessels subjected to internal pressure, windload, bending and torque - relation of pressure vessels - conical and tetrahedral vessels.

UNIT-II

Cylinders and plates: Shrink fit stresses in built up cylinders - auto frettage of thick cylinders. Thermal stresses in Pressure Vessels. Plates subjected to pure bending with different edge conditions. Circular plates withsimplysupported and clamped ends subjected toconcentrated and uniformly distributed loads, stresses, Design of domebends, shell connections, flat heads and cone openings.

UNIT-III

Discontinuity stresses in pressure vessels: Introduction, beam on an elastic foundation, indefinitely long beam, semi infinite beam, cylindrical vessel under axially symmetrical loading, extent and significance of load deformations on pressure vessels, discontinuity stress in vessels, stress in a bimetallic joints, deformation and stress in flanges. Pressure vessel materials, ductile material tensile tests, structure and strength of steel, Leuder's lines, determination of stress patterns behaviour of steel beyond the yield point, effect of cold work or strain hardening on the physical properties of pressure vessel steels.

UNIT-IV

Fatigue of metals: fatigue crack growth, fatigue life prediction, cumulative fatigue damage, stress theory of failure of vessels subject to steady state and fatigue conditions. Influence of surface effects on fatigue, effectofthe environment and other factors on fatigue life, thermal stress fatigue, creep and rupture of metals at elevated temperatures, hydrogen embrittlement of pressure vessel steels, brittle fracture, effect of environment on fracture toughness,fracture toughness relationships, criteria for design with defects, significance of fracture mechanics evaluations, effect of warm prestressing on the ambient temperature toughness of pressure vessel steels.

UNIT-V

Design features: Localized stresses and their significance, stress concentration at a variable thickness transition section in a cylindrical vessel, stress concentration about a circular hole in a plate subjected to tension, elliptical openings, stress concentration factors for position, dynamic and thermal transient conditions, theory of reinforced openings, reinforcement, placement and shape, fatigue and stress concentraction.

TEXT BOOKS:

1. JohnF.Harvey, "Theory and Design of Modern Pressure Vessels", 3rd Edition,VanNostrand Rein hold Company, NewYork,1997.
2. Timoshenko & Winowsky, "Theory of Plates and Shells", 2nd Edition,TataMcGrawHill,1964.

REFERENCE BOOKS:

1. Brownell & EdwinHYoung, "Process Equipment Design", 2nd Edition, Wiley & SonsCo., 2009. Indian standard code for unfired Pressure vessels IS:2825.
2. Henry H.Bednar, "Pressure Vessel Design Hand Book", 2nd Edition, Krieger Publishing Co., 1991.

Activities:

Calculation of the principle stresses from body coordinate stresses. Transformation of stresses from on-axis to off-axis or vice versa.

17MD013 THEORY OF PLASTICITY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Objectives:

- To understand the concepts of stresses, strains and stress-strain relationships, as well as Yield and failure criteria.
- To provide the knowledge of various theoretical elements of plasticity and establish plasticity models for metallic structures.
- To apply the principles of the theory of plasticity for large deformations in nonlinear analysis of structures.

Learning Outcomes:

After the completion of this course, students will be able to:

- Describe the elastic and plastic behaviour from stress-strain curves for materials;
- Recognize typical plastic yield criteria established in constitutive modeling;
- Understand the physical interpretation of material constants in mathematical formulation of constitutive relationship;
- Solve analytically the simple boundary value problems with elasto-plastic properties;
- Develop constitutive models based on experimental results on material behavior.

Skills:

- Derive the equations in the theory of plasticity for large deformations and apply established plasticity models in the analysis of metallic structures.
- Identify material parameters from laboratory experiments, and implement plasticity models in the nonlinear analysis of mechanical structures.

UNIT-I

Introduction : Uniaxial behavior in plasticity, Index notation, Cartesian tensors, Yield and failure criteria, stress deviator tensors, invariants principal stresses, mean stresses, Elastic strain energy, Mohr's representation of stress in 2&3 dimensions, Haigh-wester gaard stress space, Yield criteria: Tresca & von Mises rules, Drucker - prager criterion, anisotropic yield criteria.

UNIT-II

Strain at point:Cauchy's formula for strains, principal strains, principal shear strains, derivative strain tensor, Strain - displacement relationships, Linear elastic stress strain relations, generalized Hooke's law, nonlinear elastic stress strain relations, principle of virtual work and its rate forms.

UNIT-III

Criteria for loading and unloading: Elastic and plastic strain increment tensors, plastic potential and flow rule associated with different Yield criteria, Convexity, normality and uniqueness considerations for elastic - plastic materials, Expansion of thick walled cylinder.

UNIT-IV

Incremental stress strain relation: Prandtl-Reuss material model, Flow plasticity theory, J_2deformation theory, Drucker-prager material, General Isotropic materials.

UNIT-V

Deformation theory inplasticity: Loading surface, Hardening rules, Flow rules and Druckers stability postulate, effective stress and effective strain, mixed hardening material.

TEXT BOOKS:

1. L. M. Kachanov, "Fundamentals of the Theory of Plasticity", 4th edition, Dover Publications, 2004.
2. Dr.Sadhu Singh,"Theory of Plasticity", 2nd Edition,Khanna Publications,1990.

REFERENCE BOOKS:

1. J.Chakrabarty,"Theory of Plasticity",3rd Edition, Elsevier Publications, 2006.
2. Dr.Sadhu Singh,"Theory of Plasticity & Metal forming process", 3rd Edition, Khanna Publications, 1999.

ACIVITIES:

1. Equal Channel Angular Press (ECAP) test of an aluminium billet through an 90 degree channel;
2. Strain hardening test of a metal (aluminium) after large plastic deformation

17MD015 DESIGN AND METALLURGY OF WELDED JOINTS

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

Welding is one most the most commonly used fabrication techniques. For successful application of welding to produced sound weld joints, it is utmost important to understand the science and technology behind the welding. This course is aimed at familiarizing the students with the fundamentals weld joint design, metallurgical aspects in welding of steel, and assessing the quality and suitability of weld joints. Topics related with weldablity of metals shall also be covered to equip the students technological input for handling the problems in welding of selected metals and alloys.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Understand the concept of static design of joints.
- Design of welded joints and static and dynamic loading.
- Evaluate the metallurgical and thermal aspects of welding joints of metals acquire knowledge about the cooling transformation curves of welded joints acquire knowledge about destructive and non-destructive tests of weldments

SKILLS :

- Evaluate the static stresses in loaded welded structures
- Evaluate the developed dynamic stresses in the welding structures
- Understand heat flow through the welding joints
- Understand the CCT of weldments
- Understand the destructive and non-destructive tests of the weldments

Unit – I

Introduction: Welded joints, symbols, welded defects; Design considerations; Joint efficiency;Factor of safety, Types of loading; Permissible stress; Computation of stresses in welds;Weld size calculation; Code requirement for statically loaded structures.

Unit - II

Dynamic Behaviour of Welded Joints and Failure Theories: Design for fluctuating and impact loading; Dynamic behavior of welded joints; Stress Concentrations; Fatigue analysis; Fatigue improvement techniques; Permissible stress- life prediction; Concept of stress intensity factors - LEFM and EPFM concepts; Brittle fracture; Transition temperature approach, Application of fracture mechanics to fatigue..

Unit - III

Welding Metallurgy: Thermal effect of welding on parent metal; Structure of fusion welds; Effect of cooling rate; Weld metal solidification and heat affected zone; Heat flow - temperature distribution-cooling rates; Influence of heat input; Joint geometry; Plate thickness; Preheat; Significance of thermal severity number; Epitaxial growth - weld metal solidification - columnar structures and growth morphology effect of welding parameters; Absorption of gases - gas/metal and slag/metal reactions.

Unit - IV

Phase Transformations: weld CCT diagrams - carbon equivalent-preheating and post heating weldability of low alloy steels; Welding of stainless steels use of Schaffler and Delong diagrams;

Unit-V

Testing of Weld Joints: Destructive and non-destructive tests; Equipments required of tests; Tensile test; Bend test; Impact test; Hardness test; Brittle and fatigue failure tests; Dye penetrate inspection; Magnetic particle inspection etc.

Lab Component:

1. Preparation of formulae of failure of joints and joint efficiency
2. Calculation of weld size
3. Calculation of life of welded joint
4. Drawing CCT diagrams of weldment
5. Calculation of load required to fail joint in tension, and bending

TEXT BOOKS:

1. Design of Weldments; W. B. Omer; James. F. Lincoln; Arc Welding Foundation; 1991.
2. Deformation and Fracture of Mechanics of Engineering Materials; R. W. Hertzberg; John Wiley;1996.
3. Welding Metallurgy; Volume I and II; 4th Edition; G. E. Linnert; AWS; 1994
4. The Metallurgy of Welding, 6th Edition , Lancaster, William Andrew Publishing, NY

REFERENCE BOOKS:

1. Rational Welding Design; T. G. E. Gray; Butterworths; 1982.
2. Mechanical Metallurgy; G. Dieter; Tata McGraw Hill; 1988.
3. Weldment Design; M. Bhattacharya; Association of Engineers;1991.
4. Fundamentals of Welding Metallurgy; H. Granjon; Jaico Publishing House; 1994.
5. Introduction to Physical Metallurgy of Welding; 2nd Edition; Easterling Kenneth; Butterworth Heinmann; 1992.

Activities:

1. Preparation of formulae of failure of joints and joint efficiency
2. Calculation of weld size
3. Calculation of life of welded joint
4. Drawing CCT diagrams of weldment
5. Calculation of load required to fail joint in tension, and bending

17MD017 RELIABILITY ENGINEERING

Hours Per Week :

L	T	P	C
3	1	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives

Reliability is one of the biggest concerns with almost all physical Systems used in the industry. This course equips the students with all the concepts and tools that are required to assess & Manage risk and plan for uninterrupted and hassle free operation of industrial systems.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Convince others on the importance of reliability with examples and show clear understanding of the terms and confusion commonly found in reliability.
- Analyze failure modes for any engineering system.
- Develop suitable life testing procedures for a given component and draw inferences on the test results.
- Explain and Identification of the possible causes of poor reliability.
- Suggest appropriate reliability tests and the associated failure analysis methods.

SKILLS:

- Calculate the Reliability.
- Develop FTA for a system.
- Analyze the risk involved in a system or a process.
- Evaluate the failure mechanism of a system.

UNIT-I

Reliability Engineering: Reliability function – failure rate – Meantime between failures (MTBF) – Mean time to failure (MTTF) – Probability concept – Additional of probabilities – complimentary events useful life availability – maintainability – system effectiveness

UNIT-II

Reliability Data Analysis :Time tofailure distributions – Exponential, normal, Gamma, Weibull, ranking ofdata – probabilityplottingtechniques – Hazardplotting.

UNIT-III

Reliability Prediction Models: Series and parallel Systems – RBD approach – Stand by systems - k/m configuration – Application of Bayes theorem – cut and tie set method – Markov analysis – FTA – Limitations.

UNIT-IV

Reliability Management :Reliability Testing – Reliability growth monitoring – Non parametric methods – Reliability and life cycle costs – Reliability allocation – Replacement model.

UNIT-V

Risk Assessment : Definiton and measurement risk – risk analysis techniques – risk reduction resources – industrial safety and risk assessment.

Text Books:

1. John Davidson, The Reliability of Mechanical System, 2nd Edition, Published by the Institution of Mechanical Engineers, London, 1998.
2. E.BalaguruSwamy, ReliabilityEngineering, 1st Edition,TataMc.GrawHill,NewDelhi,2003.
3. Charles E.Ebeling, Reliability and Maintainability Engineering, 2nd Edition, Tata McGraw Hill, 2009.

Reference Books:

1. Modarres, Reliability and Risk analysis, 1st Edition, CRC Press, 1992.
2. SmithC.O.Introduction to Reliability in Design, 1st Edition, McGraw Hill, London, 1976.

Activities:

1. Draw Fault tree Diagram for all machines in Dynamics Lab.
2. Perform FMEA on each machine in Machine Dynamics lab.

17MD019 INDUSTRIAL HYDRAULICS AND PNEUMATICS

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course equips the students with know how of hydraulic systems and pneumatic systems required for selection, design, operation and maintenance.

Course Outcomes:

Upon successful completion of this course student wll be able to:

- Design circuits used in hydraulic systems.
- Operate different types of valves used in hydraulic system
- Classify the valves used in hydraulic systems.
- Maintain different valves and auxiliaries.
- Assemble pumps and motors to rectify problems. Develop efficient hydraulic circuits.
- Maintain the pneumatic and hydraulic system

SKILLS :

- Demonstrate various accessories and their uses in hydraulic system Draw graphical symbols.
- Use directional,pressure control valves for various applications.
- Demonstrate application of injection control circuit.
- Understand the use of pressure intensifier.

UNIT-I

Basic Principles: Principles of Hydraulics, Hydraulic pumps and their characteristics, pumpselection, pumping circuits, Hydraulic actuators both linear &rotary, selection& characteristics of pumps, Hydraulic valves, pressure & Flow direction controls, applications, Hydraulic fluids, symbols.

UNIT-II

Hydraulic Circuits: Reciprocating, Quick Return, Sequencing, Synchronizing andAccumulator, Safety circuits.

UNIT-III

Design & Selection: Design of Hydraulic circuits and selection of components.

UNIT-VI

Pneumatic fundamentals, control elements, logic circuits, sensing of position and pressure, switching. Electro-pneumatic and Electro Hydraulic circuits Robotic circuits.

UNIT-V

Design of pneumatic circuits: Classic, cascade, step counter and combination methods PLC,Microprocessors, uses, selection criteria for pneumatic components, Installation and maintenance of Hydraulic and pneumatic power packs–fault finding, principles of low cost automation and case students.

TEXT BOOKS:

1. J.Michael and G.Ashby,"Power Hydraulics, 2nd Edition, Prentice Hall,1989.
2. Andrew Parr,"Hydraulics & Pneumatics", 2nd Edition, Elsevier Publications, 2006.

REFERENCE BOOKS:

1. Dudley and Pippenger, "Basic Fluidic Power", 2nd Edition,PrenticeHall,1987.
2. Anthony Esposito, "Fluid Power with applications", 6th Edition, Prentice Hall, 2010.
3. The Metallurgy of Welding; D. Saferian; Chapman and Hall; 1985. Welding Methods and Metallurgy; M. D. Jackson; Grffin; London; 1967.

Activities:

1. Preparation of chart for different hydraulic symbols.
2. Collection of information related troubleshooting various problems.
3. Preparation of animations on internet for understanding functioning of various hydraulic and pneumatic components
4. Demonstration of use of clamp control and reciprocating screw circuits.

17MD010 COMPUTATIONAL FLUID DYNAMICS

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

This course offers computational methods to solve and analyze problems involving fluid flowand heat transfer. The objective of this course is to enable the students to simulate the interaction of fluids and gases with the surfaces for various initial and boundary conditions.

Course Outcomes:

Upon successful completion of this course student will be able to:

- develop a geometrical model for the fluid flow.
- apply appropriate boundary conditions and visualize the obtained results. gain skills in the actual implementation of CFD methods
- formulate finite difference and finite volume methods for various fluid flow problems assess stability of a given numerical scheme.

SKILLS:

- Convert partial differential equations to linear algebraic equations. Solve linear equations using various numerical techniques.
- Visualize the fluid flow patterns and heat transfer phenomenon using various plots. Analyze the results with available experimental results.
- Apply finite difference methods for various fluid flow problems.
- Perform stability and grid-convergence analysis for a given numerical scheme.

UNIT-I

Introduction to Numerical Methods - Finite Difference, Finite Element and Finite Volume Methods – Classification of Partial Differential Equations – Solution of Linear Algebraic Equations – Direct and Iterative Approaches

Finite difference methods: Taylor's series – FDE formulation for 1D and 2D steady state heat transfer problems – Cartesian, cylindrical and spherical co-ordinate systems – boundary conditions – Un steady state heat conduction – Errors associated with FDE - Explicit Method – Stability criteria – Implicit Method – Crank Nickolson method – 2-D FDE formulation – ADI – ADE

UNIT-II

Finite Volume Method: Formation of Basic rules for control volume approach using 1D steady heat conduction equation – Interface Thermal Conductivity - Extension of General Nodal Equation to 2D and 3D Steady heat conduction and Unsteady heat conduction

UNIT-III

FVM to Convection and Diffusion: Concept of Elliptic, Parabolic and Hyperbolic Equations

applied to fluid flow – Governing Equations of Flow and Heat transfer – Steady 1D

Convection Diffusion – Discretization Schemes and their assessment – Treatment of

Boundary Conditions

UNIT-IV

Calculation of Flow Field: Vorticity & Stream Function Method - Staggered Grid as Remedy for representation of Flow Field - Pressure and Velocity Corrections – Pressure Velocity Coupling - SIMPLE & SIMPLER (revised algorithm) Algorithm.

UNIT-V

Turbulent Flows: Direct Numerical Simulation, Large Eddy Simulation and RANS Models

Compressible Flows: Introduction - Pressure, Velocity and Density Coupling.

Lab Component:

1) CFD analysis of laminar flow over plate in FLUENT
2) CFD analysis of turbulent flow over plate in FLUENT
3) CFD analysis of laminar flow over a sphere in FLUENT
4) Numerical analysis of convective heat transfer in FLUENT/MATLAB

TEXT BOOKS:

1. Computational Fluid Flow and Heat Transfer – Muralidharan & Sundarajan (Narosa Pub)
2. Numerical heat transfer and fluid flow – S.V. Patankar (Hemisphere Pub. House)
3. An Introduction to Computational Fluid Dynamics – FVM Method – H.K. Versteeg, W. Malalasekhara (PHI)
4. Computational Fluid Dynamics – Anderson (TMH)
5. Computational Methods for Fluid Dynamics – Ferziger, Peric (Springer)

REFERENCE BOOKS:

1. Computational Fluid Dynamics, T.J. Chung, Cambridge University
2. Computaional Fluid Dynamics – A Practical Approach – Tu, Yeoh, Liu (Elsevier)

17MD012 INDUSTRIAL TRIBOLOGY

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description and Objectives:

Tribology deals with the study of friction, lubrication and wear in all contacting pairs.The Tribological knowledge helps:To provide fundamental knowledge in lubrication,.rubbing of surfaces & wear. To design efficient mechanical systems using good bearings to provide high quality machines. To improve service life, safety and reliability of interacting machine components; and yields substantial economic benefits.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand the concepts of the tribological phenomenon of Engineering systems.
- Design any type of Engineering system incorporating lubrication.
- Propose suitable lubrication and types of bearing for a given operational parameters.

SKILLS:

- Calculate the dynamic capacity of rolling bearings and selection of suitable bearing
- Evaluation of film thickness and amount of heat generated in the journal bearing
- Understand the design procedure of thrust bearing
- Suggest proper lubrication procedure and equipment
- Understand the wear analysis of components

Unit – I

Introduction : Nature of surfaces and contact-Surface topography-friction and wear mechanisms and effect of lubricants methods of fluid film formation. Selection of rolling element bearings: Nominallife, static and dynamic capacity– Equivalent load, probabilities of survival – cubic mean load– bearing mounting details, preloading of bearings,

Conditioning monitoring using shock pulse method.

Unit – II

Hydrodynamic bearings : Fundamentals of fluid formation –Reynold's equation; Hydrodynamic journal bearings–Sommerfield number–performance parameters– Optimum bearing with maximum load capacity – Friction – Heat generated and Heat dissipated. Hydrodynamic thrust bearings; Raimondi and Boyd solution for hydrodynamic thrust bearings–fixed tilting pads, single and multiple pad bearings-optimum condition with largest minimum film thickness.

Unit – III

Hydrostatic Bearings :Thrust bearings –pad coefficients –restriction –optimum

Film thickness- journal bearings–design procedure –Aerostatic bearings; Thrust bearings and Journal bearings– design procedure. Dry rubbing Bearings : Porous metal bearings and oscillatory journal bearings – qualitative approach only.

Unit – IV

Lubrication : Choice of lubricants,types of oil, Grease and solid lubricants – additives – lubrication systems and their selection – selection of pump, filters, piping design – oil changing and oil conservation.

Unit – V

Seals: Different types–mechanical seals, lipseals, packed glands, soft piston seals, Mechanical Piston rod packing, labyrinth seals and throttling bushes,oil flinger rings and drain grooves–selection of mechanical seals.

Failure of Tribological components: Failure analysis of plain bearings, rolling bearings, gears and seals, wear analysis using Ferrography.

Activities:

1. Design of journal bearing
2. Design of thrust bearing
3. Evaluating pressure distribution at journal bearing interface
4. Design calculations for the selection of rolling beaings

17MD014 GEAR ENGINEERING

Hours Per Week :

L	T	P	C
-	1	-	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

Gearsareprime machine element members in many of the power transmission devices. Proper design and selection of efficient gearing system improves the overall efficiency of the system. Force analysis on gears and various dimensions of gears based on static , dynamic and wear considerations covered in this course. Gear failure and optimum gear design is also focused.

Course Outcomes:

Upon successful completion of this course student will be able to:

- Analyze forces acting on gear.
- Design various types of gears under static and dynamic loading.
- Identify the gear failures.
- Design gear box and selection of gear trains.
- Apply optimization principles to design gear against strength, space,size, weight etc.

SKILLS:

- Force analysis on gearsPower transmitted by gears evaluation
- Gear dimension and other parameters estimation
- Gear failure analysis and able to suggest remedies
- Gear box design
- Gear design optimization

UNIT–I

Introduction :Principles of gear tooth action, Generation of Cycloid and Involute gears, fundamental law of gearing, contact ratio, gear manufacturing processes ,gear tooth failure modes, stresses.

Spur Gears : Tooth loads, Principles of Geometry,Design considerations and methodology, Complete design of spur gear teeth considering Lewis beam strength, Buckingham's dynamic load and wear load,.

UNIT–II

Helical Gears : Helical gear geometry, helical gear forces, virtual number of teeth, contact ratio, Design considerations ,Complete design of helical gear teeth considering Lewis beam strength, Buckingham's dynamic load and wear load,.

Bevel Gears :Tooth loads, Principles ofGeometry, Design considerations and methodology, Complete design of bevel gear teeth considering Lewis beam strength, Buckingham's dynamic load and wear load,

UNIT–III

Worm Gears : Nomenclature of worm and worm wheel, materials for worm gears, forces on worm wheels, , Design considerations and methodology, Complete design of worm gear teeth considering Lewis beam strength, Buckingham's and wear load, Heat dissipation considerations.

Gear Failures:Analysis of gear tooth failures, Nomenclature of gear Tooth wear and failure, tooth breakage,pitting,scoring,wear,overloading,gear-causingproblems,lubricationfailures.

UNIT–IV

GearTrains: Simple, compound and epicyclic geartrains, Raydiagrams, Design of a gear box of an automobile, Design of gear trains from the propeller shafts of airplanes for auxiliary systems.

UNIT–V

Optimal Gear design: Optimization of gear design parameters, Weight minimization, Constraintsin gear train design- space, interference, strength, dynamic considerations, rigidity etc. Compact design of gear trains, multi objective optimization of gear trains.

TEXT BOOKS:

1. Norton,"Machine Design - An Integrated Approach", 2nd Edition,Pearson Publications, 2003
2. Henry E.Merrit,"Gear Engineering",2ndEdition,Wheeler publishing, Allahabad,2000

REFERENCEBOOKS:

1. Shigley,"Machanical Engineering Design",10th Edition, McGraw Hill Publishers, 2015.
2. G.M.Maitha, "HandBook of Gear Design", 2nd Edition, Tata Mc.Graw Hill Publishing company Ltd.,NewDelhi, 1995

ACTIVITIES:

- Spur gear design for the given power requirement based on space constraints.
- Helical gear design based on static and wear considerations.
- Bevel gear design for differential In automobile applications.
- Ray diagram preparation and gear box design for machine tool applications.
- Gear design optimization with space , weight and cost constraints.

17MD016 EXPREIMENTAL STRESS ANALYSIS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

Experimental Stress Analysis plays a very vital role in engineering design and performance monitoring of mechanical equipment. Various types of stress measurement techniques are discussed in this course. The main focus is on Photoelasticity, strain gauges. Topic of stress transformations is also included to provide knowledge about converting the experimental stress values into stress components that can be easily used in machine design.

Course Outcomes:

Upon successful completion of the course student will be able to:

- Understand the process of conversion of stress components from one coordinate system to the other.
- Acquire knowledge in selection of strain gauges.
- Suggest suitable experimental stress measuring technique based on application.
- Explain the measurement of strains or stresses by using different experimental methods

Skills:

- Computation of stresses from the strain rosette data.
- Computation of stresses from the data obtained from moiré fringe pattern.
- Computation of stress from the data obtained from photo elastic experiment.
- Identification of stress conditions from Brittle coating patterns.

UNIT-I

Introduction:Theory of Elasticity, Plane stress and plane strain conditions, Compatibility conditions, Problems using plane stress and plane strain conditions.Three-dimensional stress strain relations.

UNIT-II

Brittle coatings: Introduction, coating stresses, failure theories,brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings, analysis, calibration procedures, analysis of brittle coating data.

UNIT - IV

Moire Methods:Introduction, mechanism offormationofMoirefringes,thegeometrical approachto Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of moiré-Fringes, experimental procedures and techniques.

Birefringent Coatings: Introduction, Coating stresses and strains, coating sensitivity, coating materials,application of coating effects of coating thickness,Fringe-order determinations in coatings, stress separation methods.

UNIT-V

Photoelasticity: Polariscope–Planeandcircularly polarized light. Photoelasticmaterials–Isochromaticfringes–Isoclinics,three-dimensional Photoelasticity: locking inmodel deformation, materials forthree dimensional photo elasticity, machining, cementing and slicing the three dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear-difference method in three dimensions, application of the Frozen-stress method,the scattered-light method.

TEXT BOOKS:

1. Dally and Riley,"Experimental stress analysis",3rd Edition,McGraw Hill,1991.
2. Dr.Sadhu Singh,"Experimental stress analysis",2nd Edition,Khanna Publications,1990.

REFERENCE BOOKS:

1. Timoshenko and Goodier JN,"Theory of Elasticity",3rd Edition,Tata McGraw Hill,2010.
2. Frocht,"Photo Elasticity",3rd Edition,Wiley Sons & Co.,2008.

Activities:

- Calculation of principle stresses and their directions for three dimensional problems.
- Calculation of strains for a given strain gauge arrangement.
- Calculation of stresses in prototypes from the results of Photoelastic experiment.

17MD018 NANO TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To provide a basic understanding with case studies on different surface NDE techniques and apply them for inspecting materials in accordance with industry specifications and standards.

- To provide knowledge and enrich ideas about the conventional NDT techniques
- develop a strong hands on experience for inspecting and evaluating components in accordance with industry specifications
- To develop a fundamental knowledge about the advanced techniques and the recent developments in non-destructive testing so as to control the quality in manufacturing engineering components.

Course Outcomes:

After successful completion of this course the student will be able:

- To have a basic knowledge of surface NDE techniques which enables to carry out various inspection in accordance with the established procedures.
- To calibrate the instrument and inspect for in-service damage in the components.
- To differentiate various defect types and select the appropriate NDT methods for better evaluation.
- To communicate their conclusions clearly to specialist and non-specialist audiences.
- To document the testing and evaluation of the results for further analysis

SKILLS :

- Analyzing engineering problems, selecting and using mathematical and theoretical data to provide suitable NDT solutions with consideration of the entire inspection cycle
- Apply their engineering knowledge to the development, operation, maintenance and progression of technologies used for NDT
- Observe, record and draw conclusions from data and experimental evidence, recognizing inherent uncertainties and limitations
- Applying design processes, including materials selection that meet NDT standards

UNIT-I

Importance of Nano-technology, Emergence of Nano-Technology, Bottom-up and Top-down approaches, challenges in NanoTechnology.

General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

UNIT-II

Silicon Carbide: Application of Silicon car bide, nano materials preparation, Sintering of SiC,X-rayDiffraction data, electron micro scopy sintering of nano particles, Nano particles of Alumina

And Zirconia: Nano materials preparation, Characterization, Wear materials and nano composits.

UNIT-III

Mechanical properties: Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties.

UNIT-IV

Electricalproperties:Switchingglasseswithnanoparticles,Electronicconductionwithnano particles.

Opticalproperties: Opticalproperties, special properties and the coloured lasses.

UNIT-V

Process of synthesis of nano powders, Electrode position, Important nano materials Investigating and manipulating materials in the nano scale: Electron microscopes, scanning probe microscopes, optical microscopes for nano science and technology, X-ray diffraction.

TEXT BOOKS:

1. A.K.Bandyopadhyay,"Nano Materials",1st Edition,New Age Publishers,2009
2. T.Pradeep,"Nano the Essentials",3rd Edition,Tata McGraw Hill, 2009

REFERENCE BOOKS

1. Guozhong Cao,"Nano structures and Nano Materials: Synthesis, Properties and Application" 1st Edition, Imperial College Press, 2004.
2. Bharat Bhusan, "Springer's Hand Book of Nano-technology", 2nd Edition, Spingers Publihsers, 2007.

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17MD020 CONDITION MONITORING AND FAULT DIAGNOSIS OF MACHINES

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To provide a basic understanding with case studies on different surface NDE techniques and apply them for inspecting materials in accordance with industry specifications and standards.

- To provide knowledge and enrich ideas about the conventional NDT techniques
- Develop a strong hands on experience for inspecting and evaluating components in accordance with industry specifications
- To develop a fundamental knowledge about the advanced techniques and the recent developments in non-destructive testing so as to control the quality in manufacturing engineering components.

Course Outcomes:

After successful completion of this course the student will be able to:

- Understand the benefits of condition monitoring
- Calibrate the instrument and inspect for in-service damage in the components.
- Differentiate various defect types and select the appropriate monitoring methods for better evaluation.
- Ability to communicate their conclusions clearly to specialist and non-specialist audiences.
- Documentation of the testing and evaluation of the results for failure analysis.

SKILLS:

- Analyzing engineering problems, selecting and using mathematical and theoretical data to provide suitable NDT solutions with consideration of the entire inspection cycle
- Apply their engineering knowledge to the development, operation, maintenance and progression of technologies used for NDT
- Observe, record and draw conclusions from data and experimental evidence, recognizing inherent uncertainties and limitations
- Applying design processes, including materials selection that meet NDT standards

UNIT - I

Introduction: System failure, component failure, failure decisions, failure classifications, types of failure, failure investigations, causes of failure, Methods of maintenance – condition based maintenance, preventive maintenance, predictive maintenance, proactive maintenance.

UNIT - II

Condition Monitoring: Need and importance of condition monitoring, the decision to monitor, common monitoring techniques, online/off-line monitoring, commonly measured operating characteristics.

UNIT - III

Transducers and Instrumentation for Recording and Analysis: Vibration transducers Displacement transducers, velocity pickups, accelerometers, Temperature transducers Vibrationmeters, FFT analyzers. Time domain instruments, Tracking analyzers.

UNIT - IV

Analyzing Machine Condition: General characteristics-Process measurements, vibration, Typical vibration sources, symptoms of other common machinery problems.Development and use of acceptance limits-guide line and limits based on physical constraints. Vibration severity criteria, changing machinery condition-time trends and detailed diagnostic monitoring.

UNIT - V

Data Processing & Vibration Analysis: Fourier analysis, frequency analysis techniques, vibration signature, vibration monitoring equipment, system monitors and vibration limit detectors. Performance Trend Monitoring : Primary and secondary performance parameters, performance monitoring systems

TEXT BOOKS:

1. Collacott R.A. "Mechanical Fault Diagnosis and Condition Monitoring", 2nd Edition, Chapman and Hall,London,2007.
2. Randall R.B., "Vibration based Condition Monitoring: Industrial, Aerospace and Automotive Applications", Wiley Sons & Co., 2010.
3. Mohanty.A.R. "Machinery Conditon Monitoring: Principles and Practices", CRC Press Book, 2014.

REFERENCE BOOKS:

1. Rao B.K.N, "Hand Book of Condition Monitoring", Elsevier Science & Technology, Oxford U.K, 1996.
2. Rao J.S., "Vibratory Condition Monitoring of Machines", Narosa, 2000.

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Activities:

- Inspection of welds using solvent removable visible dye penetrant.
- Inspection of welds using solvent removable fluorescent dye penetrant.
- Inspection of welds by Magnetic Particle Testing - Dry method.
- Inspection of welds by Magnetic Particle Testing- Wet method.
- Inspection of a welded plate by radiographic single wall single image technique- X rays.
- Inspection of a welded pipe by Panoramic Technique- Gamma rays.
- Inspection of a welded pipe by double wall single image technique - Gamma rays.
- Familiarization of ultrasonic flaw detectors

I

YEAR

M.Tech.

POWER ELECTRONICS & DRIVES

I SEMESTER

4	17PE001	-	Analysis of Power Electronic Converters
4	17PE003	-	Electric Drives-I
4	17PE005	-	Flexible AC Transmission Systems
4	17PE007	-	Modeling & Dynamics of Electrical Machines
4		-	Elective Course - I
4		-	Elective Course - II

II SEMESTER

4	17HS001	-	Research Methods
4	17HS002	-	Employment Orientation Program
4	17PE002	-	Digital Control of Power Electronics
4	17PE004	-	Electric Drives-II
4	17PE006	-	HVDC Transmission System
4	17PE008	-	Design of Power electronic Systems
4		-	Elective Course - III
4		-	Elective Course - IV

COURSE CONTENTS

I SEM & II SEM

17PE001 ANALYSIS OF POWER ELECTRONIC CONVERTERS

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	36

WA/RA	SSH/HSH	CS	SA	S	BS
05	05	05	05	05	10

Course Description and Objectives:

This course deals with the basic concepts of converters, choppers, inverters and their analysis.

With the advent of semiconductor devices, revolution is taking place in the power transmissions, distribution and utilization.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

a. Describe the operation of dc-dc, dc-ac, ac-dc and ac-ac power converters.

b. able to analyze and design switched mode regulator for various industrial applications.

c. Comprehend the concepts of different power converters and their applications.

d. Evaluate the effects of various modulation techniques on the quality of input and output waveforms.

SKILLS:

- Able to understand analysis of basic power electronics converters
- Able to understand the power quality issues (current and voltage harmonics) caused by the operation of the converters in a power network
- Able to acquire a skill of understanding principles of static power conversions, PWM techniques for voltage and frequency control, circuit design considerations, and applications of power electronics.

ACTIVITIES:

- *Design of DC-DC converter for battery charging application.*
- *Design of inverter for UPS.*
- *Design of regulator by using AC-AC converter.*

UNIT – I **L- 09**

Phase Control Rectifiers : Introduction– Half controlled and Fully controlled converters –harmonic analysis —power factor Improvement -single phase series converters –Numerical problems. Three phase converters – Half controlled and fully controlled converters – harmonic analysis — power factor Improvement – twelve pulse converter– dual converters – Numerical problems.

UNIT – II **L- 09**

Three phase AC voltage controllers and cyclo Converters: Three phase AC voltage controllers – Analysis of controllers with star and delta Connected loads–applications–numerical problems. Three phase to three phase cycloconverters – analysis of Midpoint and bridge configurations – Limitations – Advantages – Applications –numerical problems.

UNIT – III L- 09

D.C. to D.C. Converters: Switched mode regulators–analysis of Buck ,Boost , buck-boost and Cuk regulators– comparison- Numerical problems .DC-DC converters with isolation- fly back, forward, push pull and half bridge configurations- comparison – applications –Numerical problems.

UNIT – IV **L- 09**

Pulse Width Modulated Inverters(Three Phase): Three phase inverters – analysis of 180 degree 120 degree Conduction modes – voltage control of three phase inverters – sinusoidal PWM – Third Harmonic PWM – 60 degree PWM – space vector modulation – Comparison of PWM techniques – Current Source Inverter.

UNIT – V **L- 09**

Resonant Converters: Resonant Converters- Zero current switching (ZCS) DC-DC converter -zero voltage switching(ZVS) DC-DC converter- clamped voltage (ZVSCV)- applications –Numerical problems.

LABORATORY EXPERIMENTS

List of Experiments Total Hours-36

1. Single phase AC voltage controller.
2. Single phase cyclo converter.
3. Single phase fully controlled bridge converter
4. Single phase half controlled bridge converter.
5. Series resonant converter.
6. Three phase semi and fully controlled rectifiers with R and RL load using MATLAB/Simulink.
7. Boost chopper using MATLAB/SIMULINK.
8. Buck chopper using MATLAB/SIMULINK.
9. To study the operation of Switch-Mode DC-DC BUCK Converter
10. To study the operation of Switch-Mode DC-DC flyback Converter

TEXT BOOKS:

1. R. Erickson and D. Maksimovic, “Fundamentals of Power Electronics,” 2nd Edition 2001, Springer International Edition.
2. Ned Mohan, Tore M, Undelnad, William P, Robbins (3 Edition), “ Power Electronics: Converters, Applications and Design,” Wiley 2002.

REFERENCES:

1. Mohammed H. Rashid, “Power Electronics”, 3rd ed., Pearson Education, First Indian reprint 2004.
2. Ned Mohan, Tore M. Undeland and William P.Robbins, “Power Electronics” 2nd ed., John Wiley & Sons.

17PE003 ELECTRIC DRIVES - I

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	36

WA/RA	SSH/HSH	CS	SA	S	BS
05	05	05	05	05	10

Course Description and Objectives:

This course deals with the basics understanding of main principles of DC drives, various modes of operation, control from converters and choppers.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

a. Select and implement the drives for industrial processes.

b. Design scalar control drive for industrial application.

c. Implement various variable speed drives in electrical energy conversion systems.

SKILLS:

- The ability of taking decision over the design aspect of digital IC for a particular application increases.
- Skill of Designing new techniques for critical parameters in digital IC design like power is improved.
- Circuit and switch level simulation and verification in design tool skill acquired.

UNIT – I **L- 09**

Modeling of DC Machines: Theory of operation-Equivalent Circuit and Electromagnetic Torque-Electromechanical Modeling-State space modeling-Block diagram and Transfer functions

UNIT – II **L- 09**

Single Phase Controlled Converter DC Motor Drives: Principle of DC Motor Speed Control-Armature control-Field Control-armature and field controls. Single –phase semi converter and single-phase full converter fed Separately excited DC motor- for continuous and discontinuous modes of operation-Problems

UNIT – III **L- 09**

Three Phase Controlled Converter DC Motor Drives: Three-phase semi converter and three-phase full converter Separately excited DC motor for continuous and discontinuous modes of operation-Problems-Four Quadrant Operation using Dual Converters-Control modeling of three-phase converter-Two quadrant Three Phase Converter Controlled DC Motor Drive- Transfer Functions of the subsystems

UNIT – IV **L- 09**

Design of Controllers: Current controller-First order Approximation of Inner Current Loop- speed controller-Simulation of one quadrant DC Motor Drive-The Motor equations-filet in the speed feed back loop-Speed Controller- Current Reference Generator-Current Controller-Flow Chart for Simulation.

UNIT – V **L- 09**

Chopper controlled DC Motor drives: Principle of operation of the chopper – four quadrant chopper circuit – chopper for inversion – chopper with other power devices –model of the chopper – input to the chopper – steady state analysis of chopper controlled DC motor drives – rating of the devices - Closed loop operation of DC Motor drives- Speed controlled drive system current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current controller.

ACTIVITIES:

- *Simulate single phase converter fed DC drive using PWM technique.*
- *Simulate three phase converter fed DC drive using SPWM technique.*
- *Controlling the speed of DC motor using Ward Leonard technique.*
- *Simulate chopper fed DC drive with dynamic braking.*

LABORATORY EXPERIMENTS

List of Experiments Total Hours-36

1. Speed control of DC motor using single phase half wave rectifier.
2. Speed control of DC motor using three phase half wave rectifier.
3. Speed control of DC motor using single phase full wave rectifier.
4. Speed control of DC motor using three phase full wave rectifier.
5. Speed control of DC motor using three phase SCR module.
6. Speed control of DC motor using IGBT power module.
7. Speed control of PMDC motor using PID controller.
8. Speed Control Of PMDC Motor Using Single Phase 4 Quadrant Chopper
9. Speed control of DC motor using ward-Leonard method.
10. Braking of DC motor using Plugging and rheostatic braking methods.

TEXT BOOKS:

1. G.K, Dubey, “Power semiconductor controlled Drives”, Prentice Hall international, New Jersey, 1989.
2. R.Krishnan, “Electric motor drives modeling, analysis and control”, PHI-India-2009.

REFERENCES:

1. G. K. Dubey – Fundamentals of electric Drives, Narosa Publishing House, 2nd edition, 2011.
2. W. Leonhard – Control of Electrical drives, Springer, 3rd edition, 2001.
3. P.C. Krause – Analysis of Electric Machine, Wiley-IEEE press 3rdedition.
4. B. K. Bose – Modern Power Electronics and AC Drives, Prentice Hall publication, 1st edition, 2001.

17PE005 FLEXIBLE OF AC TRANSMISSION SYSTEMS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
05	05	05	-	05	10

Course Description and Objectives:

This course deals with the fundamental concepts of FACTS technology which are emerging in the area of power systems. The objective of this course is to understand the role of FACTS technology in delivering quality power at bulk levels.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

a. Understand the importance of FACTS technology.

b. Analyze different FACTS devices in Transmission system.

c. Bring out the advantages of FACTS technology.

d. Design of FACTS controllers for different Power system applications.

SKILLS:

- Analyze the performance of given transmission system with and without FACTS technology.
- Review the static devices for series and shunt control.
- Select suitable FACTS device for specific power quantity/quality.
- Identify suitable location of FACTS controller for given transmission system.

ACTIVITIES:

- *Survey on FACTS devices existed in India.*
- *Simulation of Series FACTS Controllers using MATLAB.*
- *Simulation of Shunt FACTS Controllers using MATLAB.*

UNIT – I **L- 12**

Introduction: Power Flow in AC Systems, Loading capability Limits, Dynamic stability considerations, controllable parameters, basic types of FACTS controllers.

UNIT – II **L- 12**

Voltage Source Converters: Single phase and 3-phase full wave bridge converters, transformer connections for 12, 24, 48 pulse operation, 3 level voltage source converters, PWM converters.

UNIT – III L- 12

Static Shunt Compensation: Objectives of shunt compensation, Voltage in stability and its prevention, power oscillations and damping, controllable VAR generation, variable impedance type VAR generators.

UNIT – IV **L- 12**

SVC and STATCOM: Dynamic performance, transient stability enhancement with SVC and STATCOM- operating principle – V-I characteristics.

UNIT – V **L- 12**

Series Compensation & UPFC: Series capacitive compensation, transient stability improvement, Thyristor controlled series capacitor (TCSC), thyristor control power angle regulator (TCPAR), Unified power flow controller.

TEXT BOOKS:

1. N.G. Hingorani and L.Guygi, “Understanding FACTS Devices”, IEEE Press Publications, Standard Publishers, Delhi 2001.
2. Mohan Mathur, R., Rajiv. K. Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc.

REFERENCES:

1. E. Achaet. Al. John Wiley, “FACTS: Modelling and Simulation in power Networks”, London, UK, 2004
2. P. Kundur, “Power System Stability and Control”, McGrawHill, 1994.

17PE007 MODELING AND DYNAMICS OF ELECTRICAL MACHINES

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
05	05	05	-	05	10

Course Description and Objectives:

This course deals with the basics of electromechanical energy conversion and enables them to be acquainted with the mathematical modeling of various types of machines and the dynamics related to speed control of these machines

Course Outcomes:

Upon successful completion of this course, the student should be able to:

a. Design induction machine for starting, accelerating and braking w.r.to rotor resistance.

b. Analyze different control theories.

c. Model and simulate AC machines for further studies.

d. Utilize BLDC and SRM motors.

SKILLS:

- Able to understand the principle of coenergy.
- Able to understand the working of basic two pole machine.
- Able to transform a machine between reference frames.
- Able to analyze induction and synchronous machine.

ACTIVITIES:

- *Mathematical modeling of induction machine.*
- *Mathematical modeling of synchronous machine.*
- *Mathematical modeling of BLDC.*
- *Mathematical modeling of SRM.*

UNIT – I **L- 12**

Basic Principles of Electrical Machine Analysis

Operation and Steady State Behavior of Electrical Machines: Magnetically coupled circuits Electro-mechanical conversion – Principles of energy flow - Steady state equations of dc machines - rotating field theory – operation of Induction motor – operation of Synchronous motor – power angle characteristics.

UNIT – II **L- 12**

Theory of Two Pole Machine

Elements of generalized theory Basic two pole machine, Transformer and speed voltages in the armature, Kron's primitive machine, Analysis of Electric Machines.

UNIT – III **L- 12**

Reference Frame Theory

Linear transformation in machines-Invariance of power, transformation from a displayed brush axis, Reference theory Transformation from 3 phases–to-2 phase, (á-â and d-q transformation), Physical concept of Park s transformation. Transformation between reference frames.

UNIT – IV **L- 12**

Modeling & Analysis of Asynchronous Machines

Poly phase Induction Machines- Mathematical Modeling of Induction Machines. Voltage and torque equations in machine variables, Induction machine dynamics during starting and braking – Induction machine dynamics during normal operation

UNIT – V **L- 12**

Modeling & Analysis of Synchronous Machines

Synchronous motor – circuit model of a three –phase synchronous motor, flux linkages voltage equations–parks transformation to d,q,0 variables, Electromechanical equation –Motor operation – generator operation – small oscillations – general equations for small oscillations

TEXT BOOKS:

1. P. C. Krause, Oreg Wasynczuk, Scott D. Sudhoff, "Analysis of Electric Machinery and drive systems" , IEEE Press, 2002.
2. P. S. Bhimbra, "Generalized Theory of Electrical Machines", Khanna Publications.

REFERENCES:

1. Werner Leonhard, "Control of Electrical Drives", Springer; 3rd edition, 2001.
2. D. P. Sen Gupta and J. W. Lynn, "Electrical Machine Dynamics, The Macmillan Press, 1980.
3. T.J.E Miller, "Brushless permanent Magnet & Reluctance Motor Drives" clarendom press, Oxford 1989.
4. Kenjo T and Nagamoris "Permant Magnet & brushless Dc motor" Clarendon press, Oxford, 1989.

17HS001 RESEARCH METHODS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondarydata, probability and non-probability sampling techniques.

UNIT-II

Research Design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III

Measurement and Scaling Concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion,measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminate analysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution inInterpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copyrights.

TEXT BOOKS:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

REFERENCE BOOKS:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17HS002 EMPLOYMENT ORIENTATION PROGRAM

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Preamble:

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.

ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.

iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech

students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education

according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and

get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.63

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- 5 Marks for attendance
- 5 Marks for formative assessment
- 40 Marks for summative assessment

17PE002 DIGITAL CONTROL OF POWER ELECTRONICS

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P
45	-	36

WA/RA	SSH/HSH	CS	SA	S	BS
05	05	05	05	05	10

Course Description and Objectives:

This course deals with the concept of digital principles, digital instrumentation setup to control various power electronics based drives and the recent trends in digital instrumentation.

Course Outcomes:

Upon successful completion of this course, the student able to:

a. have basic concepts of Digital Signal Processing.

b. have better knowledge about DSP controllers in converters applications .

c. have better knowledge about DSP controllers in induction motors and other drives.

SKILLS:

- Able to understand analysis of basic concepts of digital controller
- Able to understand realization of PWM signals using DSP.
- Able to acquire a skill of understanding control of converters using DSP.
- Able to acquire a skill of understanding control of drive using DSP.

ACTIVITIES:

- Design of digital controller for buck DC-DC converter for battery charging application.
- Design of digital inverter for UPS.
- Design of digital voltage regulator .

UNIT – I **L- 09**

DSP Controllers: Introduction to TMS DSP controllers – C2xx DSP CPU and instruction set – Mapping external devices to the C2xx core and the peripheral interface – General purpose Input/ Output functionality – Interrupts – ADC – Event Managers.

UNIT – II **L- 09**

Digital PWM Generation Schemes: Signal analysis, Digital PWM generation schemes, Realization of different PWM's using DSP's.

UNIT – III **L- 09**

DSP BASED Control of Converters: DSP based – Implementation of Switched mode regulators–Boost –Buck-Boost, Flyback and Forward converters.

UNIT – IV **L- 09**

DSP BASED Control of Induction Motors : Park and Clarke's transformations. Space Vector Pulse Width Modulation. DSP-based vector control of induction motors.

UNIT – V **L- 09**

DSP BASED Control of Special Machines : DSP based control of stepper motors, DSP-Based control of permanent magnet brushless DC machines,DSP-based control of permanent magnet synchronous machines.

LABORATORY EXPERIMENTS

List of Experiments Total Hours-36

1. To study the speed control of PMDC motor using Micro2812 and IPM in open loop mode.
2. To study the speed control of BLDC motor using Micro2812 and IPM in closed loop mode.
3. To study the speed control of PMSM motor using Micro2812 and IPM in open loop mode.
4. To study the speed control of PMSM motor using Micro2812 and IPM in closed loop mode.
5. To study the speed control of induction motor using Micro2407 and IPM in open loop mode.
6. To study the speed control of induction motor using Micro2407 and IPM in closed loop mode.
7. To study the space analysis of switched mode DC-DC Buck converter using MATLAB.
8. To study the space analysis of Switched mode DC-DC Boost converter using MATLAB.
9. Design of digital PWM using MATLAB.
10. To study the space analysis of Switched mode DC-DC flyback converter using MATLAB.

TEXT BOOKS:

1. Hamid Toliyat and Steven Campbell, "DSP-Based Electromechanical Motion Control", CRC Press, 2011.
2. P.C.Krause, Oleg Wasynczuk, Scott D.Sudhoff, "Analysis of Electrical Machinery and Drive Systems", 2nd Edition, Wiley India,2010
3. Chee-Mun Ong, "Dynamic Simulation of Electric Machinery using Matlab / Simulink", Prentice Hall,1998.

REFERENCES:

1. Sanjit K. Mitra, "Digital Signal Processing", Tata McGraw Hill, 4thed. 2007.
2. Dougles Elliott F., Hand book of "Digital Signal proceedings: Engineering applications", Academic Press, 1987.
3. Texas and Analog Devices - Reference Manual

17PE004 ELECTRIC DRIVES - II

Hours Per Week :

L	T	P	C
3	-	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	36	05	05	05	05	05	10

Course Description and Objectives:

This course deals with the introduction on operation and performance of Induction motor, Synchronous motor and brushless DC motor and their speed control technique.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

a. Derive dynamic model of ac motor.

b. Compare scalar and vector control of induction motor.

SKILLS:

- Able to reduce the rotor copper losses using slip power recovery scheme.
- Able to design a speed controller for induction motor.
- Able to design a speed controller for synchronous motor.
- Able to choose a drive for different industrial applications.

ACTIVITIES:

- *Design of VFD for irrigation application.*
- *Simulate open loop v/f control of induction motor.*
- *Simulate Static Scherbius and Kramer drive.*
- *Simulate sensor less vector control of induction motor.*

UNIT – I **L- 09**

AC Machines for Drives: Induction Machines- torque production – equivalent circuit analysis – speed torque characteristics with variable voltage operation, variable frequency operation, constant v/f operation – variable stator current operation – induction motor characteristics in constant torque and field weakening regions.

UNIT – II **L- 09**

Control and Estimation of Induction Motor Drives : Scalar control voltage fed inverter control- open-loop volts/Hz control-speed control slip regulation – speed control with torque and flux control current controlled voltage fed inverter drive – current fed inverter control – independent current and frequency control- speed and flux control in current –fed inverter drive- Volts /Hz control of current-fed inverter drive -Slip power recovery drives – static Kramer Drive – Phasor diagram- torque expression – speed control of a Kramer Drive – Static Scherbius Drive –modes of operation.

UNIT – III **L- 09**

Vector or Field Oriented Control of Induction motor drives: DC Drive analogy-Principles of Vector control-vector control methods – direct vector control –Introduction to DTC.

UNIT – IV **L- 09**

Control and Estimation of Synchronous Motor Drives: Synchronous motor and its characteristics – control strategies – constant torque angle control-unity power factor control constant mutual flux linkage control- Flux weakening operation – maximum speed – direct flux weakening algorithm – constant torque mode controller – flux weakening controller – indirect flux weakening –maximum permissible torque – speed control scheme – implementation strategy – speed controller design.

UNIT – V **L- 09**

Brushless DC Motor Drives: Three-phase full wave brush less dc motor – sinusoidal type of brush less dc motor – current controlled blushless dc motor servo drive.

LABORATORY EXPERIMENTS

List of Experiments Total Hours-36

1. Speed control of three phase induction motor.
2. Speed control of BLDC motor.
3. Speed control of induction motor.
4. Speed control of three phase slip ring induction motor using MATLAB.
5. Speed control of universal motor using cyclo converter.
6. Multilevel inverter using MATLAB.
7. SPWM controlled Multi level inverter fed Induction Motor speed control.
8. SVPWM controlled Multi level inverter fed Induction Motor speed control.
9. To study the speed control of PMSM motor using Micro2812 and IPM in open loop mode.
10. To study the speed control of PMSM motor using Micro2812 and IPM in closed loop mode.

TEXT BOOKS:

1. R. Krishnan, “Electric Motor Drives, Modeling, Analysis & control”, Prentice Hall of India.
2. B. K. Bose, “Modern Power Electronics and AC drives”, Prentice Hall of India.

REFERENCES:

1. Boldea & S.A.Nasar, “Electric Drives”, Taylor & Francies.
2. Vedan Subrahmanay, “Electric drives, concepts & Applications”.
3. A. Hamid Toliyat and Steven Campbell, “DSP based Electromechanical Motion Control”, By, CRC Press, 2004.

17PE006 HVDC TRANSMISSION SYSTEM

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
05	05	05	-	-	10

Course Description and Objectives:

This course deals with the characteristics of solar radiation, its global distribution, and conversion methods of solar energy to heat and power, design and application of solar photovoltaic systems for power generation on small and large scale electrification.

Course Outcomes:

Upon successful completion of this course, the student should be able to:

a. Understand the HVDC advantages and types of HVDC links.

b. Understand the Rectifier and inverter operation and characteristics.

c. Understand the DC power flow and firing angle control methods.

d. Understand the concept of MTDC systems and Harmonics

e. Understand the concept of over voltages and protection.

SKILLS:

- Able to understand importance of HVDC transmission over HVAC transmission.
- Able to understand the operation and control of converters.
- Able to acquire a knowledge of harmonics and elimination in HVDC systems
- Able to understand the converts faults and protection.

ACTIVITIES:

- o Draw the Complete Diagram of HVDC system.
- o Draw the wave forms and characteristics of Rectifier and Inverter
- o Draw the Firing Angle Control diagram of HVDC system.
- o Design Low and High pass filters.
- o Draw the over voltage and over current protection diagrams.

UNIT – I **L- 12**

Introduction& types of HVDC Links

Introduction to HVDC transmission, Comparison between HVAC and HVDC systems - Economic, technical- Power Handling Capabilities of HVDC Lines and reliability, limitations, Types of HVDC links - Monopolar,Bipolar and Homopolar links, Components of HVDC transmission system. Applications of HVDC lines, Basic Conversion principle.

UNIT – II **L- 12**

Converter Operation & Analysis

Analysis of HVDC Converters- Rectifier and Inverter operation of Graetz circuit without and with overlap angle. Complete Equivalent circuit of HVDC link. Complete characteristics of converter as Rectifier and Inverter. Analysis of 12-pulse converter. Power flow in HVDC Links.

UNIT – III **L- 12**

Control of HVDC Converter & Systems

Basic principles of HVDC system control, necessity of control in HVDC link, power reversal, Basic controllers - constant current and constant extinction, power control, high level controllers. Firing angle control- Individual phase control and equidistant firing angle control. Summary of converter control.

UNIT – IV **L- 12**

MTDC Systems, Harmonics and Filters

Multi-terminal DC links and systems- series, parallel and series parallel systems, their operation. Harmonics in HVDC system - Characteristic and uncharacteristic harmonics - Troubles due to harmonics – Harmonic filters - Active and passive filters - Reactive power control of converters.

UNIT – V **L- 12**

Over voltages, Converter Faults and Protection in HVDC Systems

Over voltages due to disturbances on DC side, AC side & internal converter side. Converter faults-misfire, arc through, commutation failure, over current protection - valve group, and DC line protection. Over voltage protection of converters, surge arresters.

TEXT BOOKS:

1. Padiyar, K.R., ‘HVDC transmission systems’, Wiley Eastern Ltd., 2010.
2. Kamakshaiah, S and Kamaraju, V, ‘HVDC Transmission’, 1st Edition, Tata McGraw Hill Education (India), Newdelhi 2011.

REFERENCES:

1. Kimbark, E.W., ‘Direct Current Transmission-vol.1’, Wiley Inter science, New York, 1971
2. Arrilaga, J., ‘High Voltage Direct Current Transmission’, 2nd Edition, Institution of Engineering and Technology, London, 1998.
3. Vijay K. Sood, ‘HVDC and FACTS Controllers’, Kluwer Academic Publishers, New York, 2004.
4. E.Uhlman, “Power Transmission by Direct Current”, Springer Verlag, Berlin Helberg, 1985.

17PE006 DESIGN OF POWER ELECTRONIC SYSTEMS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	05	05	05	05	05	10

Course Description and Objectives:

This course introduces the design of auxillary components used to support a power electronic circuit such as magnetic, thermal and protective elements. The objective of course is to analysis and design of inductors, transformers, heat sinks and driver circuits for converters.

Course Outcomes:

The student will be able to:

- specify various magnetic components for power semiconductor devices.
- specify design criteria (power, efficiency, ripple voltage and current, harmonic distortions, power factor) for a converter circuit.
- design driver circuits for converter.
- design of heat sink for power electronic devices.

SKILLS:

- *Design of gate driver circuits for different power semi conductor switches.*
- *Design of suitable flyback converter for an application.*
- *Design of suitable forward converter for an application.*
- *Design of suitable buck-boost converter for an application.*

ACTIVITIES:

- o *Design of Gate driver circuits for different power semi conductor switches.*
- o *Design flyback converter for Laptop charger*
- o *Design flyback converter for LED lighting system*
- o *Design flyback converter for Mobile phone charger*
- o *Design forward converter LED lighting system*
- o *Design forward converter Laptop charger*
- o *Design forward converter Mobile phone charger*

UNIT - 1 **L-12**

Design of Magnetics Components: Concept of magnetic materials , Core and copper winding, Thermal considerations of magnetic materials.

UNIT - 2 **L-12**

Design of Inductors: Analysis and design of specific Inductor, Inductor design procedure, Numerical problems.

Design of Transformers: Analysis and design of specific transformer, Eddy currents, Transformer leakage inductance, Transformer design procedure, Numerical problems.

UNIT - 3 **L-102**

Gate and Base Driver Circuits: Different driver circuits - DC coupled drive circuits, Electrically isolated drive circuits and cascode connected drive circuits; Design of thyristor drive circuit, Power device protection in drive circuits.

UNIT - 4 **L-12**

HEAT SINKS: Control of semiconductor device temperature, Heat transfer by conduction, Heat sinks, Heat transfer by radiation and convection.

UNIT - 5 **L-12**

DESIGN OF CONVERTERS: Design of single phase full bridge AC/DC converters, Design of DC-DC converters - Buck, Boost, Buck-boost, Flyback and forward converter.

TEXT BOOKS :

1. Muhammad H. Rashid, “Power Electronics - Circuits, Devices and Applications”, Academic Press, New Delhi, 2nd edition, 2006.
2. Mohan, Ned. et.al, “Power Electronics Converters, Applications and Design”, Wiley India Pvt. Ltd., New Delhi, 3rd edition 2007.

REFERENCE BOOKS:

1. B. Jayant Baliga, “Fundamentals of Power Semiconductor Devices”, Springer-Verlag Publication, New Delhi, 1st edition, 2008.
2. Robert Perret, “Power Electronics Semiconductor Devices”, Wiley-ISTE Publications, New Delhi, New Edition, 2009.

I

YEAR

M.Tech.

VLSI DESIGN

I SEMESTER

4	17VL001	-	Analog IC Design
4	17VL003	-	Digital IC Design
4	17VL005	-	VLSI Technology
4	17VL007	-	Semiconductor Device Modeling
4		-	Elective Course - I
4		-	Elective Course - II

II SEMESTER

4	17VL002	-	Mixed Signal Design
4	17VL004	-	VLSI Testing and Validation
4	17VL006	-	Low power VLSI Design
4	17VL008	-	Modelling and Synthesis with Verilog HDL
4	17HS001	-	Research Methods
4	17HS002	-	Employment Orientation Program
4		-	Elective Course - III
4		-	Elective Course - IV

COURSE CONTENTS

I SEM & II SEM

17VL001 ANALOG IC DESIGN

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

With an emphasis on CMOS technology, device models are briefly reviewed and developed further to cover channel-length modulation, sub threshold and short channel effects, as well as device parasitic capacitances. Integrated-circuit DC biasing techniques are presented starting from simple to more complex current mirrors, leading to analysis and design of current and voltage references. Temperature and power supply sensitivity, as well as absolute and mismatch parameter variations are introduced.

Course Outcomes:

- Develop an understanding of device and circuit theory sufficient to estimate the low and high frequency behavior of linear circuits, including noise.
- Develop an intuition for analog circuit behavior in both linear and nonlinear operation.
- Develop an ability to parse large circuits and systems into smaller, analyzable subunits, analyze them, and then apply the understanding gained from that process to analyze the system as a whole, including for noise and variation.
- Implement a circuit or subsystem at the transistor level to solve an open-ended problem and effectively communicate the constraints and critical aspects of that system.

SKILLS:

- Analog circuits design and verification techniques
- Detailed knowledge of the complete analog circuits design and analysis flow.

ACTIVITIES:

- *Current mirrors and Amplifiers.*
- *Frequency response analysis of Op-Amps.*
- *Able to do noise analysis.*

UNIT –I

CMOS device fundamentals: Basic MOS models, device capacitances, parasitic resistances, substrate models, transconductance, output resistance, frequency dependence of device parameters.

UNIT –II

Current Mirrors and Single stage amplifiers: CMOS current mirror, Common source amplifier, common drain amplifier or source follower, Common gate amplifier, Source degenerated current mirror, High output impedance current mirrors; Casode current mirror, Wilson current mirror, Cascode gain stage , MOS differential pair

UNIT –III

Frequency Response of Amplifiers: Miller effect, Common Source amplifier, Source follower amplifier, Common gate amplifier, Cascode gain stage.

UNIT –IV

Feedback topologies and Noise: Input mixing, Output sampling, Noise: Statistical characteristics, types of noise, Noise summation, Noise spectral density, White noise, 1/f or flicker noise, Noise bandwidth.

UNIT – V

CMOS Operational Amplifiers: Classification of Op Amps, Design of Op Amps, Compensation of Op Amps, Performance parameters, Design of two-stage Op Amps, Gain boosting, common mode feedback, Input range, slew rate, Power supply rejection, Noise in Op Amps. Stability and frequency Compensation, Buffered Op-amps, High speed / Frequency Op-amps, Differential output op-amps, low noise and low voltage op-amps.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

I) Design and simulate the following analog circuits.

1. Verify the characteristics of nMOS and pMOS Transistor
2. Common Source Amplifier
3. Common Drain Amplifier
4. Common Gate Amplifier
5. Current Mirror
6. Cascaded Current Mirror
7. Differential Amplifier
8. CMOS Op-amp single Stage
9. Two stage operational amplifier
10. Cascade Amplifier
11. Folded Cascode amplifier
12. Push Pull Amplifier
13. Current Controlled Voltage source

II) Layouts

TEXT BOOKS:

1. Behzad Razavi, Design of Analog CMOS integrated circuits, McGraw-Hill International edition, 2002.
2. D. A. Johns and Martin, Analog Integrated Circuit Design, John Wiley, 1st edition 1997.
3. Paul B Gray and Robert G Meyer, Analysis and Design of Analog Integrated Circuits, 5th edition, Wiley, 2009.
4. Phillip E.Allen and Douglas R.Holberg, CMOS Analog Circuit Design, Oxford University Press, 1st edition, 2007.

REFERENCE BOOKS:

1. R Gregorian and G C Temes, Analog MOS Integrated Circuits for Signal Processing, John Wiley,1st edition, 1986.
2. R L Geiger, P E Allen and N R Strader, VLSI Design Techniques for Analog & Digital Circuits, McGraw Hill, 3 rd edition, 1990.
3. Gray, Wooley, Brodersen, “Analog MOS Integrated circuits”, IEEE press, 1st edition, 1989.

17VL003 DIGITAL IC DESIGN

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

- To learn the basic MOS Circuits
- To learn the MOS Process Technology
- To understand the operation of MOS devices.
- To impart in-depth knowledge about analog and digital CMOS circuits.

Course Outcomes:

Upon successful completion of this course student should be able to:

Upon successful completion of this course student should be able to:

- Analyse the operation of CMOS.
- Analyse the design rules and layout diagram.
- Design of low power Adders and Multipliers.
- Analyse the physical design process of VLSI design flow.
- Design of CMOS Memories.

SKILLS:

- The ability of taking decision over the design aspect of digital IC for a particular application increases.
- Skill of Designing new techniques for critical parameters in digital IC design like power is improved.
- Circuit and switch level simulation and verification in design tool skill acquired.

UNIT – I

CMOS Inverter: Introduction to MOS transistor, V-I Characteristics, Electrical Parameters, Static behaviour, switching Threshold, Noise Margins, Robustness revisited, Dynamic behaviour: Computing the capacitances, propagation delay, propagation delay from a design perspective, power,energy and energy delay.

UNIT – II

Combinational Logic Design: Introduction, Static CMOS Design: Complementary CMOS, ratioed logic, pass transistor logic dynamic CMOS Design: Dynamic logic, speed and power dissipation of dynamic logic, signal integrity issues in Dynamic design, cascading dynamic gates.

UNIT – III

Sequential Logic Design: Introduction, static latches and registers: The Bistablility principle, multiplexer based laches, master-slave edge-Triggered register, low-voltage static laches, Static SR Flip-flop, dynamic laches and registers, dynamic transmission, Gate Edge - triggered registers, CMOS NORA-CMOS True single - phase clocked register (TSPCER).

UNIT – IV

Timing Issues in Digital Circuits: Introduction, Timing classification of digital systems, synchronous design, Self-Timed circuit design, synchronizers and arbiters.

UNIT – V

Digital Integrated System Building Blocks: Introduction, Adders, Multipliers, Shifters, Memories, ROM, RAM, Internal structure, ROM 2 D Structure, SRAM, DRAM.

ACTIVITIES:

- *Discussing different case studies like real design examples*
- *Implementing existing design tool and verifying the response of that particular design IC.*
- *Taking a particular design and doing all steps in VLSI design flow.*

DIGITAL IC DESIGN LAB

List of Experiments

1. Design of Inverter and all logic gates
2. Design and Simulation of Full adder
3. Design and Simulation of Serial Binary Adder, Carry Look Ahead Adder.
4. Design of SRAM and DRAM
5. Design of pseudo logic gates
6. Design of DCVSL logic gates
7. Design of flip flops: SR, D, JK, T
8. Design of edge triggered registers
9. Design of barrel shifter
10. Design of Multiplier

Note: Implementing the above designs on Circuit level/ RTL level in Cadence/Xilinx and FPGA/ CPLD kits.

TEXT BOOKS:

1. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic., Digital Integrated Circuits: A Design Perspective, Second Edition, **Pearson Education India,** 2003
2. Ken Martin, Digital Integrated Circuit Design, Oxford University Press, 1st edition, 1999.

REFERENCE BOOKS:

1. Neil H. E. Weste and D. M. Harris, CMOS VLSI Design, Third Edition, 2010. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia, 29 December 2017

17VL005 VLSI TECHNOLOGY

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

- To understand the Fabrication of ICs and purification of Silicon in different technologies.
- To impart in-depth knowledge about Etching and deposition of different layers.
- To understand the different packaging techniques of VLSI devices.

Course Outcomes:

Upon successful completion of this course student should be able to:

- The ability to use metallization techniques to create three dimensional device structures and devices.
- The ability to know methodology to fabricate an IC's.

SKILLS:

ü Ability to apply knowledge on different fabrication steps and design of different technology circuits using MOSFETS.

ü Ability to utilize a System approach to design a chip and operational performance.

UNIT – I

Crystal Growth, Wafer Preparation, Epitaxy and Oxidation : Metallurgical Grade Silicon, Electronic Grade Silicon, Czochralski crystal growing, Silicon Shaping, Etching, Polishing, Chemical Cleaning, gettering treatment, Vapor phase Epitaxy, Epitaxial Evaluation, Growth Mechanism, Introduction to Oxidation Techniques.

UNIT – II

Lithography, Deposition,Diffusion and Ion Implantation : Optical Lithography, Electron Lithography, Deposition process, CVD, Poly-silicon, structure, properties of Silicon Dioxide, Annealing, Furnace Annealing.

UNIT – III

Metallization, VLSI Process Integration and Packaging : Physical Vapor Deposition (PVD), NMOS IC Technology, CMOS IC Technology, BICMOS IC Technology, Packaging, packaging types and Packaging Design Considerations.

UNIT – IV

Introduction to MOS Technology and Electrical Properties : Introduction to MOS technology, Basic MOS transistors, MOS transistor operation, Drain current Vs voltage derivation, MOS Transistor parameters: threshold Voltage, gm, gds, pass transistor, NMOS inverter, Various Pull ups, Determination of pull up to pull down ratio for an NMOS inverter, CMOS inverter, DC Characteristics, Bi-CMOS inverter, Latch up in CMOS circuits.

UNIT – V

VLSI Circuit Design Processes and Circuit concepts and characterization : VLSI Design Flow, MOS Layers, Stick diagrams, Design rules, Layout generation- nMOS, CMOS, Bi-CMOS, Sheet Resistance, Standard unit of capacitance, Delay estimation, Power dissipation, Interconnect, Design margin, Scaling.

TEXT BOOKS:

1. S.M.Sze, *VLSI Technology*, 2nd edition, McGraw Hill, 2003.
2. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, Essentials of VLSI circuits and systems, 1st Edition. PHI, 2005.

REFERENCE BOOKS:

1. Amar Mukherjee, *Introduction to NMOS and CMOS VLSI System Design*, 1st edition, PHI, 2000.
2. James D Plummer, Michael D. Deal and Peter B. Griffin, *Silicon VLSI Technology: Fundamentals Practice and Modeling*, 1st edition, PHI, 2000.
3. Wai Kai Chen, *VLSI Technology*, 1st edition,CRC press, 2003.
4. Rainer Waser ,*Nano Electronics and Information Technology* , Wiley VCH – April 2003. AND *.S.K. Ghandhi, VLSI Fabrication Principles, John Wiley Inc., New York, 2nd edition, 1983.*
5. Nandita Das Gupta, *VLSI technology,* NPTEL Courseware.
6. Neil H.E.Weste and D.M.Harris, CMOS VLSI Design, Third Edition, PEARSON, 2011

ACTIVITIES:

- *Very Fast and Low Power Carry Select Adder Circuit using cadence tool.*

17VL007 SEMICONDUCTOR DEVICE MODELING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

- This course provides a solid foundation in the physics of semiconductors so that students will be able to not only understand current devices and exploit them in novel applications.
- It also appreciate the workings of new semiconductor devices as they materialize and evolve in future years.

Course Outcomes:

Upon successful completion of this course student should be able to:

- At the end of this course you should be able to Explain the equations, approximations and techniques available for deriving a model with specified properties, for a general device characteristic with known qualitative theory.
- Apply suitable approximations and techniques to derive the model referred to above starting from drift-diffusion transport equations (assuming these equations hold).
- Offer clues to qualitative understanding of the physics of a new device and conversion of this understanding into equations.
- Simulate characteristics of a simple device using MATLAB, SPICE and ATLAS / SYNOPSYS.
- Explain how the equations get lengthy and parameters increase in number while developing a compact model
- List mathematical functions representing various non-linear shapes

SKILLS:

- Ability to apply knowledge on different device models and design of devices and circuits.
- Ability to undertake problem identification through simulation which in turn cuts the fabrication costs significantly.

UNIT – I

SEMICONDUCTOR PHYSICS : Metals, insulator, semiconductors, intrinsic and extrinsic semiconductors, direct and indirect band gap, free carrier densities, Fermi distribution, density of states, Boltzmann statistics, thermal equilibrium, current flow mechanisms, drift current, diffusion current, mobility, band gap narrowing, resistance, generation and recombination, lifetime, internal electro-static fields and potentials, Poisson's equation, continuity equations, drift-diffusion equations.

UNIT – II

PN-JUNCTION DIODES : Thermal equilibrium physics, energy band diagrams, space charge layers, internal electro-static fields and potentials, reverse biased diode physics, junction capacitance, wide and narrow diodes, transient behavior, transit time, diffusion capacitance, small signal model.

UNIT – III

BIPOLAR TRANSISTORS : Basic theory and operation, heavy doping effects, double diffused transistors, Ebers-Moll model, low forward bias, junction and diffusion capacitance, transit times, parasitic, small-signal models, Early effect, saturation and inverse operation, breakdown mechanisms, punch-through.

UNIT – IV

MOS TRANSISTORS : MOS capacitor, accumulation, depletion, strong inversion, threshold voltage, contact potential, oxide and interface charges, body effect, drain current, saturation voltage, gate work function, channel mobility, sub-threshold conduction, short channel effects, effective channel length, effects of channel length and width on threshold voltage, Compact models for MOSFET and their implementation in SPICE. Level 1, 2 and 3, MOS model parameters in SPICE.

UNIT – V

UDSM TRANSISTOR DESIGN ISSUES : Short channel and ultra short channel effects, effect of high k and low k dielectrics on the gate leakage and Source –drain leakage; tunneling effects; different gate structures in UDSM - impact and reliability challenges in UDSM.

TEXT BOOKS:

1. Y.P. Tsividis, The MOS Transistor, McGraw-Hill, international edition ed.,1988.
2. Nandita DasGupta, Amitava DasGupta, Semiconductor Devices: Modeling and Technology, PHI
3. S.M.Sze, Semiconductor Devices Physics and Technology, John Wiley & Sons Inc, (2/e).
4. Angsuman Sarkar, [2] Short Channel Effects(SCE's) in sub-100nm MOSFETs: A Review.

REFERENCE BOOKS:

1. Getreu, Modeling the bipolar transistor, New York, NY: Elselvier, 1978.
2. D. Roulston, Bipolar Semiconductor Devices, McGraw Hill, 1990.
3. N.Arora, MOSFETModels for VLSICircuit Simulation, Springer-Verlag, 1993.
4. P.Antognetti and G. Massobrio, Semiconductor DeviceModeling with SPICE,McGraw-Hill, 1988.
5. D.W. Greve, Field Effect Devices and Applications, Prentice Hall Series in Electronics and VLSI, 1998.

ACTIVITIES:

- *Modelling and simulation of III-IV and Ge transistors for logic and power applications.*
- *A simple sub threshold CMOS voltage reference circuit with channel- length modulation compensation.*
- *Extremely-wide-range supply-independent CMOS voltage references for telemetry-powering applications.*

17VL002 MIXED SIGNAL DESIGN

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

- To understand the types of filters.
- To understand the different techniques of ADC and DAC.

Course Outcomes:

Upon successful completion of this course student should be able to:

- The ability to use DAC and ADC techniques for data conversions.
- The ability to program, Mixed Signal VLSI Circuits.

SKILLS:

- Understand What SoC is and what the differences between SoC and Embedded System.
- Learn to employ specialized knowledge of subsystems like processor cores and other SoC components to design.
- Improve student's capabilities of using the technical knowledge of processor architecture, peripherals, programming, and CAD tools.

UNIT – I

PLL & Switched Capacitors : Characterization of a comparator, Basic CMOS comparator design, analog multiplier, PLL – simple PLL, charge-pump PLL, applications of PLL, Switched Capacitor circuits – basic principles, switched capacitor sensitive integrator and insensitive integrator, switched capacitor filter, switched capacitor amplifier.

UNIT – II

Sampling Circuits : Basic sampling circuits for analog signal sampling, performance metrics of sampling circuits, different types of sampling switches.

Sample-and-Hold Architectures: Open-loop & closed-loop architectures, open-loop architecture with miller capacitance, multiplexed-input architectures, recycling architecture.

UNIT – III

Digital - to Analog Conversion : Input/output characteristics of an ideal D/A converter, performance metrics of D/A converter, Resistor string 3 bit DAC , Binary scale DACs, Cyclic DAC.

D/A Converter architectures: Resistor-Ladder architectures, current-steering, Pipeline DAC

UNIT – IV

Analog-To-Digital Conversion Input/output characteristics and quantization error of an A/D converter, performance metrics of A/D converter.

A/D converter architectures: Flash architectures, interpolate and folding architectures, pipelined architectures, Integrating (Dual slope) ADC Successive approximation architectures.

UNIT – V

Analog CMOS Filters : Low Pass filters, active–RC fully differential integrator, Two transistor MOSFET–C integrator, g_m-C Integrator, Active RC integrators

Mixed Signal Design Lab

List of Experiments:

1. Design of Common mode feed-back circuits
2. Design of switched capacitor circuits
3. Design of High Speed Comparator
4. Design of High Gain comparator
5. Design of first order filters
6. Design of full wave rectifier
7. Design of sinusoidal oscillator
8. Design of Ring oscillator
9. Design of PLL
10. Design of ADC
11. Design of DACs
12. Mini project.

Note : All the experiments are to be carried out independently by each students with different specifications.

ACTIVITIES:

- o Students can conceptualize multi resolution techniques using CAD.
- o Ability of extract the MOS amplification parameters.
- o Design improved CMOS amplifiers and Operational Amplifiers.

TEXT BOOKS:

1. Razavi, *"Design of analog CMOS integrated circuits"*, McGraw Hill, 2001.
2. Razavi, *"Principles of data conversion system design"*, S.Chand and company ltd, 2000.
3. Jacob Baker et. all, "CMOS Mixed-Signal circuit design", IEEE Press, 2002

REFERENCE BOOKS:

1. Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons.

17VL004 VLSI TESTING AND VALIDATION

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

- To involve the students in the theory and practice of VLSI test and validations.
- To introduce advanced techniques for efficiently testing and validating the VLSI design.
- To introduce the concept of Design for Test and the technique of automated test pattern generation.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Effectively test VLSI systems using existing test methodologies, equipments, and tools.
- Define a methodology to test the combinational and sequential circuits.
- To construct a Design for Testability (DFT) algorithm for VLSI Circuits.

SKILLS:

- Able to implement DFT techniques for VLSI Circuits
- Able to design any testable combinational logic circuit.
- Able to identify and analyse the yield of chips.

ACTIVITIES:

- How to detect the presence of fault in a circuit using different simulator techniques.
- Find a test vector for the circuit that stucks at 1 faults using combinational and sequential circuits.
- Find a device faults by using IDDQ technique.
- How to scan a by using system level approaches.
- How to test a memory by test algorithm.

UNIT – I

Introduction to VLSI Testing

Introduction - VLSI Testing Process And Test Equipment - Test Economics And Product Quality – Fault Molding-Logic And Fault Simulation.

UNIT – II

Test Generation for Combinational and Sequential Circuits Test generation for combinational logic circuits - Testable combinational logic circuit design - Test generation for sequential circuits - design of testable sequential circuits

UNIT – III

Advanced Testing Memory Test- Memory Density and Defect Trends, Faults **MEMORY TEST** Delay Test- IDDQ Test

UNIT – IV

Design for Testability : Design for Testability - Ad-hoc design - Storage cells for scan designs - Generic scan based design - System level DFT approaches

UNIT – V

Self Test and Test Algorithms : Built-In Self Test - Test pattern generation for BIST - Circular BIST – BIST Architectures - Testable Memory Design - Test algorithms - Test generation for Embedded RAMs.

TEXT BOOKS:

1. Viswani D.Agarval Michael L.Bushnell, “Essentials of Electronic Testing forDigitalMemory & Mixed Signal VLSI Circuit “, Kluwer Academic Publications, 2000.
2. L. T. Wang, C. W. Wu, and X. Wen, VLSI Test Principles and Architectures, Morgan

REFERENCE BOOKS:

1. Kaufmann Morgan Kaufmann Publishers, 2006 M. Abramovici, M.A. Breuer and A.D. Friedman, “Digital Systems and Testable Design”, Jaico Publishing House, 2002.
2. Alfred L.Crouch “Design for Test for Digital IC’s And Embedded Core Systems “, -PHI 1999

17VL006 LOW POWER VLSI DESIGN

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Objectives:

- The student will be able to understand the fundamentals of low power VLSI design.
- In this course, students can study low-power design approaches, power estimation and analysis.
- Another main object of this course is to motivate the graduate students to study and to analyze the low-voltage, low-power adders, Multipliers.
- The concepts of low-voltage, low-power memories and future trend and development of DRAM.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand the concepts of low-power design approaches.
- Design and analysis of low-voltage, low-power circuits.
- Extend the low power design to different applications.
- Understand of low-voltage, low-power memories and basics of DRAM.

SKILLS:

- Designing and analyzing skills acquired to words the low power and low voltage circuits.
- Spice circuits simulator usage skills improved.
- Students get skills in developing new techniques to decrement power in existing design for new designs and future use.

ACTIVITIES:

- Write a program for 8 bit addition by using different data types.
- Write a program for 8x1 multiplexer
- Write a program for D flip flop.
- Write a program for shift register.
- Write a program for ALU

UNIT - I

Fundamentals of Low Power VLSI Design: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT - II

Low-Power Design Approaches: Low-Power Design through Voltage Scaling: VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT - III

Power estimation and analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power and gate level capacitance estimation.

UNIT - IV

Low-Voltage Low-Power Adders, Low-Voltage Low-Power Multipliers Low-Voltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage, Low- Voltage Low-Power Logic Styles.

UNIT - V

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

REFERENCE BOOKS:

1. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.

2. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press, 2002.

17VL008 MODELLING AND SYNTHESIS WITH VERILOG HDL

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	45	15	30	-	5	5	-

Course Objectives:

- To design combinational, sequential circuits using Verilog HDL.
- To understand behavioral and RTL modeling of digital circuits.
- To verify that a design meets its timing constraints, both manually and through the use of computer aided design tools.
- To simulate, synthesize, and program their designs on a development board.
- To verify and design the digital circuit by means of Computer Aided Engineering tools.which involves in programming with the help of Verilog HDL.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand the basic concepts of verilog HDL
- Model digital systems in verilog HDL at different levels of abstraction
- Know the simulation techniques and test bench creation.
- Understand the design flow from simulation to synthesizable version
- Get an idea of the process of synthesis and post-synthesis

SKILLS:

- Able to design digital circuit by HDL.
- Able to realize digital circuit on FPGA kits

ACTIVITIES:

- o Write a program for 8 bit addition by using different data types.
- o Write a program for 8x1 multiplexer
- o Write a program for D flip flop.
- o Write a program for shift register.
- o Write a program for ALU

UNIT - I

Hardware modeling with the verilog HDL. Encapsulation, modeling primitives, different types of description.

UNIT - II

Logic system, data types and operators for modeling in verilog HDL. Verilog Models of propagation delay and net delay path delays and simulation, inertial delay effects and pulse rejection.

UNIT - III

Behavioral descriptions in verilog HDL - Verilog behaviors, behavioral statements, procedural assignments, procedural continuous assignments, timing controls and synchronization, blocking and non blocking assignments, constructs for activity flow control, tasks and functions, behavioral models of FSM.

UNIT - IV

Synthesis of combinational logic: HDL-based synthesis - technology-independent design, styles for synthesis of combinational and sequential logic, synthesis of finite state machines, synthesis of gated clocks, design partitions and hierarchical structures.

UNIT - V

Synthesis of language constructs, nets, register variables, expressions and operators, assignments and compiler directives. Switch-level models in verilog. Design examples in verilog.

HDL & FPGA Synthesis Lab

List of Experiments:

1. Design of combinational circuits using EDA Tools.
2. Design of sequential circuits using EDA Tools.
3. Design of 4-bit binary, BCD counters using EDA Tools (synchronous/ asynchronous reset).
4. Design of a N- bit Register using EDA Tools.
5. Design of Sequence Detector using EDA Tools (Finite State Machine- Mealy and Moore Machines).
6. Design of 4- Bit Multiplier, Divider using EDA Tools.
7. Design of ALU using EDA Tools.
8. Serial adder.
9. Memories.
10. Implement Real time small application digital circuit on FPGA - Case study.

TEXTBOOKS:

1. M.D.Ciletti, “Modeling, Synthesis and Rapid Prototyping with the Verilog HDL”, PHI, 1999.
2. S. Palnitkar, “Verilog HDL – A Guide to Digital Design and Synthesis”, Pearson, 2003.

REFERENCE BOOKS:

1. J Bhaskar, “A Verilog HDL Primer (3/e)”, Kluwer, 2005
2. M.G.Arnold, “Verilog Digital – Computer Design”, Prentice Hall (PTR), 1999.
3. Recent literature in Modeling and Synthesis with Verilog HDL.

17HS001 RESEARCH METHODS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondarydata, probability and non-probability sampling techniques.

UNIT-II

Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III

Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion,measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminate analysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution inInterpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copyrights.

TEXT BOOKS:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

REFERENCE BOOKS:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17HS002 EMPLOYMENT ORIENTATION PROGRAM

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P
30	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Preamble:

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.

ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.

iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech

students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education

according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and

get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.63

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- 5 Marks for attendance
- 5 Marks for formative assessment
- 40 Marks for summative assessment

I

YEAR

VLSI DESIGN

M.Tech.

ELECTIVES

4	17VL009	-	Scripting languages
4	17VL011	-	VLSI Signal Processing
4	17VL013	-	Verification Methodologies
4	17ES015	-	System On-chip Design
4	17VL015	-	CAD VLSI
4	17VL017	-	Advanced digital system design
4	17VL010	-	Nano Electronics
4	17VL012	-	ASIC
4	17VL014	-	MEMS
4	17VL016	-	Semiconductor Memory Design
4	17VL018	-	Nano Sensors and its Applications
4	17VL020	-	RF integrated circuit design

COURSE CONTENTS

I SEM & II SEM

17VL009 SCRIPTING LANGUAGES

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	15	30

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- This course provides an introduction to the script programming paradigm
- Introduces scripting languages such as Perl, PHP and Python.
- Learning TCL

Course Outcomes:

- Comprehend the differences between typical scripting languages and application programming languages.
- Acquire programming skills using scripting languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Python and select an appropriate language for solving a given problem
- Ability to design web pages using advanced features of PHP.

SKILLS:

- Able to implement any program using scripting language.
- Able to resolve security issues in internet programming.
- Write a program of employs list of a company using perl.
- Write a programming of security issues on operative systems in perl.
- Write a program to store the data using TCL.
- Execute a program on addition by using eval function.
- Design a window and widget using TK.

ACTIVITIES:

- Write a program of employs list of a company using perl.
- Write a programming of security issues on operative systems in perl.
- Write a program to store the data using TCL.
- Execute a program on addition by using eval function.
- Design a window and widget using TK.

UNIT – I

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT – II

Advanced perl Finer points of looping, pack and unpack, filesystem, eval, datastructures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Isses.

UNIT – III

TCL TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, PerlTk.

UNIT - IV

Python Introduction to Python langauge, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python,Exception Handling. Integrated

UNIT – V

Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

SCRIPTING LANGUAGES LAB

LIST OF EXPERIMENTS

1. Write a script that calculates the average performance score and prints out the members of the groups meeting the following criteria (each criterion should produce one group, rather than identifying a group that meets all four criteria): (a)native language is English (b) age is greater than 20 (c) age is greater than 20 and native language is English (d) performance score is greater than 70

2. Suppose you're given the following arrays containing participant information: @firstnames = ("Sarah", "Jareth", "Ludo", "Hoggle"); @lastnames = ("Williams", "King", "Beast", "Dwarf"); Write a script that asks the user whether the names should be sorted by first or last names, and whether the names should be sorted alphabetically or reverse alphabetically. Then, sort the participant list this way, and print out the sorted list of participants. Look at sort names reverseABC.pl for an example of sorting these names reverse alphabetically.

3. Suppose you're given the following arrays containing participant information: @firstnames = ("Sarah", "Jareth", "Ludo", "Hoggle"); @lastnames = ("Williams", "King", "Beast", "Dwarf"); @ages = (15, 39, 33, 43); @nativelanguages = ("English", "English", "Romanian", "English"); @performancescores = (85, 99, 35, 75);

4. Suppose you're given the following arrays containing participant information: @usernames = ("Sarah1", "Sarah2", "sarah3", "sArah4"); @scores = (10, 7, 42, 3); Write a program that outputs the participant information, sorted in one of the following ways: (a) ASCII-betical by participant username (b) case-insensitive ASCII-betical by participant username (c) numerical order by participant score (lowest to highest) (d) reverse numerical order by participant score (highest to lowest) The user should be able to choose which sorting order is preferred (default ASCIIbetical

on username) using a command line option. If you get stuck, have a peek at sort revnum.pl for an example of sorting this information reverse numerically.

5. Write a program on Recursive Procedures in TCL?
6. Write a program on Procedures with Variable Arguments in TCL?
7. Write a program on how to create a namespaces in TCL?
8. Write a program on regular expressions in TCL?
9. Design widget using TK?
10. Write a program on tuples in python?
11. Write a program on how to create strings?
12. Write a program on how to send one e-mail using Python script.

TEXT BOOKS:

1. David Barron, “The World of Scripting Languages”, Wiley Publications, 1 edition 2000

2. Steve Holden and David Beazley, “Python Web Programming”, ,New Riders Publications,2002

REFERENCE BOOKS:

1. J.Lee and B.Ware ,”Open Source Web Development with LAMP using Linux Apache,MySQL,Perl and PHP” (Addison Wesley) Pearson Education,2002.

2. M.Lutz,SPD, “Programming Python”, 2006

17VL011 VLSI SIGNAL PROCESSING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- To understand the basic concepts of DSP algorithms.
- To analyze the various pipelining and parallel processing techniques.
- To analyze the retiming and unfolding algorithms for various DSP applications.

Course Outcomes:

- To learn DSP algorithms.
- To understand and analysis the concept of pipelining and other processing for DSP applications.

SKILLS:

- The physical design process of VLSI circuits, including: logic partitioning, floor planning, placement, global routing, detailed routing, clock and power routing, and new trends in physical design.
- Students acquired the knowledge CMOS digital circuits for a low voltage low power environment.
- To impart knowledge on implementation of graph theory in VLSI.

UNIT – I

Introduction to DSP systems-Typical DSP algorithms-Representation of DSP Algorithm - Iteration Bound - Pipelined and parallel processing.

UNIT – II

Retiming - Unfolding –Folding.

UNIT – III

Systolic architecture design -Algorithmic strength reduction in filters and transforms.

UNIT – IV

Pipelined and parallel recursive and adaptive filters- Bit level arithmetic architecture.

UNIT – V

Numerical strength reduction – Overview of low power design and programmable digital signal processors.

TEXT BOOKS:

1. Keshab K.Parthi, " VLSI Digital Signal Processing systems, Design and implementation ",Wiley, Inter Science, 1999.

REFERENCE BOOKS:

1. Mohammed Isamail and Terri Fiez, "Analog VLSI Signal and Information Processing", Mc Graw-Hill, 1994.

2. S.Y. Kung, H.J.White House, T. Kailath, "VLSI and Modern Signal Processing ",Prentice Hall, 1985.

3. Jose E. France, Yannis Tsividis, " Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing ", Prentice Hall, 1994

ACTIVITIES:

- To introduce students to the process of designing application specific hardware implementations of algorithms for ASICs (FPGAs).
- Students will work with commercial computer aided design tools to synthesize designs described in hardware description languages by using CAD tools.
- To impart knowledge on automation methods for VLSI physical design.

17VL013 VERIFICATION METHODOLOGIES

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- This course gives a brief idea to Hardware Verification methodologies.
- It gives brief idea about Binary Decision Diagrams (BDDs) and algorithms over BDDs.
- It gives introduction to Combinational equivalence checking, Temporal Logics, Modeling sequential systems and model checking, Symbolic model checking.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Able to understand about Hardware Verification methodologies.
- Ability to understand the design of different algorithms over BDDS.
- Able to understand digital systems modeling and equivalence checking.

SKILLS:

- Able to identify combinational equivalence checking.
- Able to implement BDDS from combinational circuits.
- Able to identify the difference between model checking and symbolic checking.

UNIT – I

Introduction to Digital VLSI Design Flow, High Level Design Representation, Transformations for High Level Synthesis

Scheduling, Allocation and Binding

Introduction to HLS: Scheduling, Allocation and Binding, Problem, Scheduling Algorithms, Binding and Allocation Algorithms.

UNIT – II

Logic Optimization and Synthesis Two level Boolean Logic Synthesis, Heuristic Minimization of Two-Level Circuits, Finite State Machine Synthesis, and Multilevel Implementation.

UNIT – III

Verification Introduction to formal methods for verification, Temporal Logic: Introduction and Basic Operators, Syntax and Semantics of CTL, Equivalence between CTL Formulas.

UNIT – IV

Binary Decision Diagram: Introduction and construction, Ordered Binary Decision Diagram, Operations on Ordered Binary Decision Diagram, Ordered Binary Decision Diagram for Sequential Circuits.

UNIT – V

Verification Techniques Introduction to Verification Techniques, Model Checking, Symbolic Model Checking.

TEXT BOOKS:

1. D. D. Gajski, N. D. Dutt, A.C.-H. Wu and S.Y.-L. Lin, High-Level Synthesis: Introduction to Chip and System Design, Springer, 1st edition, 1992.

2. S. Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Prentice Hall,2nd edition, 2003.

REFERENCE BOOKS:

1. G. De Micheli. Synthesis and optimization of digital circuits, 1st edition, 1994.

2. M. Huth and M. Ryan, Logic in Computer Science modeling and reasoning about systems, Cambridge University Press, 2nd Edition, 2004.

3. Bushnell and Agrawal, Essentials of Electronic Testing for Digital, Memory & Mixed-Signal Circuits, Kluwer Academic Publishers, 2000.

ACTIVITIES:

- For any given problem apply any one of the scheduling algorithm..
- Design any one of finite state machine.
- Write a verilog HDL program using basic operators for addition and subtraction.
- Obtain a OBDD for the given logic function.
- Write a program for checking the errors in a code using code verification techniques.

17ES015 SYSTEM ON-CHIP DESIGN

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- To understand the concepts of System on Chip Design methodology for Logic and Analog Cores.
- To understand the concepts of System on Chip Design Validation.
- To understand the concepts of SOC Testing.

Course Outcomes:

- Upon successful completion of this course student should be able to: understand about SoC Design Methodology.
- Ability to understand the design of different embedded memories.
- SoC Design Validation and Testing Concepts can be understood.

SKILLS:

- He can know the different Bus protocols/architecture scan become an Expert in the following areas:
- Low Power, Security, Networking, Wireless, Flash Memory, Graphics, DSP.
- Good understanding of entire design flow, from RTL to GDS High RTL coding skills.

UNIT – I

Introduction- System tradeoffs and evolution of ASIC Technology- System on chip concepts and methodology – SoC design issues -SoC challenges and components.

UNIT – II

Design Methodological For Logic Cores- SoC Design Flow – On-chip buses –Design process for hard cores –Soft and firm cores – Core and SoC design examples.

UNIT – III

Design Methodology for Memory and Analog Cores- Embedded memories –Simulation modes Specification of analog circuits – A to D converter –Phase locked loops –High I/O.

UNIT – IV

Design Validation- Core level validation –Test benches –SoC design validation – Co simulation – hardware/ Software co-verification. Case Study: Validation and test of systems on chip.

UNIT – V

SoC Testing- SoC Test Issues –Cores with boundary scan –Test methodology for design reuse– Testing of microprocessor cores – Built in self-method –testing of embedded memories. Case Study: Integrating BIST techniques for on-line SoC testing.

TEXT BOOKS:

1. RochitRajsunah, System- on - a -chip: Design and Test, Artech House, 2007.

2. PrakashRaslinkar, Peter Paterson &Leena Singh, System-on-a-chip verification: Methodology and Techniques, Kluwer Academic Publishers, 2000.

REFERENCE BOOKS:

1. M.Keating, D.Flynn, R.Aitken, A, GibbonsShi, Low Power Methodology Manual for System-on-Chip Design Series: Integrated Circuits and Systems, Springer, 2007.

2. L.Balado, E. Lupon, Validation and test of systems on chip, IEEE conference on ASIC/SOC,1999.

3. A.Manzone, P.Bernardi, M.Grosso, M. Rebaudengo, E. Sanchez, M.SReorda, Centro Ricerche Fiat, Integrating BIST techniques for on-line SoC testing, IEEE Symposium on On-Line testing, 2000

ACTIVITIES:

- VHDL MODEL OF SMART SENSOR.
- VHDL Environment for Floating point Arithmetic Logic Unit - ALU Design and Simulation.
- DESIGN OF AN ON-CHIP PERMUTATION NETWORK FOR MULTIPROCESSOR SOC.
- Design and Synthesis of a Field Programmable CRC Circuit Architecture.
- Design of FPGA based 32-bit Floating Point Arithmetic Unit and verification of its VHDL code using MATLAB..

17VL015 CAD VLSI

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- To provide an introduction to the fundamentals of Computer-Aided Design tools for the modeling, design, analysis, test, and verification of digital Very Large Scale Integration (VLSI) systems. · To learn Physical design of VLSI Circuits ·
- To learn the Basics of Graph Theory Algorithms ·
- To understand the concept of CAD Tools. · To Learn the Physical Design of FPGA and MCMS

Course Outcomes:

Upon successful completion of this course student should be able to:

- Demonstrate knowledge and understanding of fundamental concepts in CAD.
- Demonstrate knowledge of computational and optimization algorithms and tools applicable to solving CAD related problems.
- Establish capability for CAD tool development and enhancement.
- Get the Overview of Physical Design of VLSI ICs .
- Gain the Knowledge of Graph Theory.
- Able to Design Backend Process using CAD Tools.
- To Get the Knowledge about Physical design of FPGA and MCMS.

SKILLS:

- Able to perform circuit extraction and simulation.
- Able to develop physical layout design.
- Able to perform logic verification.

UNIT – I

Introduction to VLSI Design Automation Introduction to VLSI Methodologies - VLSI Physical Design Automation - Design and Fabrication of VLSI Devices - Fabrication process and its impact on Physical Design.

UNIT – II

Graph Theory A Quick Tour of VLSI Design Automation Tools - Data structures and Basic Algorithms-Algorithmic Graph theory and computational complexity - Tractable and Intractable problems.

UNIT – III

CAD Tools General purpose methods for combinational optimization - partitioning - floor planning and pin assignment - placement - routing.

UNIT – IV

Simulation and Synthesis Simulation-logic synthesis -Verification-High level synthesis-Layout synthesis- Compaction.

UNIT – V

Design Automation of FPGA and MCMS Physical Design Automation of FPGAs, MCMS-VHDL-Verilog-Implementation of Simple circuits using VHDL and Verilog.

ACTIVITIES:

- o Design and testing of half adder /full adder.
- o Design and testing of 8 bit ALU.
- o Design a 6 transistor memory cell.
- o Design of dynamic logic d nand, d nor and d xor.

TEXT BOOKS

1. N.A. Sherwani, " Algorithms for VLSI Physical Design Automation ", 1999. 2. S.H.Gerez, " Algorithms for VLSI Design Automation ", 1998. REFERENCES: 1. Wayne Wolf "Modern VLSI Design",Third edition.

2. S.Smith "Application Specific Integrated Circuits". 5. S. Y. Kung, H. J. Whilo House, T.Kailath, " VLSI and Modern Signal Processing Prentice Hall, 1985.

/REFERENCE BOOKS

1. Jose E. France, YannisTsividis, " Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing ", Prentice Hall, 1994.

17VL017 ADVANCED DIGITAL SYSTEMS DESIGN

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- The objective of this course is to study methods to design of synchronous and asynchronous sequential circuits. This course also introduces testing algorithm techniques for combinational circuits, sequential circuits and PLAs & minimization and folding techniques of PLAs.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Ability to analyze and design synchronous and asynchronous sequential circuits.
- Ability to understand the testing of combinational, sequential and PLAs.
- Ability to understand the PLA folding and minimization.

SKILLS:

- Students able to learn the various digital systems and technologies include FPGA's.
- Students able to find how to test the digital circuit and what are different types of faults and how to eliminate those faults.

UNIT - I

SYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN & ASM CHARTS : Reduction of State Tables State Assignments,Sequential Circuit Design:- Design of Code Converter,Design of Iterative Circuits.Design of Sequential Circuits Using ROMs and PLAs, Sequential Circuit Design using CPLDs and FPGAs. ASM Charts.

UNIT - II

FAULTS IN DIGITAL CIRCUITS & TEST GENERATION FOR COMBINATIONAL CIRCUITS : Faults in Digital Circuits:-Failures and Faults, Modelling of Faults, Temporary Faults. Test Generation for Combinational Circuits:- Fault Diagnosis of Digital Circuits, Path Sensitization Technique, Boolean Difference Method, D-Algorithm, PODEM Algorithm, FAN, Delay Fault Detection. Detection of Multiple Faults.

UNIT - III

STATE-IDENTIFICATION EXPERIMENTS AND TESTING OF SEQUENTIAL CIRCUITS : Experiments, Homing Experiments,Distinguishing Experiments, Machine Identification, Checking Experiments, Design of Diagnosable Machines, Alternative Approaches to the Testing of Sequential Circuits, Design for Testability, Built-In Self-Test (BIST).

UNIT - IV

PROGRAMMABLE LOGIC ARRAYS : PLA Minimization and PLA Folding-The Compact Algorithm, Practical PLA s. PLA testing – Fault in PLA, Test Generation, DFT Schemes, Built-In Self Test.

UNIT - V

ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN : Analysis of Asynchronous Sequential Circuit (ASC) – Fundamental Mode Model, Flow Table, State Reduction, Design of ASC. Hazards, Races and Cycles.

TEXT BOOKS

1. Charles H. Roth Jr. and Larry L. Kinney, “Fundamentals of Logic design”, 6th ed.,Thomson Learning, 2004.

2. Parag K Lala, “Digital Circuit Testing and Testability”, Academic Press, 2002.

3. Zvi Kohavi and Niraj K.Jha, “Switching and Finite Automata Theory”,3rd., Cambridge University Press, 2010.

4. Nripendra N Biswas, “Logic Design Theory”, Prentice Hall of India, 2001.

5. John M Yarbrough, “Digital Logic applications and Design”, Thomson Learning, 2001.

REFERENCE BOOKS

1. Donald G. Givone, “Digital principles and Design”, Tata McGraw Hill 2002.

2. Stephen Brown and Zvonk Vranesic, “Fundamentals of Digital Logic with VHDLDeisgn”, Tata McGraw Hill, 2002.

3. Mark Zwolinski, “Digital System Design with VHDL”, Pearson Education, 2004.

ACTIVITIES:

- Design an ALU using PLA.
- Algorithm for fault finding in sequential circuits.
- Students able to perform the experiment on FPGA’s (Spartan 3E,vertex) boards.
- Students able to design the testing circuits by using testing methods (BIST).

17VL010 NANO ELECTRONICS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- To acquire knowledge about fundamental quantum mechanics.
- To study about architecture and operations of different nano structures.
- To comprehend the low dimension, high speed and low power design techniques and methodologies.

Course Outcomes:

Upon successful completion of this course student should be able to:

- To explain challenges due to scaling on CMOS devices, VLSI circuit design and fundamental limits of operation.
- To analyze and explain working of novel MOS based silicon devices and various multi gate devices.
- To analyze and explain working of SOI devices and their performance comparison with Silicon devices
- To understand the underlying concepts by setting up and solving the Schrödinger equation for different types of potentials in one dimension as well as in 2 or 3 dimensions for specific cases.
- To understand nanoelectronic systems and building blocks such as: low dimensional semiconductors, heterostructures, carbon nanotubes, quantum dots, nanowires etc.

SKILLS:

- knowledge about Quantum structures.
- Utilise the nano scale transistors for current applications.

UNIT - I

Challenges going to sub-100 nm MOSFETs – Oxide layer thickness, tunneling, power density, non-uniform dopant concentration, threshold voltage scaling, lithography, hot electron effects, sub-threshold current, velocity saturation, interconnect issues, fundamental limits for MOS operation. High-K gate dielectrics, effects of high-K gate dielectrics on MOSFET performance.

UNIT - II

Novel MOS-based devices – Multiple gate MOSFETs, Silicon-on-nothing, Silicon-on-insulator devices, FD SOI, PD SOI, FinFETs, vertical MOSFETs, strained Si devices 34.

UNIT - III

Hetero structure based devices – Type I, II and III Heterojunction, Si-Geheterostructure, hetero structures of III-V and II-VI compounds - resonant tunneling devices, MODFET/HEMT.

UNIT - IV

Carbon nanotubes based devices – CNFET, characteristics, Spin-based devices – spinFET, characteristics.

UNIT - V

Quantum structures – quantum wells, quantum wires and quantum dots, Single electron devices – charge quantization, energy quantization, Coulomb blockade, Coulomb staircase, Bloch oscillations

ACTIVITIES:

- o Using cadence tool, code should be written for FinFET and CNTFET, also simulated.
- o And schematics were drawn using MOSFETs.

TEXT BOOKS

1. Mircea Dragoman and Daniela Dragoman, Nanoelectronics – Principles & devices, Artech House Publishers, 2005.

2. Karl Goser, Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices, Springer 2005.

3. Mark Lundstrom and Jing Guo, Nanoscale Transistors: Device Physics, Modeling and Simulation, Springer, 2005.

4. Vladimir V Mitin, Viatcheslav A Kochelap and Michael A Stroscio, Quantum heterostructures, Cambridge University Press, 1999.

/REFERENCE BOOKS

1. S.M. Sze (Ed), High speed semiconductor devices, Wiley, 1990.

2. ManijehRazeghi, Technology of Quantum Devices, Springer, ISBN 978-1-4419-1055-4.

3. H.R. Huff and D.C. Gilmer, High Dielectric Constant Materials for VLSI MOSFET Applications, Springer 2005, ISBN 978-3-540-21081-8 , (Available on NITC intranet in Springer eBook section)

4. B.R. Nag, Physics of Quantum Well Devices, Springer 2002, ISBN 978-0-7923-6576-1, (Available on NITC intranet in Springer eBook section).

5. E.Kasper, D.J. Paul, Silicon Quantum Integrated Circuits Silicon-Germanium Heterostructures Devices: Basics and Realisations, Springer 2005, ISBN 978-3-540-22050-3, (Available on NITC intranet in Springer eBook section).

17VL012 ASIC

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- To prepare the student to be an entry-level industrial standard ASIC or FPGA designer.
- To give the student an understanding of issues and tools related to ASIC/FPGA design and implementation.
- To give the student an understanding of basics of System on Chip and platform based design.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Demonstrate VLSI tool-flow and appreciate FPGA architecture.
- Understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.
- Understand the algorithms used for ASIC construction.
- Understand the basics of System on Chip, on chip communication architectures like AMBA, AXI and utilizing Platform based design.
- Appreciate high performance algorithms available for ASICs IC.

SKILLS:

- Digital ASIC design and verification techniques
- Detailed knowledge of the complete ASIC design flow
-

UNIT - I

Types of ASICs, VLSI Design flow, Programmable ASICs - Antifuse, SRAM, EPROM, EEPROM based ASICs. Programmable ASIC logic cells and I/O cells. Programmable interconnects. Latest Version - FPGAs and CPLDs and Soft-core processors.

UNIT - II

Trade off issues at System Level: Optimization with regard to speed, area and power, asynchronous and low power system design. ASIC physical design issues, System Partitioning, Power Dissipation, Partitioning Methods.

UNIT - III

ASIC floor planning, Placement and Routing.

UNIT - IV

System-On-Chip Design - SoC Design Flow, Platform-based and IP based SoC Designs, Basic Concepts of Bus-Based Communication Architectures, On-Chip Communication Architecture Standards, Low-Power SoC Design.

UNIT - V

High performance algorithms for ASICS/ SoCs as case studies – Canonic Signed Digit Arithmetic, KCM, Distributed Arithmetic, High performance digital filters for sigma-delta ADC, USB controllers, OMAP

TEXT BOOKS

1. M.J.S. Smith,"Application Specific Integrated Circuits", Pearson, 2003 REFERENCEBOOKS: 1. H.Gerez, "Algorithms for VLSI Design Automation", John Wiley, 1999.

/REFERENCE BOOKS

1. J..M.Rabaey, A. Chandrakasan, and B.Nikolic, "Digital Integrated Circuit Design Perspective (2/e)", PHI 2003.

2. D. A.Hodges, "Analysis and Design of Digital Integrated Circuits (3/e)", MGH 2004.

3. Hoi-Jun Yoo, KangminLeeand Jun Kyong Kim, "Low-Power NoC for High-Performance SoC Design", CRC Press, 2008.

4. S.Pasricha and N.Dutt," OnChip Communication Architectures System on Chip Interconnect, Elsveir", 2008.

ACTIVITIES:

- o Design a SRAM memory cell.
- o Floor planning, routing and placing of adder in ASIC.
- o Design of digital filter of ADC.

17VL014 MEMS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- This course is an introduction to Micro Electro Mechanical Systems and is intended for Post Graduate students.
- Silicon-based integrated MEMS promise reliable performance, miniaturization and low-cost production of sensors and actuator systems with broad applications in data storage, biomedical systems, inertial navigation, micromanipulation, optical display and micro fluid jet systems.
- The course covers such subjects as materials properties, fabrication techniques, Mechanical sensor packaging, mechanical transduction techniques, pressure sensors, Force, torque and internal sensors.

Course Outcomes:

Upon successful completion of this course student should be able to:

- An introduction to microsensors and actuators and different applications in MEMS.
- Different micromachining technologies in MEMS
- Introduction on micromachinedmicrosensors and their different types
- MEMS Simulators and different FEA tools
- Bonding and Packaging of MEMS

SKILLS:

- Understand future applications of MEMS.
- Be able to apply all these skills to the design of a MEMS system.
  The above can be applied to understand the design and fabrication of NEMS

UNIT - I

An introduction to Micro sensors and MEMS, Evolution of Micro sensors & MEMS, Micro sensors & MEMS applications.

UNIT - II

Microelectronic technologies for MEMS, Micromachining Technology, Surface and Bulk Micromachining, working principle of various MEMS.

UNIT - III

Micro machined Micro sensors: Mechanical, Inertial, Biological, Chemical, Acoustic, Microsystems Technology, Integrated Smart Sensors and MEMS.

UNIT - IV

Interface Electronics for MEMS, MEMS Simulators, MEMS for RF Applications, Bonding & Packaging of MEMS, Conclusions & Future Trends.

UNIT - V

Polymer Mems Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors.

TEXT BOOKS

1. Tai-ran Su, MEMS and Microsystems: design and Manufacture, Tata McGraw Hill.
2. S.K. Ghandhi, VLSI Fabrication Principles, John Wiley Inc., New York, 1983.

REFERENCE BOOKS

1. S.M. Sze (Ed), VLSI Technology, McGraw Hill, 1988.
2. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2006.

ACTIVITIES:

- Design and Simulation of Inertia Sensors.
- Design and Simulation of Pressure Sensors.
- Design and Simulation of Electrostatic Actuators.
- Design and Simulation of Piezo resistive Actuators.

17VL016 SEMICONDUCTOR MEMORY DESIGN

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

To acquire knowledge about different types of semiconductormemories.

- To study about architecture and operations of different semiconductor memories.
- To comprehend the low power design techniques andmethodologies.

Course Outcomes:

Analysis the different types of RAM, ROM designs.

- Analysis the different RAM and ROM architecture and interconnects.
- Analysis about design and characterization technique.
- Analysis of different memory testing and design for testability.
- Identification of new developments in semiconductor memorydesign.

SKILLS:

- In-depth understanding of volatile and nonvolatile SRAMs, DRAMs.
  Analyse and test the advanced memory designs.

UNIT - I

Random Access Memory Technologies: Static Random Access Memories(SRAMs):SRAM cell structure- MOS SRAM architecture, MOS SRAM cell andperipheral circuit operation, bipolar SRAM technologies, silicon on insulator(SOI) technology, advanced SRAM architectures and technologies, applicationspecific SRAMs.

Dynamic Random Access Memories (DRAMs): DRAM technology development, CMOS CRAMs, DRAMs cell theory and advanced cell structures-BiCMOS DRAMs-soft error failure in DRAMs, Advanced DRAM designs andarchitecture, application specific DRAMs.

UNIT – II

Nonvolatile Memories: Masked Read, only memories (ROMs): High densityROMs, programmable read-only memories (PROMs)- bipolar PROMs, CMOSPROMs, erasable (UV)- Programmble read-only memories (EPROMs)-Floating Gate EPROM cell- one, time progammable (OTP) Eproms ElectricallyErasable PROMs (EEPROMs), EEPROM technology and architecture,nonvolatile SRAM-Flash memories (EPROMs or EEPROM), Advanced flashmemory architecture.

UNIT – III

Memory fault modeling, testing and memory design for Testability andfault tolerance, RAM fault modeling, electrical testing, Peusdo randomtesting, megabit DRAM testing nonvolatile memory modeling and testing,IDDQ fault modeling and testing, application specific memory testing.

UNIT – IV

Semiconductor memory reliability and radiation effects: General Reliability issues, RAM failure modes and mechanism, nonvolatile memory reliability,reliability modeling and failure rate prediction, design for reliability, reliability test structures, reliability screening and qualification.

Radiation effects, single event phenomenon (SEP)- radiation hardeningtechniques, radiation hardening process and design issues, radiation hardened memory characteristics, radiation hardness assurance and testing,radiation dosimetry, water level radiation testing and test structures.

UNIT – V

Advanced memory technologies and high-density memory packaging technologies:Ferroelectric Random Access Memories (FRAMs), Gallium Arsenide (GaAs)FRAMs, Analog memories magnetoresistive random access memories(MRAMs), Experimental memory devices.

Memory hybrids and MCMs (2D), Memory stacks and MCMs (3D), Memory MCM testing and reliability issues- memory cards- high density memory packaging future directions.

TEXT BOOKS

1. Ashok K.Sharma, Semiconductor Memories Technology, testing andreliability, Prentice hall of India Private Limited, New Delhi 1997.

2. Ashok K Sharna, Advanced Semiconductor Memories – Architecture, Designand Applications, Wiley 2002.

REFERENCE BOOKS

1. Anjan Ghosh, High Speed Semiconductor Devices, NPTEL Courseware,2009.

ACTIVITIES:

- Design of 6T SRAM, 7T SRAM, DRAM circuits
- Design of Sensing Amplifiers

17VL018 NANO SENSORS AND ITS APPLICATIONS

Hours Per Week :

L	T	P	C
4	-	-	4

Total Hours :

L	T	P
60	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

- The importance of nanoscale materials for sensing applications.
- Metallic and semiconductor nanoparticles.
- Organic and inorganic nanotubes and nanowires.
- Optical, mechanical and chemical sensors based on nanomaterials.
- Hybrid nanomaterial-based sensors.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Ability to enhance critical, creative, and innovative thinking.
- Approaches used for characterizing sensors based nanomaterials.
- Approaches used for tailoring nanomaterials for a specific sensing application

SKILLS:

- Ability to apply knowledge on different sensors and design of different technology circuits using sensors.
- Ability to utilize a system approach to design a chip and operational performance

UNIT-1

Sensor Characteristics and Physical Effects : Active and Passive sensors – Static characteristic - Accuracy, offset and linearity – Dynamic characteristics - First and second order sensors – Physical effects involved in signal transduction- Photoelectric effect – Photo dielectric effect – Photoluminescence effect – Electroluminescence effect – Hal effect – Thermoelectric effect – Peizoresistive effect – Piezoelectric effect – Pyroelectric effect –Magnetomechanical effect (magnetostriction) – Magneto resistive effect.

UNIT-2

Nano Based InorganicSensors : Density of states (DOS) – DOS of 3D, 2D, 1D and 0D materials – one dimensional gas sensors: - gas sensing with nanostructured thin films – absorption on surfaces – metal oxide modifications by additives – surface modifications – nano optical sensors – nano mechanical sensors – plasmon resonance sensors with nano particles – AMR, Giant and colossal magneto resistors – magnetic tunneling junctions.

UNIT-3

Organic / Biosensors: Structure of Protein – role of protein in nanotechnology – using protein in nanodevices – antibodies in sensing – antibody in nano particle conjugates – enzymes in sensing – enzyme nanoparticle hybrid sensors – Motor proteins in sensing – transmembrane sensors – Nanosensors based on Nucleotides and DNA – Structure of DNA – DNA decoders and microarrays – DNA protein conjugate based sensors – Bioelectronic sensors – DNA sequencing with nanopores – sensors based on molecules withdendritic architectures – biomagnetic sensors.

UNIT-4

Nano Sensors: Temperature Sensors, Smoke Sensors, Sensors for aerospace and defense: Accelerometer, Pressure Sensor, Night Vision System, Nano tweezers, nano-cutting tools, Integration of sensor with actuators and electronic circuitry Biosensors.

UNIT-5

Applications: Cantilever array sensors - Cantilever sensors for diagnosis of diabetes mellitus - Cantilever sensors for cancer diagnosis - Nanotube based sensors - Nanotube based sensors for DNA detection - Nanotube based sensors for capnography - Nanowire based sensors - Nanowire based electrical detection of single viruses – Nanowire based electrical detection of biomolecules.

TEXT BOOKS

1. Kourosh Kalantar – Zadeh, Benjamin Fry, “Nanotechnology- Enabled Sensors”, Springer,
2. H.Rosemary Taylor, “Data acquisition for sensor systems”, Chapman & Hall, 1997.

REFERENCE BOOKS

1. Jerome Schultz, Milan Mrksich, Sangeeta N. Bhatia, David J. Brady, Antonio J. Ricco, David R. Walt, Charles L. Wilkins, “Biosensing: International Research and Development”, Springer.
2. Ramon Pallas-Areny, John G. Webster, “Sensors and signal conditioning” John Wiley &Sons, 2001.
3. Vijay.K.Varadan, Linfeng Chen, Sivathanupillai, “Nanotechnology Engineering in Nano and Biomedicine”, John Wiley & Sons, 2010.

ACTIVITIES:

- Electrical and Optical Characteristics of InP Nanowires based p-i-n Photodetectors
- Modeling and Simulation of Carbon Nanotube Field Effect Transistors.
- Application of Porous Silicon in Terahertz Technology.

17VL020 RF INTEGRATED CIRCUIT DESIGN

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives

This course will develop electronic circuits for radio frequency applications, specific to CMOS integrated circuits. As the course title suggests, the course will be specific to CMOS integrated circuits, and specific to radio frequencies.

Course Outcomes

In particular, the course will focus on circuits for radio front-ends for mobile phone handsets. The course will cover low noise amplifiers, mixers and voltage controlled oscillators power amplifiers.

SKILLS:

- In-depth understanding of RF and analog circuit blocks such as LNAs, Mixers, Power.
- Amplifiers, VCOs, PLL, LO generation and base-band amplifiers.

UNIT-1

INTRODUCTION: RF systems- Basic Architectures, Transmission Media and Reflections, Maximum Power Transfer, Passive RLC Networks for Matching, Passive Impedance Transformation, Noise Models for Active and Passive Components, Classical Two-Port Noise Theory, Noise Figure, Friis Equation, Nonlinearity, Sensitivity and Dynamic range

UNIT-2

HIGH FREQUENCY AMPLIFIER DESIGN & LOW NOISE AMPLIFIERS DESIGN: High Frequency Amplifier Design – Bandwidth Estimation Using Open-Circuit Time Constants, Bandwidth Estimation Using Short-Circuit Time Constants, Risetime, Delay and Bandwidth, Zeros to Enhance Bandwidth , Shunt-Series Amplifier, Cascode Amplifier.Low Noise Amplifier (LNA) Design – LNA Topologies, Large Signal Performance, Design Examples.

UNIT-3

MIXERS: Mixer Fundamentals, Multiplier-Based Mixers, Sub-Sampling Mixers.

UNIT-4

VOLTAGE CONTROLLED OSCILLATORS: Resonators, Negative Resistance Oscillators.

UNIT – 5

RF POWER AMPLIFIERS: Class A, AB, B, C amplifiers, Class D, E, F Amplifiers,RF Power Amplifier Design Examples.

TEXT BOOKS

1. Thomas H. Lee ,"The Design of CMOS Radio-Frequency Integrated Circuits". Cambridge University Press, 2004.
2. Behzad Razavi ,"RF Microelectronics". Prentice Hall, 1998.

REFERENCE BOOKS

1. A.A. Abidi, P.R. Gray, and R.G. Meyer," Integrated Circuits for Wireless communications", New York: IEEE Press, 1999.
2. Jeremy Everard, "Fundamentals of RF Circuit Design With Low Noise Oscillators",John Wiley & Sons Ltd.2001

ACTIVITIES:

- Design LNA,Mixer, VCO,PLL and Power Amplifier

FOOD PROCESSING TECHNOLOGY

I

YEAR

M.Tech.

I SEMESTER

17FT001	-	Plant Food Technology
17FT003	-	Unit Operations in Food Processing Engineering
17FT005	-	Food Quality And Safety Engineering
17FT007	-	Food Microbiology
	-	Elective Course - I
	-	Elective Course - II

II SEMESTER

17HS101	-	Research Methods
17FT002	-	Engineering Technologies in Food Processing
17FT004	-	Food Quality Systems and Management
17FT006	-	Animal Product Training
17FT008	-	Food Packing Technology
17HS102	-	Employment Orientation Programme
	-	Elective Course - III
	-	Elective Course - IV

COURSE CONTENTS

I SEM & II SEM

17FT001 PLANT FOOD TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

This course deals with technologies related to handling, processing, and storage of 'fruits and vegetables' and 'Cereal and Pulses'. The objective of this course is to impart skill and knowledge required to apply the principles and concepts behind 'fruit and vegetable' and 'cereals and pulses' processing including post-harvest handling, specific processing techniques, quality analysis and stabilizing shelf life of the products.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Gain knowledge on processing techniques of 'fruits, vegetables, Cereal and pulses
- Know about preservation techniques to improve the shelf life of seasonal fruits
- Know the utilization of by products from fruits, vegetables, cereals and pulses

SKILLS:

- ✓ Identify and predicts the post harvest handling factors affecting the shelf life of fruits, vegetables, cereals and pulses
- ✓ Suggest suitable processing and storage conditions for fruits, vegetables, cereals and pulses
- ✓ Handle cereal processing equipment.

ACTIVITY:

- Report on nutritional composition, processing and storage considerations for a particular fruit / vegetable product

UNIT –I

Production of fruits and vegetables in India. Composition of each of the major fruits and vegetables produced in the country -Mangoes, Pineapple, Guava, Papaya, Grapes among fruits - Beans, Carrot, Tomatoes, Potato, Onion, Brinjal among vegetables. Causes for heavy losses. Spoilage factors, post harvest field operations including methods to reduce the post harvest losses, General methods of preservation of fruits and vegetables. Canning of fruits and vegetables Reception, sorting and storage operations for fruit and vegetables. Preparation of fruits and vegetables for canning. – Washing, peeling, grating, slicing, dicing, deseeding, blanching - Importance of blanching operations - Batch and continuous blanching.-Hot water and steam blanching.- Canning operations – Precautions in canning operations, Spoilage of canned foods. Common machinery for operations like Peeling, Slicing/Dicing, Pulping, Grating and canning process.

UNIT –II

Production and preservation of fruits and vegetable juices, preservation of fruit juice by hurdle technology. Preparation of Jam, Jelly and marmalade, pickles, vinegar and tomato product. Juice and pulp extraction – various extractors used including Hydraulic Press - Hot and Cold Break processes- Clarification centrifuges – Decanters and desludgers. Processing of tea, coffee cocoa and mushroom technology.

UNIT –III

Specialty products - Fruit Bars, Fruit juice concentrates – methods of concentration - evaporators used for concentration of fruit juices and pulp - Tubular, Plate and scraped surface evaporators and Fruit Powders -Preparation of Fruit material for powder production - Working of Spray, Dryer and Drum Dryer – Fruit juice aroma Recovery and its importance. Brief on Aroma Recovery equipment.

UNIT –IV

Storage of cereals, Infestation measures; Drying of grains, Processing of rice and rice products. Milling of wheat and production of wheat products, including flour and semolina. Milling of corn, barley, oat, coarse grains including sorghum, ragi and millets. Milling of Pulses: Major Pulses grown in the country and their application, Status of Pulse milling industry in India, need for modernization, Traditional milling process - merits and demerits. Drying of legumes - Sun drying, Traditional Processing steps – Pre-cleaning, Pitting, Oil application, Conditioning, Dehusking and splitting - Machinery and equipment employed, mass balance, losses during milling. Modern milling process - Process flow chart - Mechanical hot air drying and conditioning – merits and demerits, Dehusking in Pulse Pearler, Water conditioning, splitting of pulses in Pulse splitter, Merits and demerits. Mini dhal mill – working principle - advantages and disadvantages. Grinding of split pulses, pulse, flour products, their applications, and equipment used.

UNIT – V

Grain Storage and Handling: Bag Storage -Advantages and Disadvantages- Bag Storage structure design. Parameters of good storage structure. Cover Plinth Storage Structures, CAP storage (Ceiling and Plinth Storage), Plans for Bag storage, lay outs, Dunnage, Materials for Dunnage, Pallets, Protection against Rodents, Fungi, Pests and Mites. Fumigation Processes for bag storage piles. Bulk Storage in silos and large bins -Problems of Silo storage, Construction of Silos - concrete and Metal Silos, Physical load and mechanical strength of Silos, Silo flow problems, Relative merits and demerits of Silo storage to Bag Storage, Conveyors and Elevators for feeding and discharging into Silos. In silo Aeration and Drying, Problems of Dust Explosion in Grain Storages, Quality Changes of Grains during storages and remedial measures to prevent unwanted quality changes.

TEXT BOOKS:

1. Srivastava,R.P., and Sanjeev Kumar: Fruit and vegetable preservation; principles and practices : International Book Distributing Co., Lucknow. 1998.

2. Lal, G., Siddappa, G. and Tondon G.L.: Preservation of Fruits and Vegetables, Indian Council of Agricultural Research, New Delhi. 1986.

3. A. chakraverty: Post Harvest Technology of cereals, Pulses and Oilseeds: Oxford and IBH Publishing Company Pvt. Ltd., New Delhi. 1995.

REFERENCE BOOKS:

1. NLKent andADEvers, “Kent’s Technology of Cereals: An Introduction for students of Food Science and Agriculture”, 4th Ed., Woodhead Pub. Ltd., Cambridge, UK (1994
2. Dauthy, M.E.: Fruit and Vegetable Processing. International Book Distributing Co.Lucknow, India. (1997).
3. Hamson, L.P: Commercial Processing of Vegetables. Noyes Data Corporation, New Jersey. (1975)

17FT003 UNIT OPERTIONS IN FOOD PROCESSING ENGINEERING

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

- To understand the principle involved in food processing engineering
- To the principle and working of various processing equipments
- To know the methods of product recovery

Course Outcomes:

Upon successful completion of this course student should be able to:

- The students understand the operation of equipment
- The students know various factors affecting food processing equipments
- The students learn to select suitable processing equipment

SKILLS:

✓ Perform cumulative and differential particle size analysis

✓ Identify the suitable mixer required for mixing cohesive and non-cohesive solids

✓ Recognize the required specifications of the size reduction equipment for a given feed

✓ Identify the filtration equipment required for a specific application.

✓ Compare the efficiency of separation, size reduction, mixing and drying equipments

UNIT – I

Principles of fluid flow : Basic engineering mathematics - UNITs and dimension-conservation of mass and energy – principles of fluid flow – properties of liquids, fluid dynamics - mass and energy balance- potential energy, kinetic energy, pressure energy, friction loss, mechanical energy, Newtonian and non – Newtonian fluids-stream line and turbulent flow - flow measurement and measurement of viscosity.

UNIT – II

Evaporation and distillation : Blanching, pasteurization-LTLT, HTST and UHT process- evaporation – definition-single and multiple effect evaporator – mass and enthalpy balance – liquid characteristics – single and multiple effect evaporation-performance of evaporators and boiling point elevation – capacity – economy and heat balance-types of evaporators –short tube evaporators and long tube evaporators– agitated film evaporator- distillation - methods – flash distillation and differential distillation – steam distillation - distillation with Reflux and McCabe – Thiele method- Raleigh equation fractional distillation -steam requirements in food processing industries.

UNIT – III

Separation process : Sedimentation – gravitational sedimentation - Stoke's law - sedimentation of particles in fluids - cyclones – settling under sedimentation and gravitational sedimentation-centrifugal separations – rate of separations – liquid – liquid separation – centrifuge equipment - filtration –filter media – types and requirements-constant rate filtration – constant pressure filtration – filter cake resistance filtration equipment – rotary vacuum filter – filter press - membrane technology- classification – dialysis -gas permeation membrane process – types of membrane – equipments-Reverse osmosis membrane process – flux equation –ultra filtration membrane process – fluid equation – effects of processing variables filtration.

UNIT – IV

Contact equilibrium process : Concentrations - gas/liquid equilibria, solid/ liquid equilibria,- equilibrium concentration relationships - operating conditions- applications - gas absorption- rate of gas absorption- properties of tower packing – types – construction – flow through packed towers - extraction and washing – extraction equipments- washing – equipments and equilibrium diagram - equipment for leaching coarse solids – intermediate solids – crystallization - rate of crystal growth-crystallization equipments.

UNIT – V

Material handling, size reduction and mixing : Material handling equipments screw conveyor, bucket elevator, belt conveyor, chain conveyor, pneumatic conveyor-size reduction process- energy and power requirements in comminuting- Rittinger's, Bond's and Kick's laws of crushing - principles of milling equipments - hammer mill, attrition mill- pin mill, ball mill - homogenization principles - mixing – types of mixers –kneaders and blenders - gas liquid mixing – liquid solid mixing – applications – food plant layout and design - concepts- food plant hygiene - cleaning sterilizing waste disposal methods -- food packaging – functions, technique - machinery and equipment.

ACTIVITY:

- Evaluation of efficiency of drying for various fruits and vegetables using different dryers.

FOOD PROCESSING ENGINEERING LAB

List of Experiments

1. Experiment on minimal processing of fruits and vegetables
2. Experiment on microwave heating of food materials
3. Experiments on vacuum dryer
4. Experiments on freeze dryer
5. Experiments on extrusion cooking of foods
6. Experiments on value addition by flaking
7. Experiment on osmotic dehydration of fruits
8. Experiment on canning of fruits and vegetables
9. Experiment on freeze drying of fruits
10. Visit to cold storage
11. Manufacture of fruit squashes, RTS beverages
12. Experiment on irradiation of potatoes
13. Visit to fruit/vegetable processing UNIT
14. Experiment on vacuum packaging of fruits
15. Experiment on vacuum packaging of meat and meat products
16. Experiment on vacuum packaging of vegetables
17. Determination of tensile strength and elongation of packaging materials
18. Determination of water absorption of packaging materials
19. Experiments on modified atmospheric storage of fruits and vegetables
20. Experiment on packaging of powderedmaterials and oils using FFS machines
21. Visit to food industries and familiarize with packaging operations

TEXT BOOKS:

1. Bird R. Byron, Warren E. Stewart and Edwin N. Lightfoot. 2006. Transport Phenomena. Wiley India Pvt. Ltd., New Delhi
2. Earle, R.L. 1985. UNIT Operations in Food Processing. Pergamon Press. London.
3. Geankoplis J. Christie. 1999. Transport Process and UNIT Operations. Third Edition, Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. Albert Ibarz, Gustavo V. Barbosa – Canovas, "UNIT Operations in Food Engineering". 2nd Edition, Taylor & Francis, 2014.
2. Smith, PG. Introduction to food process engineering, 2nd edition, Springer 2011.
3. Chapman & Hall. USA, CBS publications New Delhi, 2007.

17FT005 FOOD QUALITY AND SAFETY ENGINEERING

Hours Per Week :

L	T	P	C
4	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

The course deals with global food safety laws, standards and regulations. The objective of the course is to impart knowledge to students on national and international food standards along with application of ISO and HACCP in food processing industries.

Course Outcomes:

Upon successful completion of this course student should be able to:

- understand about toxins from bacteria and fungi.
- know about different food additives, anti-nutrients, anti-vitamins used in food processing.
- explain about heavy metal contamination in foods.
- discuss about food safety and microbial standards

SKILLS:

✓ Identify the different sources of food contamination
✓ Categorize the contaminants on the basis of severity
✓ Prepare quality control charts for a given process
✓ Identify different allergens in foods
✓ Identify natural toxin present in food

UNIT – I

Criteria for quality control : Principles of food safety – Historical developments - need for quality control and safety- impact of food safety on world trade issues - strategy and criteria for food safety - microbiological criteria for safety and quality-sources of micro organisms for food spoilage –food borne diseases and their control - sampling plans and criteria for microbial assessments in foods food contaminants – physical, biological and chemical contaminants-factors affecting toxicity of compounds- quality control and food safety.

UNIT – II

Source of contamination : Causes of major failure of food safety – clothing and personal hygiene – –test for food safety. Quality control tools. Quality control chart – Quality factors in food – Nutritional labeling – Specification – Rules and Regulations - need for food plant sanitation –– cleaning and cleaners – Water supply- Good Manufacturing Practice. Metal contaminants- Sources of health hazard of metallic contaminants.

UNIT – III

Assessment of food safety: General and acute toxicity – Mutagenicity and carcinogenicity. Additives (Intention – direct) – Preservatives – antioxidants, sweeteners, flavors, colours, vitamins, stabilizers – indirect additives – organic resides – inorganic residues and contaminants. Food allergy, food intolerance, contaminants of processed foods, solvent residue, contaminants of smoked foods. Cleaner production is food industry-fruit and vegetable processing, sea food processing, brewing and wine processing.

UNIT – IV

Analytical Techniques in Foods : Application and operating parameters of Spectrophotometry, AAS, GC, HPLC, GC-MS, ICP, DSC, TGA,SEM, Colorimeter.

UNIT – V

Hygienic practices : Process equipment and machinery auditing, consideration of risk, environmental consideration, mechanical quality control - personnel hygienic standards- preventative pest control, cleaning and disinfesting system, biological factors underlying food safety.

TEXT BOOKS:

1. David A.Shapton and Norah F. Shapton. 1991. Principles and Practices for the Safe Processing of Foods. ButterworthHeinemann Ltd, Oxford.

2. Chesworth, N. 1997. Food HygieneAuditing. BlackieAcademic Professional, Chapman and Hall.

3. Jose M. Concon. 1988. Food Toxicology, Part-A-Principles and concepts Part B - Contaminants and Additives, Marrcel Dekkar Inc. Newyork and Brazil.

4. Jacob, M. 2004. Safe Food Handling. CBS Publishers and Distributors, New Delhi.

ACTIVITY:

- Detection of different heavy metals in food products.

REFERENCE BOOKS:

1. AOAC International, “Official methods of Analysis”, AOAC International, 18th edition, Gaithersburg, Mary Land, 2007.
2. Y. Pomeranz and C.E. Meloan, “Food Analysis: Theory and practice”, 3rd edition,A.V.I Publishing Company, INC West Port, U.S.A, 2013.
3. J. Jayaraman, “Laboratory Manual in Biochemistry”, 3rd edition, Wiley Eastern Publishers, New Delhi, 1980.
4. D. T. Plummer, “An introduction to Practical Biochemistry”, 2nd edition, Tata Mc Graw- Hill Publishing Co., New Delhi, 1979.
5. S. Sadasivam and A. Manickam, “Biochemical methods for Agricultural Sciences”, 2nd edition, New Age International Publisher, New Delhi, 1996.

17FT007 FOOD MICROBIOLOGY

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

This course deals with basics of food microbiology, preservation and spoilage of various food products. The objective of this course is to enable students to apply identification and enumeration techniques of microbes found in food products.

Course Outcomes:

Upon successful completion of this course student should be able to:

- understand the characteristics, morphology and classification of food borne microorganisms.
- understand microbiology of food products
- know about pathogens responsible for food spoilage
- understand the principles involved in food preservation techniques

SKILLS:

- ✓ efficient in preparing sterilize media and pure cultures of microbes
- ✓ able to Identify types of microorganisms present in food products
- ✓ expert in Isolation of microorganisms from the food sample

ACTIVITY

- Detection of different microbes from a given food products obtained from different sites (street foods, supermarket foods, hostel mess food etc).

UNIT – I

Foods as ecological niches, relevant microbial groups, Microbes found in raw materials and foods that are detrimental to quality, Factors that influence the development of microbes in food.

UNIT – II

Newer and rapid methods for qualitative and quantitative assay demonstrating the presence and characterization of microbes, Stress, damage, adaptation, reparation, death.

UNIT – III

Microbial growth in food: intrinsic, extrinsic and implicit factors, Microbial interactions, Inorganic, organic and antibiotic additives. Effects of enzymes and other proteins, Combination systems, Adaptation phenomena and stress phenomena, Effect of injury on growth or survival, Commercial available databases.

UNIT – IV

Microbial behavior against the newer methods of food processing, Adoption and resistance development, Microbes as test organisms, as sensors and as tools for future applications in energy production and food and non food industrial products.

UNIT – V

Modern methods of cell culture: synchronous and co- cell culture, continuous cell culture in liquid and solidmedia, Cell immobilization and applications, Pre and probiotics cultures.

FOOD MICROBIOLOGY AND ENZYMOLOGY LAB

Microbiology:

1. Evaluation of microorganism in raw and processed products by using various techniques
2. Study of factors influencing growth of microorganisms
3. Determination of effects of various preservatives including antibiotics on the suppression of microbial growth
4. Development of cell cultures using various techniques, production of newer microbial metabolites of industrial importance
5. Development of probiotics in lab.
6. Microbiological analysis of raw water quality
7. Isolation of micro organisms in fresh and processed foods.
8. Detection of food borne pathogens using polymerase chain reaction.

Enzymology :

9. Assay of enzymes for activity, specific activity, kinetics, stability (temperature, pH and storage)
10. Extraction and clarification of juices using enzymes
11. Applications of enzymes in baking
12. Starch and protein hydrolysis
13. Meat tenderization
14. Cheese making.
15. Preparation of wine and beer

Note: Out of the above experiments, a minimum of 12 experiments will be conducted in a semeste

TEXTBOOKS:

1. Adams M. 2006. Emerging Food-borne Pathogens.Woodhead Publ.
2. AdamsMR & MossMO. 2000. Food Microbiology. Panima.
3. Easter MC. 2003. Rapid Microbiological Methods in the Pharmaceutical Industry.
4. Harrigan W. 2003. Laboratory Methods in Food Microbiology. University of Reading, UK, Elsevier.

REFERENCEBOOKS:

1. James MJ, Loessner MJ & David A. 2005. Modern Food Microbiology. 7th Ed. Golden Food Science Text Series.
2. PedersonCS.1979.Microbiology of Food Fermentations.AVI Publ.
3. Roberts R .2002. Practical FoodMicrobiology. Blackwell Publ.
4. Rossmore HW. 1995. Handbook of Biocide and Preservative. Blackie
5. Wood JBB. 1999. Microbiology of Fermented Foods. Vols. I, II. Blackwell Academic.
6. Yousef AE. 2002. FoodMicrobiology: ALaboratory Manual. AVI.

17HS001 RESEARCH METHODS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondarydata, probability and non-probability sampling techniques.

UNIT-II

Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III

Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion,measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminateanalysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution inInterpretation, Significance of Report writing, Different steps in writing Report, Layout of theResearch Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copy rights.

Text Books:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17FT002 EMERGING TECHNOLOGIES IN FOOD PROCESSING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

To study about the concepts and principles of various techniques such as High Intensity Pulse techniques, Light Pulses and emerging aspects in food process engineering. To learn about the equipments used and working principle for the emerging aspects in food process engineering. To know the various applications of the new technologies in food process engineering.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Students are updated of the recent technological advancements in the field of Food Technology.
- Students are appraised of the alternate technologies in Thermal Processing of foods.
- The students are able to apply their knowledge on various technological advancements in the field of Food Technology.

SKILLS:

✓ Identify and compare various thermal and non-thermal treatment for a particular process.

✓ Understand process and equipment design of an emerging technique.

✓ Proficient knowledge of various value added products using emerging techniques.

UNIT – I

Thermal processing: Thermo bacteriology - thermal destruction of microorganisms - thermal death rate kinetics methods of sterilization and equipments involved- latest trends in thermal processing.

UNIT – II

Emerging technologies: Emerging technologies in food processing –necessity and advantages – hurdle technology – concepts and applications behavior of microorganisms during preservation – multi target preservation -minimal processing – optimal range of hurdles - super critical fluid extraction processes in food materials - electrical resistance heating – principles process and equipments.

UNIT – III

Non-thermal processing: High voltage electric pulse treatment in food preservation – radiation preservation of food- ionizing radiation- dosimetry lethal effects on microorganisms - UV light and pulsed light preservation –high hydrostatic pressure process of foods- equipment, processing and effect on microorganisms

UNIT – IV

Drying: Psychrometry - equilibrium moisture contents- theory of drying – drying models - drying rate constant –effective moisture diffusion– activation energy calculation during drying - heat requirements – driers for solid and liquid food- foam mat dryer, vacuum dryer, freeze dryer - microwave heating of food - Process and equipment- application - radio frequency drying, infrared drying, application of ultrasound - inactivation of microorganisms and enzymes

UNIT – V

Value addition processes: Extrusion - cold and hot extrusion – production of pasta - principles- extrusion cooking – single screw and twin screw extruders applications, process and quality of extrudates - value addition by flaking –process and quality assessment - encapsulation – micro and nano level process – process and methods – selection of core and wall materials –quality of encapsulated products - coating – coating materials and equipments – battering and breading, seasoning.

TEXT BOOKS:

1. Fellows, P. 1988. Food Processing Technology. Ellis Horwood International Publishers, Cambridge.

2. Gould,G.W. (Ed).1996. New methods of food preservation. First Edition. Blackie Academic and Professional, London.

3. Kudra,T. and A. S.Mujumdar.2009.Advanced drying technologies. Marcel Dekker, Inc. New York

REFERENCE BOOK:

1. Leniger, H.A. and Beverloo,W.A. 1975. Food Process Engineering. First Edition D. Reidel Publishing Company, Dordrecht, Holland.

2. Marcus Karel Owen R.Fennema and Daryl B.Lund. 1975. Principles of Food Science Part II, Physical Principles of Food Preservation, Marcel Dekker, Inc. New York.

3. Paul Singh, R. and Dennis R. Heldman. 2004. Introduction to Food Engineering. Elsevier India Pvt. Ltd., New Delhi.

ACTIVITY

- Formulation of extruded products using single screw and twin screw extruders and evaluation of its quality.

17FT004 FOOD QUALITY SYSTEMS AND MANAGEMENT

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	45	15	30	-	5	5	-

Course Description and Objectives:

The course deals with global food safety laws, standards and regulations. The objective of the course is to impart knowledge to students on national and international food standards along with application of ISO and HACCP in food processing industries.

Course Outcomes:

Upon successful completion of this course student should be able to:

- understand about toxins from bacteria and fungi
- know about different food additives, anti-nutrients, anti-vitamins used in food processing
- explain about heavy metal contamination in foods
- discuss about food safety and microbial standards

SKILLS:

✓ Identify the different sources of food contamination

✓ Categorize the contaminants on the basis of severity

✓ Prepare quality control charts for a given process

✓ Identify different allergens in foods

✓ Identify natural toxin present in food

UNIT – I **8 hr**

Concept of quality: Quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation; Sensory visàvis instrumental methods for testing quality

UNIT – II **12 hr**

Concepts of qualitymanagement: Objectives, importance and functions of quality control; Quality management systems in India; Sampling procedures and plans; Food Safety and Standards Act, 2006.

UNIT – III **10 hr**

Domestic regulations; Global Food safety Initiative; Various organizations dealing with inspection, traceability and authentication, certification and quality assurance (FSSAI Act, AGMARK, BIS); Labeling issues; International scenario, International food standard

UNIT – IV **8 hr**

Quality assurance, Total Quality Management; GMP/GHP; GLP, GAP; Sanitary and hygienic practices; HACCP; Quality manuals, documentation and audits; Indian & International quality systems and standards like ISO and Codex.

UNIT – V **10 hs**

Export import policy; export documentation; Laboratory quality procedures and assessment of laboratory performance; Applications in different food industries; IPR and Patent.

ACTIVITY:

- o Detection of natural toxins and allergens from various processed products.

FOOD PROCESS ENGINEERING LAB-II

1. Preparation of bread by straight dough methods
2. Preparation of yeast dough products - I
3. Preparation of yeast dough products - II
4. Preparation of Cakes and Cake decorations, cookies
5. Experiment on magnetic treatment of seeds.
6. Experiment on drying of seeds by thin layer drying.
7. Effect of microwave heating of seeds on germination of seeds.
8. Experiment with inclined belt separator.
9. Experiment with spiral separator.
10. Experiment with air screen cleaner.
11. Evaluation of specific gravity separator.
12. Evaluation of tomato seed extractor.
13. Evaluation of chillies seed extractor.
14. Experiment on distillation.
15. Experiment on centrifugal separation.

16. Experiment on vacuum filtration.
17. Experiments on ultra-filtration.
18. Experiment on reverse osmosis.
19. Experiments on pinmill and ball mill
20. Experiments on attrition mill and hammer mill.
21. Experiments on mixing of solids and liquids.
22. Preparation of regional fruit juices
23. Preparation of whey-based beverages
24. Preparation of iced and flavoured tea beverage
25. Preparation of carbonated and noncarbonated soft drinks
26. Preparation of soy milk, fruit milkshakes, herbal beverages

TEXT BOOKS:

1. AmerineMA et al 1965. Principles of Sensory Evaluation of Food. Academic Press.
2. Early R.1995. Guide to Quality Management Systems for Food Industries. Blackie Academic.
3. Furia TE.1980. Regulatory Status of Direct FoodAdditives. CRC Press.
4. Jellinek G. 1985. Sensory Evaluation of Food - Theory and Practice. Ellis Horwoood.
5. Krammer A& Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ.
6. Macrae R. et al.1994. Encyclopedia of Food Science & Technology & Nutrition. Vol. XVI. Academic Press.

REFERENCE BOOKS:

1. Piggot JR. 1984. Sensory Evaluation of Foods. Elbview Applied Science.
2. Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill.
3. Export/import Policy by Govt of India.

17FT006 ANIMAL PRODUCT TRAINING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

To understand about the composition, nutritive value of meat, poultry and fish. To know about processing technology of meat, poultry and fish. To learn the technology of meat products and eggs.

Course Outcomes:

Upon successful completion of this course student should be able to:

- The student will be able to understand about the composition of meat, poultry and fish.
- The student will have knowledge on the processing of meat, poultry and fish and their by products
- The students will have knowledge about meat plant sanitation, hygiene and standards.

SKILLS:

- ✓ Proficient in various meat preservation techniques
- ✓ Process meat, fish and poultry into various value added products
- ✓ Expert in various post mortem and ante mortem techniques
- ✓ Suggest regulations for meat processing plants

ACTIVITIES:

- o Mention the quality requirements for a fish processing UNIT
- o Mention the uses of by-products obtained from poultry processing UNIT

UNIT - I

Sources of meat and meat products in India, its importance in national economy. Chemical composition and microscopic structure of meat. Effect of feed, breed and management on meat production and quality. Slaughtering of animals and poultry, inspection and grading of meat. Factors affecting post- mortem changes, properties and shelf life of meat. Meat quality evaluation. Mechanical deboning, meat tenderization. Aging, pickling and smoking of meat. Meat plant sanitation and safety, byproduct utilization.

UNIT - II

Poultry: classification, composition, preservation methods and processing. Structure, composition, nutritive value and functional properties of eggs and its preservation by different methods. Processing of egg products. Factors affecting egg quality and measures of egg quality. Types of fish, composition, structure, post-mortem changes in fish. Handling of fresh water fish. Canning, smoking, freezing and dehydration of fish. Preparation of fish products, fish sausage and home makings.

UNIT - III

Fish products - production of fishmeal, fish protein concentrate, fish liver oil and fish sauce and other important byproducts; Quality control of processed fish; Fish processing industries in India. Milk processing: Milk processing flow sheet – Filtration / clarification, Storage of milk, Standardization – simple problems in standardization, Homogenization, pasteurization

– types of pasteurization process. Equipments used in each process - Cream separating centrifuges, Pasteurizers (Heat Exchangers), Homogenizers, Bottle and pouch fillers, Milk Chillers, Plant piping, Pumps.

UNIT - IV

Manufacture of dairy products: Manufacture of Cream, Butter, Ghee, Milk powder, Cheese – types and defects in cheese. Quality aspects of these products. Equipments used for manufacture of each product like butter, churn, ghee. Boiler, Spray and Drum Dryers, Product instantizing equipment etc.

UNIT - V

Manufacture of Ice Cream and other dairy products. Manufacture of Ice– Chemistry and technology – Microbiology of ice cream – Quality aspects. Manufacture of paneer, Toned Milk, Sweetened condensed milk, Khoa. Fermented dairy products: Fermented products – Yoghurt, curd, acidophilus milk, butter milk. dairy plant sanitization – Cleaning in place – bottle and can washing, cleaning of tankers and silos – Detergents and sanitizers used. Energy use in Dairy plant - sources and cost of energy, Control of energy losses and energy conservation. Quality control of milk and milk products; Milk plant hygiene and sanitation.

TEXT BOOKS:

1. Lawrie, R.A. 1975. Meat Science, 2nd Edn. Pergamon Press, Oxford UK.
2. Vijaya Khader, 2001, “A Textbook of Food Science and Technology”, ICAR, NewDelhi.
3. Modern Dairy Products, Lampert LH; 1970, Chemical Publishing Company.

REFERENCE BOOKS:

1. Developments in Dairy Chemistry – Vol 1 & 2; Fox PF; Applied Science Pub Ltd.
2. Milk & Milk Processing; Herrington BL; 1948, McGraw-Hill Book Company.
3. Portsmouth, J.I. 1979, Commercial Rabit Meat Production. 2nd Edn. Saiga Survey, England.

17FT008 FOOD PACKING TECHNOLOGY

Hours Per Week :

L	T	P	C
3	-	3	5

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

This course deals with types and functions of packaging material along with its various methods and equipment used for packaging. The objective of this course is to impart knowledge to students on applications of food packaging materials and methods effectively in accordance with relevant standard regulations, environment protection and ethical principles.

Course Outcomes:

Upon successful completion of this course student should be able to:

- understand various methods of packaging, factors affecting the shelf life of packaged foods
- know about hazards and toxicity associated with packaging materials
- understand various testing methods used for packaging materials
- Understand the design flow from simulation to synthesizable version
- develop knowledge on laws and regulations involved in safety and labeling of foods

SKILLS:

- ✓ Measure and evaluate properties of packaging materials
- ✓ Define the packaging requirements for a given food product
- ✓ Suggest suitable labeling requirements for a food package

ACTIVITIES:

- Prepare database for packaging materials with their functional properties
- Report on national and international packaging standards

UNIT-1

Introduction to principals of food packaging, Types of packaging. Functions of packaging; Type of packaging materials; Selection of packagingmaterial for different foods. Selective properties of packaging film; Methods of packaging and packaging equipment. Mechanical strength of different packaging materials; Printing of packages. Barcodes & other marking; Interactions between packaging material and foods; Environmental and cost consideration in selecting packaging materials.

UNIT-2

Testing of packaging; Rigid and semi rigid containers; Flexible containers; Sealing equipment; Labelling; Asceptic and shrink packaging; Secondary and transport packaging. Food packaging and law, shelf life testing,modern and traditional packaging material, physical and chemical properties, production, storage and recycling of packagingmaterials, regulation and equipment analysis of various existing packaging system and standards. Active and intelligent packaging techniques:Active packaging techniques, intelligent packaging techniques, Current use of novel packaging techniques, Consumers and novel packaging. Oxygen, ethylene and other scavengers: Oxygen scavenging technology, Selecting the right type of oxygen scavenger, Ethylene scavenging technology, Carbon dioxide and other scavengers. Antimicrobial food packaging: Antimicrobial agents, Constructing an antimicrobial packaging system, Factors affecting the effectiveness of antimicrobial packaging

UNIT-3

Non-migrating bioactive polymers (NMBP) in FoodPackaging: Advantages of NMBP, Inherently Bioactive synthetic polymers: types and application, Polymers with immobilized bioactive compounds,Applications of polymers with immobilized bioactive compounds. Time- temperature indicators (TTIs): Defining and classifying TTIs, Requirements for TTIs, The development of TTIs, Maximising the effectiveness of TTIs, Using TTIs tomonitor shelf- life during distribution. The use of freshness indicator in packaging: Compounds indicating the quality of packaged food products, Freshness indicators, Pathogen indicators Other methods for spoilage detection. Packaging-flavour interactions: Factors affecting flavour absorption, The role of the food matrix, The role of differing packagingmaterials, Flavourmodification and sensory quality. Moisture regulation: Silica gel, Clay, Molecular sieve, Humectant salts, Irreversible adsorption.

UNIT-4

Developments in modified atmosphere packaging (MAP): Novel MAP gases, Testing novel MAP applications, Applying high oxygen MAP. Recycling packaging materials: The recyclability of packaging plastics, Improving the recyclability of plastics packaging, Testing the safety and quality of recycled material, using recycled plastics in packaging. Green Plastics for food packaging: The problem of plastic packaging waste, The range of biopolymers, Developing novel biodegradable materials.

UNIT-5

Integrating intelligent packaging, storage and distribution: The supply chain for perishable foods, The role of packaging in the supply chain, Creating integrated packaging, storage and distribution: alarm systems and TTIs. Testing consumer responses to new packaging concepts: Newpackaging techniques and the consumer, Methods for testing consumer responses, Consumer attitudes towards active and intelligent packaging.

FOODQUALITY ASSURANCE LAB

List of Experiments:

1. Application of GC for pesticide residue analysis.
2. Exercise for identifying CCP in bakery processing.
3. Exercise for identifying CCP in milk processing.
4. Establishment of CCP Decision tree.
5. Visit to HACCP UNIT.
6. Exploring BIS and FPO and study their importance.

7. Exploring Codex standards and specifications and study their importance.
8. Experiments on food quality analysis – physical parameters
9. Experiments on food quality analysis – biochemical parameters
10. Visit to food quality analysis laboratory / BIS / Spice Board / AGMARK.
11. Visit to quality control laboratory of a food processing industry.
12. Chemical analysis of raw water quality
13. Assay of lipid degradation and polymerization products in fried foods and fried oils
14. Analysis of phytosterols, trans-fatty acids and omega fatty acids
15. Estimation of Gluten
16. Determination of alcoholic acidity
17. Determination of falling number/amylase
18. Determination of Pelshenke value
19. Determination of sedimentation value
20. Evaluation of quality of products stored in packaging films and glass bottles.
21. Quality analysis of vacuum packaged products after storage.
22. Estimation of sugar-acid ratio of fruits

Note: Out of the above experiments, a minimum of 12 experiments will be conducted in a semester.

Pilot Plants:

1. Vegetable processing plant
2. Automatic mango processing plant
3. Combined rice mill / paddy processing plant
4. Automatic idli / dosa making plant
5. Fully Automatic Pet Bottle Filling, Capping and Labeling plant
6. Honey Processing Plant
7. Soymilk and tofu processing plan

TEXTBOOKS:

1. A handbook of Food Packaging, FAPaine and HY Paine, Blackie & Sons Ltd., Glasgow, UK.
2. Modern Food Packaging, Published by Indian Institute of P ackaging,Mumbai (1998).
3. A Textbook of Food Science and Technology, ICAR, New Delhi (2001).

REFERENCEBOOKS:

1. Food Packaging and Preservation (theory & practice) by M.Mathlouthi Elsevier Applied science publisher, London and New york.
2. Plastics in packaging by forwarded by H.B Ajmera & M.R Subramanium – Indian institute of packaging. Published by A.P.Vaidya, Secretary IIP, E2, MIDC, Industrial Area.
3. Food and Packaging Interactions by Joseph H. Hotchkiss, (ACS symposium series - 365, April 5-10, 1987, American chemical society, Washington DC, 1988.)
4. Packaging foods with plastics by winter A. Jenkins & James P Harrington – Technomic publishing co. Inc, Lancaster. Basel.
5. Flexible food packaging (Question &Answers) by Arthur Hirsch VNB – Van Nostrand Reinhold, New York (An AVI Book), ISBN 0-442-00609-8.

17HS002 EMPLOYMENT ORIENTATION PROGRAM

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	45

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Preamble:

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.

ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.

iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech

students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education

according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and

get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.63

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- 5 Marks for attendance
- 5 Marks for formative assessment
- 40 Marks for summative assessment

I

YEAR

FOOD PROCESSING TECHNOLOGY

M.Tech.

ELECTIVES

I SEMESTER

- 17FT009 - Equipment Design And Process Control
- 17FT011 - Food Biochemistry And Nutrition
- 17FT013 - Refrigeration And Coldstorage Construction
- 17FT015 - Nutraceuticals And Health Foods
- 17FT017 - Plantation Crops, Spices & Condiment Technology
- 17FT019 - Industrial Biotechnology
- 17FT021 - Traditional And Convenience Food Technology
- 17FT023 - Automation In Food Processing

II SEMESTER

- 17FT012 - Separation Techniques in Food Processing
- 17FT014 - Environmental Food Processing
- 17FT016 - Plant Layout And Process Economics
- 17FT018 - Heat&Mass Transfer Operations in Food Processing
- 17FT020 - Sugar And Confectionary Technology
- 17FT022 - Beverages Technology
- 17FT024 - Lipid Science And Technology
- 17FT026 - Dairy Technology

COURSE CONTENTS

I SEM & II SEM

17FT009 EQUIPMENT DESIGN AND PROCESS CONTROL

Hours Per Week :

L	T	P	C
3	1	0	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

This course deals with the principles, mechanism, selection and design of different equipments used in food industry. The objective of this course is to introduce students to a wide range of equipments such as heat exchangers, dryers, freezer, filters for different process operations, their design considerations and material selection.

Course Outcomes:

- know about the designing aspects of food processing equipment
- understand the applications of processing equipment in food industry
- gain knowledge on process parameters in mechanical, thermal and mass transfer operations carried out in food processing.

SKILLS:

✓ able to Design common equipment used in food processing industries

✓ Perform design calculations for heat exchanger, dryer and evaporators

ACTIVITIES:

- Selection and optimization of operating and performance parameters in different food processing equipments

UNIT – I

Basic Scientific and Engineering principles of equipment design and process control, Properties of substances, chemical equation and stoichiometry, phases and phases rule, material and energy balances, energy balance and open system. Engineering properties of food materials and their significance in equipment design. Principles of CAD and its simple application.

UNIT – II

Design of Vessels: Codes and regulations, Materials of construction, Design for pressures, Design pressure and temperature loadings, allowable stresses, minimum thickness after forming, corrosion mechanism,corrosion control, Design for internal and external pressure, cylindrical and spherical shell, formed heads, re-enforcement openings.

UNIT – III

Design of food storage tank, horizontal and vertical silos, insulated and uninsulated, process plant piping: codes and regulations, testing, fabrication requirements, overall economic and safety considerations, heat exchangers: shell and tube heat exchangers, construction codes, general design considerations, clad tube sheet, plate type exchangers, air cooled heat exchangers, heat exchanger cost economics.

UNIT - IV

Instrument terminology and performance system accuracy, flow sheet symbols, instrument evaluation, electrical, mechanical, magnetic and optical transducers formeasurement of process variables like temperature, pressure, flow, level, consistency and humidity, indicating and recording devices: direct acting and servo operated systems, digital indicators, strip and circular chart recorders, electronic data loggers, principles of automatic process control.

UNIT – V

Process characteristics, controller characteristics, closed loop system, pneumatic and electric controllers, final controlling elements, control valves, valve sizing, electronic actuators, motor drives and controls, introduction to programmable logic controllers (PLC): internal structure, inter facing with sensors and actuators, binary logic diagrams and ladder diagrams, choosing a PLC system.

TEXT BOOKS:

1. Considine DM. 1974. Process Instruments and Controls. Mc- Graw-Hill.
2. Considine DM. 1964. Handbook of Applied Instrumentation. Mc- Graw- Hill.
3. Eackman DP. 1972. Automatic Process Control.Wiley Eastern.
4. Evans FL. 1974. Equipment Design Hand Book. Vol. II. Gulf Publ.
5. Foust AS et al. 1960. Principle of UNIT Operations. JohnWiley & Sons

REFERENCE BOOKS:

1. Hesse ND, C.R. &Ruston JH. 1964. Process EquipmentsDesign. Affiliated East-West Press.
2. Kempe's Engineers Year Book 1996.Miller Information Services, UK.
3. Kern DQ. 1965. Process Heat Transfer. McGraw-Hill.
4. Liptak BG. 1995. Process Measurement and Analysis. Butterworth- Heinmann.
5. McCabeWL, Smith JC & Harriott P. 1993. McGraw Hill.

17FT011 FOOD BIOCHEMISTRY AND NUTRITION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

This course offers the students knowledge on biological basis of nutrition, metabolic pathways, enzyme activity and mechanisms by which diet can influence health. The objective of this course is to empower the students with methods and techniques for molecular weight estimation of proteins, qualitative analysis of edible fats and oils and make nutrient profiles for balanced diet and health.

Course Outcomes:

- describe the major metabolic pathways involved in the metabolism of nutrients in the human body
- analyze the roles of biomolecules in metabolic reactions and relate metabolism with human nutrition
- understand the basis of reactivity of biologically relevant molecules and their interactions.

SKILLS:

✓ Separation and molecular weight estimation of proteins

✓ Quality analysis of edible fats and oils

✓ Identify and recommend micro and macro nutrient profile for balanced diet and health

✓ Enzyme activity measurement and determining the mechanism of the reaction

UNIT – I

Basic Concepts of Carbohydrates: Structure and properties of Mono, Di, Oligo & polysaccharides, complex carbohydrates, Confirmation of pyranose & furanose ring, glycosidic bond, Glycogen, starch & dextran; as mobilizable stores of glucose. Cel lulose, glycoproteins, glycosaminoglycans & lectins; structure and function.

UNIT – II

Bioenergetics & Metabolism of Carbohydrate: Respiratory chain, Aerobic and anaerobic respiration. Glycolysis, Glucogenesis, Glycogenolysis, Gluconeogenesis, ED Pathway, Pentoses phosphate shunt & TCAcycle.

UNIT – III

Amino Acids: Amino acids - Classifications, Physico – Chemical Properties, Protein structure, folding & function, Nitrogen Cycle, Nitrogen Balance, reductive amination & transamination & Urea cycle. Synthesis of amino acids -Glutamate pathway; Serine pathway; shikimate pathway for the production of aromatic amino acids..

UNIT – IV

Lipids and their Metabolism: Classifications, Structures and roles of fatty acids; fatty acid breakdown; fatty acid synthesis; synthesis and metabolism of triglycerols, cholesterol structure and function. Lipoproteins – classification & function.

UNIT – V

Nutrition: Functions and energy of foods, basal energy metabolism, dietary allowances and standards for different age groups. Assessment of nutritional quality of foods, mineral and vitamins as functional constituents in human metabolism and deficiency diseases associated. Effect of processing on nutritive value of food. Vitamins and minerals: Classification, structure and role of vitamins in food. Aroma substances.

TEXTBOOKS:

1. Lehninger A.L, Nelson O.'L, M.M. Cox, "Principles of Biochemistry" 3rd ed., CBS Publications, 2005.
2. J.L. Jain, "Fundamentals of Biochemistry ", 7th ed., S.Chand Publishers, 2009.
3. Food: Facts and Principles-N. Shakuntala Manay, Shadksharawamis.
4. Fundamentals of Nutrition-L Loyd McDonald

REFERENCEBOOKS:

1. Voet D, Voet J. G, "Biochemistry", 3rd ed., John C Wiley and Sons, 1994.
2. L. Stryer, J.M. Berg, JLTymockzo, "Biochemistry" 5th ed., WH Freemen & Co., 2002.
3. K. Mathews, K.E. Van Holde, Kevin G Ahern, "Biochemistry", 3rd ed., Pearson education, 2005.

ACTIVITIES:

- Report on food particle disintegration in a prototype stomach model
- Review on starch modification methods and its applications in food industry
- Estimation of RDA values for different micro and macronutrients

17FT013 REFRIGERATION AND COLDSTORAGE CONSTRUCTION

Hours Per Week :

L	T	P	C
4	1	-	4

Total Hours :

L	T	P
45	15	-

xxxx

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

To enable the students to understand the various concepts behind refrigeration and air conditioning. To enable the students to solve simple problems in refrigeration and air conditioning. To enable the students to understand the various concepts behind cold storage construction, design, maintenance, and applications in food industry.

Course Outcomes:

Upon successful completion of this course student should be able to:

- The students are knowledgeable to construct refrigeration and air conditioning
- The students will be able to solve problems on refrigeration and air conditioning and design cold storage for food applications
- The students will be able to apply their knowledge on cold storage of perishable products.

SKILLS:

- ✓ Suggest producers about various parameters related to cold chain structure
- ✓ Able to select appropriate freeze dryers for different perishable commodity
- ✓ Knowledge on design considerations for chillers and chilled Storages

UNIT – I

Principles of Refrigeration:Refrigeration cycles, Vapour Compression and Vapour Absorption cycles, Refrigerants, characteristics of different refrigerants, Ozone Depletion Potentials, Green house Potential Refrigerants, use of non polluting refrigerants, net refrigerating effect, ton of refrigeration - Components of a Refrigeration system: Compressor, condenser, Evaporator, Expansion valves piping and different controls. Atmospheric air and its properties, Psychometrics, Energy considerations.

UNIT – II

Cold Storage Design and Construction: Small and large commercial storages, Cold Room temperatures, Insulation, properties of insulating materials, air diffusion equipment, Doors and other openings. Cold load estimation; prefabricated systems, walk-in-coolers, and Refrigerated container trucks: Freezer Storages, Freezer room Temperatures, insulation of freezer rooms: Pre-cooling and pre freezing. Cold Storage practice, Stacking and handling of material in and around cold rooms, Optimum temperatures of storage for different food materials-meat and poultry products, marine products, fruits and vegetables, spices and food grains.

UNIT – III

Operation and maintenance - Controlled atmosphere and modified atmosphere storages: Operation and maintenance, Cleanliness, defrosting practices, preventive maintenance, safety measures Controlled atmosphere and Modified atmosphere storages Principles and basics of their construction.

UNIT – IV

Chilling of Foods: Chilling equipment for liquid foods. Secondary refrigerants and direct expansion techniques in chilling. Chilled foods transport and display cabinets - Basics of Chilled foods microbiology, Packaging of Chilled foods - Hygienic design considerations for chillers and chilled Storages. Cool storages and their applications. Evaporative cooling and its applications.

UNIT – V

Freezing of foods: Freezing equipment, Freezing rates, growth rate of ice crystals, crystal size and its effect of texture and quality of foods, Freezer types, Blast freezers, Contact Plate Freezers, conveyorized quick freezers, Individual quick freezing. Cryogenic Freezing, Freezing practice as applied to marine foods, meat and poultry, fruits and vegetables.

TEXTBOOKS:

1. Raymond R.Gunther: Refrigeration, Air conditioning and Cold Storage Chilten Company, Philadelphia, USA 1957
2. CliveD.J.Dellino: Cold andChilled Storage Technology Publisher: Kluwer Academic Publishers (1997)
3. S. Domkundwar and Subhash Arora: A Course in refrigeration and Air Conditioning: Dhanpat Rai and sons, Publishers, New Delhi (1994)
4. AndrewDAlthouse and others:Refrigeration and air Conditioning Goodheart –Willcox Company Inc. 1982
5. E.R.Hollowell: Cold Storage and Freezer Storage Manual AVI Publishing Co. (1980)

REFERENCEBOOKS:

1. Ed. C.P.Mallet: Frozen Food Technology BalckieAcademic and Professional, (1993)
2. Aurel Gobaneu and Gabriala Laseha and others (1976) Cooling Technology in the Food Industry:AbacusPress, TunbridgeWells, U.K.
3. Colin Dennis and Michael Stringer: Chilled Foods – A Comprehensive Guide Ellis Horwood Publishing, New york (1992)
4. D.K.Tressler and C.F.Evers: The Freezing Preservation of Foods (Vol.1&2) AVI Publishing Company Inc. USA (1965) Allied Publishers, Mumbai (1999).

ACTIVITIES:

- Performance evaluation of various freeze dryers using various food products

17FT015 NUTRACEUTICALS AND HEALTH FOODS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

xxxx

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

This course deals with the functional foods and nutraceuticals (FFN) products and their bioavailability and health benefits. The objective of the course is to impart knowledge to students on basics of functional foods and nutraceuticals, their significance, regulatory standards and role in disease prevention.

Course Outcomes:

- define functional foods and nutraceuticals
- understand the chemistry and physiological effects of FFN
- understand the role of selected FFN in health promotion and disease prevention and treatment
- discuss the regulations with respect to functional foods and Nutraceuticals

SKILLS:

- ✓ able to identify the bioactivities of the main functional ingredients and their health benefits, sources and safety issues
- ✓ proficiency in formulation, delivery and regulatory compliance related to FFN products

UNIT – I

Introduction to nutraceuticals: definitions, synonymous terms, basis of claims for a compound as a nutraceutical, regulatory issues for nutraceuticals including CODEX.

UNIT – II

Concept of angiogenesis and the role of nutraceuticals/functional foods; Nutraceuticals for cardio-vascular diseases, cancer, diabetes, cholesterol management, obesity, joint pain.

UNIT – III

Immune enhancement, age-related macular degeneration, endurance performance andmood dis-orders – compounds and their mechanisms of action, dosage levels, contraindications if any etc.

UNIT – IV

Manufacturing aspects of selected nutraceuticals such as lycopene, isoflavonoids, prebiotics and probiotics, glucosamine, phytosterols etc.; formulation of functional foods containing nutraceuticals – stability and analytical issues, labelling issues.

UNIT – V

Clinical testing of nutraceuticals and health foods; interactions of prescription drugs and nutraceuticals; adverse effects and toxicity of nutraceuticals; nutrigenomics – an introduction and its relation to nutraceuticals.

TEXT BOOKS:

1. Brigelius-Flohé, J & Joost HG. 2006. Nutritional Genomics: Impact on Health and Disease.Wiley VCH.
2. Cupp J & Tracy TS. 2003. Dietary Supplements: Toxicology and Clinical Pharmacology. Humana Press.
3. Gibson GR &William CM. 2000. Functional Foods - Concept to Product.
4. Losso JN. 2007.Angi-angiogenic Functional and Medicinal Foods. CRC Press.

REFERENCE BOOKS:

1. Neeser JR&German BJ. 2004. Bioprocesses and Biotechnology for Nutraceuticals. Chapman & Hall.
2. Robert EC. 2006. Handbook of Nutraceuticals and Functional Foods. 2nd Ed.Wildman.
3. Shi J.(Ed) 2006. Functional Food Ingredients and Nutraceuticals: Processing Technologies.. CRC

ACTIVITIES:

- Isolation of lycopene from tomato and its incorporation in beverages
- To study processing, health effects and stability of various bioactive components in wheatgrass juice

17FT017 PLANTATION CROPS, SPICES & CONDIMENT TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

This course deals with processing, packaging and storage of different types of spices and condiments. The objective of this course is to make students aware of various techniques involved in processing of spices and condiments, their value addition.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand scope, processing and production of spices and plantation crops
- Know about processing methods for value addition of spices and condiments
- Discuss standards, adulteration and packaging of spices and condiments

SKILLS:

- ✓ Analyze chemical composition of spices and plantation crops
- ✓ Suggest a technology for extraction of essential oils from different spices
- ✓ Select suitable packaging material for spice products
- ✓ Identify adulteration in spice and plantation crops

UNIT – I

Plantation Crops - Description of various types of Plantation crops, viz.,coconut, arecanut, coffee, tea, cocoa etc. Processing and preservation methods. Value-added products shelf- stable products viz., coconut water bottling, desiccated coconut powder, coffee concentrate, instant coffee powder, instant tea powder, cocoa processing. Leafy vegetables - Description of various types of leafy vegetables, viz., hibiscus, curry leaves, coriander leaves, etc. Their composition, nutritive value, health benefits. Preservation methods and packaging techniques.

UNIT – II

Spices & Condiments - Description of various types of spices and condiments, their composition, functional properties, flavouring agents. Nutritive value of spices and their health benefits. Intermediate Moisture Products – Intermediate Moisture Products viz., ginger paste, ginger –garlic paste, tamarind paste, tamarind concentrate. Their importance in culinary preparations. Flavour retention and packaging methods.

UNIT – III

Spice Powders & Curry Powders: Their importance in culinary preparations, their preparation methods, grinding and packaging methods for spice powders like chilli powder, turmeric powder, ginger powder, garlic powder; and Masala Powders for chicken masala, meat masala, biryani masala, chat masala etc. Importance of Cryogenic grinding of spices.

Spice Oils – Concept and importance of spice oils from spices like and condiments like clove, cardamom, cinnamum etc. Their application in food processing, and extraction methods of spice oils by various techniques, viz., solvent extraction, steam distillation etc.

UNIT – IV

Extraction of Oleoresins – Concept and importance of oleoresins in food processing, processing of spices like chilli, turmeric, pepper, ginger etc. for solvent extraction of Oleoresins technology, desolventization methods, regulatory and statutory requirements for oleoresin processing.Extraction of Natural Food Colours - Extraction of Natural Food colours from paprika, turmeric, blue grapes, beet root etc. Their importance in food processing.

UNIT – V

Herbs –Description of various types of herbs, viz., Basil, Chives, Cilantro,Dill, Coriander, Mint, Oregano, Parsely, Chives, Borage and Avocada leaves, Rose marry, Saga, Tarragon, Thyme,Winter savory and bolbo leaves, Papalo, Pipicha and Safflower. Their nutritive value & health benefits, their processing and Post harvest handling. Packaging methods for processed products.

TEXT BOOKS / REFERENCE BOOKS:

1. Spices: Morphology, History, Chemistry, J W Parry, Chemical Publishing Co., New York (1969)

2. D. K. Salunkhe and S. S. Kadam, “Handbook of Fruit Science and Technology: Production, Composition, Storage, and Processing”, 1st edition, CRC Press, 1995.

3. N. K. Jain, “Global Advances in Tea Science”, 1st edition, Aravali Books International, 1999

4. M. N. Clifford and K. C. Willson, “Coffee: Botany, Biochemistry and Production of Beans and Beverage”, 1st edition, AVI publishing Co.,1985

ACTIVITIES:

- Report on various adulterants used in spices and plantation products
- Flow chart of processing of local value added products of spices and condiments

17FT019 INDUSTRIAL BIOTECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

- This course will impart the knowledge to students abut prospectous of industrial biotechnology in food sector. By the end of this course students will be able to Understand biotechnology and application of biotechnology in food industry and agriculture.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Get the knowledge about cell and tissue culturing techniques and downstream processing
- Know about Rdna technology and their application in different areas
- Know about application of biotechnology in particular to food industry

SKILLS:

- ✓ Understand the concept of cellular and microbial culture techniques and their downstream and upstream techniques.
- ✓ Gain perspectives to industrially important food products manufacture with the implication of biotechnology.
- ✓ Acquire field work techniques to study, observe and prepare documents, charts, ppts, models etc.

UNIT - I

Prospectus of biotechnology- definition, scope and applications, Application of Biotechnology in food (Food industries), pharmaceuticals and agriculture, Application of biotechnology for food plant waste utilization, biogas plants.

UNIT - II

Fermentation Process: General requirements of fermentation processes, Basic design and construction of fermentor and ancillaries, Main parameters to be monitored and controlled in fermentation processes; An over view of aerobic and anaerobic fermentation processes and their application in the biotechnology industry, solid substrate, slurry fermentation and its applications, whole cell immobilization, behaviour of microbes in different reactors (air lift, fluidized, batch, continuous and fed batch condition).

UNIT - III

Bioproces optimization: Conventional optimization process (one variable at a time approach), need for statistical experimental design, screening techniques-Plackett Burman design, response surface methodology-Box- Benken design, central composite design and self directing optimization.

UNIT - IV

Solid state fermentation: Introduction to solid state fermentation (SSF), comparison of SSF with submerged fermentation, applications in industry, growth kinetics in SSF, Heat and Mass transfer problems in SSF, SSF bioreactors, Scale up of SSF.

UNIT - V

Plant and animal cell cultivation: Plant and animal cells compared to microbial cultivation, Bioreactor considerations for plant cell-suspension culture, immobilazation culture and organized tissues. Methods used for cultivation of animal cells, Bioreactor conideration for animal cell culture suspension culture, anchorage dependent cultivation. Imporant industrial products from plant and animal cell cultivation.

TEXTBOOKS:

1. Bains W. 1993. Biotechnology fromA to Z. Oxford Univ. Press.

2. Stanbury P.F, Stephen J. Hall and Whitaker A - Principles of Fermentation Technology, 2nd edition, ButterWorth -Heinemann, An imprint of Elsevier, India pvt. Ltd., 2005.

3. Shuler, M.L. and Kargi - F. " Bioprocess Engineering – Basic concepts – Second Edition, Prentice Hall of India Pvt. Ltd., 2005.

REFERENCEBOOKS:

1. Bailey andOllis - " Biochemical Engineering Fundamentals", 2nd Edition, McGraw Hill,1986

2. Pauline M. Doran - Bioprocess Engineering Calculations, First edition, Blackwell Scientific Publications, 2005

3. James M Lee - Biochemical Engineering, First edition, Prentice Hall, 1992

ACTIVITIES:

- o Prepare a flowchart for the production process of industrially important food products using biotechnology.

17FT021 TRADITIONAL AND CONVENIENCE FOOD TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

· This course deals with technologies related to processing of various grain based snacks, flour based, extruded snack based foods and fruits and vegetables based products. The objective of this course is to impart skill and knowledge required for the processing, preservation and shelf life extension of various traditional food products.

Course Outcomes:

The students will be able to:

✓ Understand scope, processing and production of various traditional food products.

✓ Know about processing methods for value addition of different regional commodities.

✓ Discuss various UNIT operations for a particular process and its effect on uality of the food products.

SKILLS:

✓ Identify and predict the processing requirement for various traditional food products.

✓ Suggest suitable processing and storage conditions for a particular traditional food product.

✓ Handle various processing equipments

UNIT - I

Technology for grain-based snacks: whole grains – roasted, toasted, puffed, popped, malted and flakes, coated grains-salted, spiced and sweetened.

UNIT - II

Flour based – batter and dough based products; savoury and farsans; formulated chips andwafers, papads, instant premixes of traditional Indian snack foods.

UNIT - III

Technology for fruit and vegetable based snacks: Chips,wafers; Technology for coated nuts – salted, spiced and sweetened; chikkis .

UNIT - IV

Extruded snack foods: Formulation and processing technology, colouring, flavouring and packaging.

UNIT - V

Equipments for frying, Baking and drying, toasting, roasting and flaking, popping, blending, Coating, chipping.

TEXTBOOKS :

1. Edmund WL. Snack Foods Processing. AVI Publ.
2. Frame ND .1994.The Technology of Extrusion Cooking. Blackie Academic.
3. Gordon BR.1997 Snack Food.AVI Publ
4. Samuel AM.1976. Snack Food Technology. AVI Publ.

/REFERENCE BOOKS :

1. Adeniji, A O.; Potter, N. N. Properties of ogi powders made from normal, fortified and opaque -2 corn. J. Food Sci., 1978, 43, 1571-1574.
2. Adeyemi, I. A. Upgrading local technology for cereal processing. Proceedings 11th Annual Conference of the Nigerian Institute of Food Science and Technology, Port Harcourt, Oct 25-29, 1987;Aworh, O. C. Ed.; NIFST: Lagos, Nigeria, 1987, 51- 60.
3. Ahmadu, J.; Igene, J. O.; Ada- Okungbowa, C. I.; Agboola, H. A. Economics of 'kilishi' production in Nigeria. Appl. Trop. Agric., 2004, 9, 25 - 33.

ACTIVITIES:

- Formulation of at least two processed product using cereal flour and proximate analysis of developed products.

17FT023 AUTOMATION IN FOOD PROCESSING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

- This course deals with various tools related to maintenance of food quality and safety. The objective of this course is to impart skill and knowledge required for the various activities like data analysis, modeling, data acquisition etc which ultimately affects the quality of processed food products.

Course Outcomes:

The students will be able to:

- Understand the tools and techniques used in food processing plants.
- Know about data analysis, modeling and control systems used in automated plants.
- Discuss various UNIT operations involved in an automated process.

SKILLS:

- ✓ Identify and predict a particular Modeling system for a process
- ✓ Suggest quality control and CIP for an automated process.
- ✓ Handle various tools used in automated industries.

UNIT - I

Introduction: electronic nose, food quality evaluation, indication variables, Data acquisition, elastography, ultrasonic, Data analysis, intramuscular fat, wavelet, marbled meat, statistical textural feature extraction from, elastography, Sampling, concept and system for data acquisition, image acquisition, ultrasonic B-mode imaging. DataAnalysis – Data processing, Dynamic data analysis, Image processing.

UNIT - II

Modeling system identification, Modeling strategy, linear statistical modeling, ANN Modeling, F statistic, null hypothesis Prediction Levenberg Marquardt algorithm, recurrent neural networks, gradient descent.

UNIT - III

Control objective function, neuro-fuzzy, membership functions Systems integration assembly language, high-level programming language. System integration, Robotics, Application of robotics and basic components of robotics, Features of II and II generation robots.

UNIT - IV

Bottle Washing Machine Automaton, Bottling Plant Drive System, Demineralization Plant Control System, Labeling Machine Control system, Charger level automation, Reverse Osmosis plant automation, Thermal plant automation, Dehydration and freezing pant automation.

UNIT - V

Automation in different UNITs of food processing, preparation of raw food and materials, sorting, grading, size reduction, mixing and agitation, thermal processing, dehydration, packaging, CIP, quality control.

ACTIVITY:

- List out various requirements for a Dehydration and freezing plant automation.

TEXTBOOKS:

1. Considne 2001. Process Control. AVI Publ.
2. Huang Y & Lacey RE. 2003. Principles of Robotics. CRC Press.
3. Huang Y,WhittakerAD & Lacey RE. 2001. Automation for Food Engineering. CRC Press.

REFERENCE BOOKS:

1. Automation in food processing, D.G.Caldwell
2. Robotics and *Automation* in the Food Industry by D. Caldwell
3. Automation and process control, Jasin Mohamad.

17FT012 SEPARATION TECHNIQUES IN FOOD PROCESSING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

- This course deals with various UNIT operations that a food processing industry uses to transform food ingredients into different forms for consumers. Separation techniques may be used to remove skins from fruits, water from juices, or whey from cheese. Each separation technique is customized to the amount of waste that needs to be removed, and the resiliency of the food product being processed.

Course Outcomes:

- To understand various separation techniques applied in food industry.
- To understand separation mechanism of different equipments.
- To understand separation technology for various food products.

SKILLS:

- ✓ Efficient in construction and design of a particular separation equipment.
- ✓ Suggest a particular equipment for separation of food commodities.
- ✓ Understand Operation layout of the modules involved in separation equipments.

UNIT - I

Introduction to various separation processes, Gas-Liquid, Gas–Solid, Liquid-Liquid, Liquid- Solid separation; Concept of phase equilibrium, Stage equilibrium, Stage efficiency, Equilibrium concentration; Single stage contact equilibrium, counter-current multiple contact stages, Concept of equilibrium line and operating line, Determination of optimum number of contact stages by analytical and graphical method.

UNIT - II

Rate of extraction, Rate of gas absorption, Individual and over all mass transfer coefficient; Calculation of tower height for gas absorption for both dilute and concentrated solution. Construction and working mechanism of different extraction equipments like single stage extraction, Multiple stage static bed system, Bollmann extractor, Hildebrandt extractor, Rotocell extractor.

UNIT - III

Solid Separation Process, Introduction, Concept of size, Shape, Cutsize, Sieving, Magnetic separation, Eddy-current separation, Wet separation, Ballistic separation, Color separation, Wet Separation Process, liquid-solid and liquid- liquid separation by hydrocyclones, Surface velocity classifier, Elutriators, Impingement separator, Electrostatic precipitation, Distillation: Introduction, boiling point diagram, differential or simple distillation, Flash or equilibrium distillation, Continuous rectification with and without reflux, Reflux ratio, Optimum reflux ratio, Batch distillation, Application of distillation in food processing.

UNIT - IV

Membrane Separation Technology: Introduction to micro-filtration, Ultrafiltration, Reverse osmosis, Electro dialyses, dialyses, physical characteristics of membrane separation, Factors affecting reverse osmosis process, Concentration polarization, Design of reverse osmosis and ultra filtration systems, Operation layout of the modules, Electrodialysis, pervaporization, Fabrication of membranes, Application of membrane technology in food industry.

UNIT - V

Powder Technology: Classification off powder, Separation of powder, Sieving, Air classification, Factors affecting air classification, Cyclone application, Air separation, Particle size distribution, Supercritical Fluid Extraction: Introduction, Properties of SCF, Food application, Application of SCFE in analytical technique, Pharmaceutical application.

ACTIVITY:

- o Calculate the efficiency of various separation equipments.

TEXTBOOKS :

1. Anantharaman N & Begum KMMS. 2001. Elements of Mass Transfer. PHI.
2. Dutta BK. 1985. Mass Transfer & Separation Process. PHI
3. GrandisonAS & LewisMJ. 2002. Separation Process in the Food & Biotechnology Industries. Woodhead Publ.
4. Narayanan CM & Bhattacharyya BC. 2004. Mechanical
5. Operations for Chemical Engineers. Khanna Publ.

REFERENCEBOOKS:

1. Bargale P (1997) Mechanical Oil Expression from Selected Oil- seeds under Uniaxial Compression Saskatoon: Department of Agricultural and Bioresource Engineering, University Saskatchewan, p. 337
2. Barta J, Balla C, Vatai G (2012) Dehydration preservation of fruits. In: Handbook of Fruits and Fruit Processing . New York: Wiley-Blackwell, pp. 133 – 151.
3. Bazinet L, Lamarche F, Ippersiel D (1998) Bipolar-membrane electrodialysis: applications of electrodialysis in the food indus-try. Trends in Food Science and Technology 9 (3): 107 – 113.

17FT014 ENVIRONMENTAL FOOD PROCESSING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

To enable the student understand the extent of wastes produced in a food industry and its environmental effects. To enable the student understand the nature of food wastes and methods of treatment. To enable the student know the importance of waste utilization in Food industries.

Course Outcomes:

- Students will attain knowledge about the methods of managing food wastes
- Students will gain knowledge on the methods for utilization of food wastes.
- Students will gain knowledge on getting value added products from wastes.

SKILLS:

- ✓ Efficient in understanding various categories of food wastes.
- ✓ Expert in utilization of by-products from various food industries.
- ✓ Proficient in organic waste utilization.

UNIT - I

Waste & its consequences in pollution and global warming, Types of food processing wastes & their present disposal methods.

UNIT – II

Treatment of plant waste by physical, chemical and biological methods, Effluent treatment plants, Use of waste and waste water.

UNIT – III

Types, availability and utilization of by-products of cereals, legumes & oilseeds, Utilization of by-products from fruits and vegetables processing industries, sugar and agro based industries, and brewery & distillery waste.

UNIT – IV

Status and utilization of dairy by-products i.e. whey, buttermilk and ghee residues, Availability & utilization of by-products of meat industry, poultry industry and fish processing UNITs.

UNIT – V

Biomethanation and biocomposting technology for organic waste utilization, incineration & efficient combustion technology, Integration of new and renewable energy sources for waste utilization.

TEXT BOOKS:

1. Beggs C. EnergyManagement and Conservation. Elsevier Publ.
2. Chaturvedi P. 2000. EnergyManagement: Challenges for the Next Millennium.
3. Energy Conservation through Waste Utilization.AmericanSociety of Mechanical Engineers, NewYork.
4. Kreit F & Goswami DY. 2008. Energy Management and Conservation Handbook. CRC Press

REFERENCE BOOKS:

1. Murphy WR & Mckay G. 1982. Energy Management. BS Publ.
2. Patrick DR. 1982.. Energy Management and Conservation. Elsevier Publ.
3. Patrick DR., Fardo SW, Richardson RE & Steven Patrick DR. 2006
4. Energy Conservation Guidebook. The Fairmont Press
5. Wulfinghoff DR. Energy Efficiency Manual. Energy Institute Press.

ACTIVITIES:

- o Design an efficient combustion technology.
- o To utlilize by-products from dairy industry.

17FT016 PLANT LAYOUT AND PROCESS ECONOMICS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

- To enable the student to understand the various factors involved in the site selection and design of food plant layout. To enable the students learn the concept of preparing cost estimate and economics. To understand the importance HACCP and food safety laws governing food industries

Course Outcomes:

- The student will gain knowledge to design and setting up of new food processing plant as Entrepreneur and/or consultant.
- The student can prepare cost estimate and economic analysis of food industry.
- The student can implement the food safety standards in food industries.

SKILLS:

- ✓ Proficient in layout deigning of a food processing plant.
- ✓ Expert in estimation of cost and economic analysis of food industry
- ✓ Implementation of food safety standards in food processing plant

UNIT-I

Basic concepts of plant layout and design with special reference to food process industries. Application of HACCP concept, ISO, FPO & MPO requirements in food plant layout and design. Design considerations for location of food plants. Basic understanding of equipment layout and ventilation in food process plants. Preparation of flowsheets for materialmovement and utility consumption in food plants.

UNIT-II

Plant layout and design of bakery and biscuit industries. Plant layout and design of fruits and vegetables processing industries including beverages. Plant layout and design of milk andmilk products. Miscellaneous aspects of plant layout and design like provision for waste disposal, safety arrangements etc.

UNIT-III

Introduction to economics: Meaning, scope, and contribution to business decisions. Analysis of Demand: Law of demand, Utility function, Rate of commodity substitution, Maximization of utility, Demand functions, Indifference curve analysis, Substitution and income effects. Market demand and demand elasticities: concept of market demand, price and income elasticities of demand, importance of elasticity. Demand forecasting: causes and techniques of demand forecasting.

UNIT-IV

Analysis of supply andmarket equilibrium: Law of supply, price elasticity of supply, equilibrium of demand and supply. Theory of the Farm: Production function, returns to scale, Optimizing behavior, Input demands, Cost functions, Profit maximization, economics & diseconomies of scale, break even analysis. Market structures perfect competition: Profit maximization and equilibrium of firm and industry, Short run and long run supply curves; Price and output determination, practical applications.

UNIT-V

Plant maintenance program; Role ofmaintenance staff and plant operators Preventive maintenance; Guidelines for good maintenance & safety precautions; Lubrication & lubricants; Work place improvement through '5S'. Hygiene and sanitation requirement in food processing and fermentation industries; CIP methods, sanitizing & disinfestation, pest control in food processing; storage and service areas.

TEXT BOOKS:

1. Peters and Timmehaus, Plant Design and economics for chemical Engineers, 4th Ed., McGraw-Hill, Inc., (1989).
2. D G Rao, Fundamentals of Food Engineering, Prentice-Hall of India, New Delhi (2010)
3. D N Dwivedi : Engineering Economics, Vikas.
4. Plant design and economics for chemical engineers- Peters and Timmerhans, McGraws- Hill.
5. Basic Concepts of Industrial Hygiene,Ronald MScott, CRCPress

REFERENCE BOOKS:

1. P A Samuelson &W D Nordhans : Economics: TMH.
2. James M Moore, "Plant Layout and Design", Mcmillan & Co., (1959)
3. Safety design criteria for industrial plants. Maurizio Cumo & Antonio Naviglia CRC Press.
4. J.M. Apple-Plant Layout andmaterial handling – John Willey & Son (1977)

ACTIVITY:

- Design a plant layout for mango juice processing industry.

17FT018 HEAT & MASS TRANSFER OPERATIONS IN FOOD PROCESSING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

This course deals on imparting fundamental understanding on the phenomena of heat and mass transfer. The objective of this course is to train students on principles of heat and mass transfer, methodologies for determining the rate of heat and mass transfer and perform heat exchanger design calculations.

Course Outcomes:

The student will be able to:

- understand the basic laws of heat and mass transfer.
- account for the consequence of heat transfer in thermal analyses of engineering systems.
- analyze problems involving steady state heat conduction in simple geometries
- obtain numerical solutions for conduction and radiation heat transfer problems.
- understand the fundamentals of convective heat transfer process.
- know about the basic mechanism behind boiling and condensation processes.

SKILLS:

- ✓ Estimate the rate of heat flow through a wall, cylinder or sphere.
- ✓ Insulation thickness estimation.
- ✓ Determine heat transfer coefficients.
- ✓ Estimate double pipe heat exchanger length required for specified conditions
- ✓ Perform basic calculations required for heat exchanger design.

UNIT-I

Conduction heat transfer: Introduction to heat and mass transfer and their analogous behaviour - steady and unsteady state heat conduction - analytical and numerical solution of unsteady state heat conduction equation - use of Gurnie-Lurie and Heisler Charts in solving problems on conduction heat transfer - applications in food processing including freezing and thawing of foods.

UNIT-II

Convective heat transfer: Convective heat transfer in food processing systems involving laminar and turbulent flow- heat transfer in boiling liquids- regimes of boiling - nucleate boiling - film boiling equation - heat transfer between fluids and solid foods - natural convection over vertical cylinders, inclined surfaces, horizontal cylinders, cylinder with axis perpendicular to flow - single sphere - banks of tubes – forced convection – boundary layer diffusion equations and convention regimes - solving numerical in forced convection.

UNIT-III

Heat exchanger: Design of heat exchanger - parallel and counter flow – types - plate heat exchanger, shell and tube type heat exchanger, scrapped surface heat exchanger and jacketed vessels - functional design of heat exchanger – solving problems on heat exchangers.

UNIT-IV

Radiation heat transfer: Diffused radiation - angle factor - rate of radiant loss - absorption factor method - uniform radiation - assumption for emissivity determination –Kirchhoff's law- radiation heat transfer –Plank's law black body radiation emissivity and absorptivity - radiation heat transfer coefficient - black bodies - grey bodies, combined radiation and convection heat transfer - radiation surface coefficient - applications in food processing.

UNIT – V

Mass transfer: Mass transfer-molecular diffusion in gases, liquids, solids, biological solutions and suspensions - unsteady statemass transfer and mass transfer coefficients, molecular diffusion with convection and chemical reaction, diffusion of gases in porous solids and capillaries, mass transfer applications in food processing.

TEXT BOOKS:

1. Bird R. Byron,Warren E. Stewart and Edwin N. Lightfoot. 2006. Transport Phenomena.Wiley India Pvt. Ltd., New Delhi.
2. Earle, R.L. 1985. UNIT Operations in Food Processing. Pergamon Press, UK
3. Geankoplis J. Christie. 1999. Transport Process and UNIT Operations. Third Edition, Prentice Hall of India, NewDelhi.

REFERENCE BOOKS:

1. McCabe L.Warren, Smith C. Jullian and Peter Harriott.1993. UNIT Operations of Chemical Engineering. McGraw Hill Inc. New York.
2. Paul Singh, R. and Dennis R. Heldman. 2004. Introduction to Food Engineering. Elsevier India Pvt. Ltd., NewDelhi.
3. Sinnott, R.K.2000. Coulson and Richardson's Chemical Engineering. Volume VI. Butterworth Heinemann, New delhi.

ACTIVITIES:

- Effect of radiation on test tube filled with water.
- Connecting shell and tube heat exchanger setup
- Design of shell and tube heat exchanger

17FT020 SUGAR AND CONFECTIONARY TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Description and Objectives:

This course deals with bakery and confectionery sector of food processing. The objective of this course is to acquaint the students with preparation methods for various bakery and confectionary products, quality control aspects, processing parameters and handling of equipment's.

Course Outcomes:

The student will be able to:

- understand the role of various ingredients used in bakery and confectionary products.
- formulate ingredients and propose suitable methods for manufacturing of bakery and confectionary products.
- assess and control the processing and quality parameters of various bakery and confectionary products.

SKILLS:

- ✓ Prepare commonly consumed bakery products like bread and fermented foods, cookies, biscuits, cakes and Icing.
- ✓ Judge the quality of raw-materials.
- ✓ Determine heat transfer coefficients.
- ✓ Predict the physiochemical changes during processing.
- ✓ Handling of various bakery equipments.

UNIT-I

Introduction: Sugarcane and sugarbeet as sugar rawmaterials. Flowcharts for manufacture of Granulated sugar and Liquid sugars. Properties of Granulated sucrose and Liquid Sugars. Invert sugar and their characteristics. Speciality products of Sugar Industry. Back strap Molasses and its uses. Applications in animal feed

UNIT-II

Sugar production processes: Extraction of juice, extraction yields, drying and uses of Bagasse, Purification of juices-juice filtration and chemical purification, Clarification stages, Lime addition, pH control, Treatment of clarified juice, evaporation –multiple effect evaporators, Vacuum pans, Crystallization, Washing of sugar crystals and centrifugal separation/ dewatering of sugar and other related processes. Sugar Refining, Sugar analysis, Sugar recovery –improvement, Sugar balance, energy conservation, Sugar plant sanitation.

UNIT-III

Technology of Chocolate manufacturing: Ingredients and their role as food additives in chocolate manufacturing. Machineries involved in the process of manufacturing chocolates.

UNIT-IV

Technology of Confectionery manufacture: General technical aspects of industrial sugar confectionery manufacture, Manufacture of high boiled sweets – Ingredients, Methods of manufacture – Types – Center – filled, lollipops, coextruded products. Manufacture of gums and jellies –Quality aspects

UNIT – V

Manufacture of Miscellaneous Products: Caramel, Toffee and fudge – Liquorice paste and aerated confectionery, Lozenges, sugar pannings and Chewing gum, Countlines - Quality aspects

TEXT BOOKS:

1. E.B. Jackson: Sugar Confectionery Manufacture, Second edition, Aspen publishers Inc., 1999. Great Britain
2. Guilford L Spencer and George P. Made: Cane Sugar Hand Book (1993) JohnWiley and sons Inc. London
3. P. Manohara Rao: Industrial Utilization of Sugar Cane and its coproducts P.J.International Consultants, New Delhi.

REFERENCE BOOKS:

1. Maurice Shachman, Soft Drinks Companion: A Technical Handbook for the Beverage Industry, CRC press, Florida, USA (2005)
2. W.Ray, Junk & Harry M. Pancost: Hand Book of Sugars – for Processors, Chemists and Technologists: AVI Puvblishing, West port (1973)
3. Oliver Lyle: Technology of Sugar for Refinery Workers Chapman and Hall Ltd., (1950)
4. E.Hugott: Hand Book of Cane Sugar Engineering Elsevier Publishing/company, London (1986)

ACTIVITY:

- Prepare a flowchart for production process of bakery and confectionary products keeping safety regulations in consideration

17FT022 BEVERAGES TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

The aim of the Master's course Beverage Technology is to enable students to solve technological problems in the field of beverage technology in industrial practice. This course emphasizes on the utilization of seasonal fruits for beverage production so as to reduce its wastage. By the end of the semester students will be able to understand the various equipment's, process and regulatory requirements for beverage industry.

Course Outcomes:

The student will be able to:

- understand the role of various ingredients used in beverage processing.
- formulate ingredients and propose suitable methods for manufacturing of alcoholic and non-alcoholic beverage
- assess and control the processing and quality parameters of beverages

SKILLS:

✓ Efficient in preparation of commonly consumed beverages from seasonal fruits.

✓ Judge the quality of raw-materials.

✓ Predict the physiochemical changes during processing.

UNIT-I

Types of beverages and their importance; status of beverage industry in India; Manufacturing technology for juice-based beverages; synthetic beverages

UNIT-II

Technology of still, carbonated, low-calorie and dry beverages; isotonic and sports drinks; role of various ingredients of soft drinks, carbonation of soft drinks.

UNIT-III

Specialty beverages based on tea, coffee, cocoa, spices, plant extracts, herbs, nuts, dairy and imitation dairy-based beverages.

UNIT-IV

Alcoholic beverages- types, manufacture and quality evaluation; the role of yeast in beer and other alcoholic beverages, ale type beer, lager type beer, technology of brewing process, equipments used for brewing and distillation, wine and related beverages, distilled spirits.

UNIT – V

Packaged drinking water- definition, types, manufacturing processes, quality evaluation and raw and processed water, methods of water treatment, BIS quality standards of bottled water; mineral water, natural spring water, flavoured water, carbonated water.

TEXT BOOKS:

1. HardwickWA. 1995. Handbook of Brewing. Marcel Dekker.
2. Hui YH. et al 2004. Handbook of Food andBeverage Fermentation Technology. Marcel Dekker.
3. Priest FG & Stewart GG. 2006. Handbook of Brewing. 2nd Ed. CRC.
4. Richard P Vine. 1981. Commercial Wine Making – Processing and Controls. AVI Publ.

REFERENCE BOOKS:

1. Varnam AH & Sutherland JP. 1994. Beverages: Technology, Chemistry and Microbiology. Chapman & Hall.. Varnam AH & Sutherland JP. 1994. Beverages: Technology, Chemistry andMicrobiology. Chapman & Hall.
2. Woodroof JG & Phillips GF.1974. Beverages: Carbonated and Non Carbonated. AVI Publ.

ACTIVITY:

- Development of blended beverage and shelf life study of the product

17FT024 LIPID SCIENCE AND TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

This course deals with Lipid chemistry and characterization; processing of fats and oils; food applications; biobased applications; overview of lipid's role in health and nutrition. By the end of the semester students will be able to understnd lipid type, sources, structure, properties and food and non-food usage; lipid metabolisms and biotechnology; as well as lipid bioproducts and industrial processing technologies.

Course Outcomes:

The student will be able to:

- To develop a working knowledge of basic lipid chemistry, sources of fats and oils, refining of fats and oils, food and biobased industrial applications.
- To use additional resources for information gathering and critical review.
- To demonstrate scientific and creative proficiencies to solve practical problems associated with lipids.

SKILLS:

✓ Judge the quality of products formed during frying.

✓ Predict the physiochemical changes during frying of foods.

.✓ Measurement of flavour emulsions and their stability

UNIT-I

Nutritional aspects of food lipids and their sources– omega-3 and omega- 6 fatty acids and their significance, Phytosterols and their nutraceutical significance.

UNIT-II

Measurement of lipid degradation parameters during deep-fat frying and storage of foods. Flavour emulsions and their stability.

UNIT-III

Fat powders like cream, butter, cod-liver oil etc. and techniques involved such as micro encapsulation, Fat substitutes based on carbohydrates and proteins.

UNIT-IV

Formulation and characterization of low-fat spreads, whipped creams, margarines, mayonnaise, salad dressings etc. Bakery shortenings chemistry, formulation and technology. Alternative fats, low fat substitutes.

UNIT – V

Trans-fatty acids- formation during processing and nutritional aspects, Enzymatic approach to tailor made fats.

TEXT BOOKS:

1. Akoh CC. 2005. Handbook of Functional Lipids. Taylor & Francis.
2. Dutta PC. 2004. Phytosterols as Functional Food Components and Nutraceuticals. Marcel Dekker.
3. Garti N & Kiyotaka S.2001. Crystallization Processes in Fats and Lipid Systems. Marcel Dekker.

REFERENCE BOOKS:

1. Gunstone F. 2006.Modifying Lipids for Use in Food.Woodhead.
2. O'Brien RD.1998. Fats and Oils - Formualting and Processing for Applications. Woodhead.
3. Sikorski ZE & Kolakowska A. 2002. Chemical and Functional Properties of Food Lipids. CRC.

ACTIVITY:

- To carry out an experiment on deep fat frying of vegetables and to study degradation products from oil

17FT026 DAIRY TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Description and Objectives:

This course deals with handling, processing, preservation of milk and milk products. The objective of this course is to impart knowledge about milk, milk processing methodologies, processing equipments, byproduct utilization and to bestow skills in the application of biological, chemical, biochemical, and engineering sciences in processing and preservation of milk and milk product.

Course Outcomes:

The student will be able to:

- Understand and describe the inherent compositional variability of milk composition
- Learn the milk processing methodologies
- Gain knowledge about the various milk processing equipments
- Understand the production of various products and its byproducts.

SKILLS:

✓ Determine physicochemical properties of milk

✓ Perform standardization of milk for different .

✓ Select suitable packaging material for spice products

✓ Identify adulteration in spice and plantation crops

UNIT-I

Dairy Chemistry and Microbiology: Introduction, Milk - composition, food and nutritive value, Physico-chemical properties. Buying and collection of milk – transportation of milk – milk reception – contaminants -Milk reception in dairies, Quality and Quantity tests at reception -Applications of enzymes in dairy industry

UNIT-II

Milk Processing: Milk processing flow sheet – Filtration / clarification, Storage of milk, Standardization – simple problems in standardization, Homogenization, Pasteurization – Types of pasteurization process. Equipments used in each process - Cream separating centrifuges, Pasteurizers (Heat Exchangers), Homogenizers, Bottle and pouch fillers, Milk Chillers, Plant piping, Pumps.

UNIT-III

Manufacture of Dairy Products: Manufacture of Cream, Butter, Ghee, Milk, powder, Cheese – Types and Defects in cheese. Quality aspects of these products. Equipments used for manufacture of each product like Butter churn, ghee boiler, Spray and Drum Dryers, Product in sanitizing equipment etc.

UNIT-IV

Manufacture of Ice Cream and other Dairy Products: Manufacture of Ice cream – Chemistry and technology – Microbiology of ice cream – Quality aspects. Manufacture of paneer, Toned Milk, Sweetened Condensed milk, Khoa. Extraction of casein from milk – properties - composition and industrial uses. Production of lactose.

UNIT – V

Fermented dairy products: Fermented products – Yoghurt, Curd, acidophilus milk, butter milk. Dairy plant sanitization – Cleaning in place – bottle and can washing, cleaning of tankers and silos – Detergents and sanitizers used. Energy use in Dairy plant - sources and cost of energy, Control of energy losses and Energy conservation.

TEXT BOOKS:

1. Sukumar De, Outlines of Dairy Technology,Oxford University Press, India (1980)
2. Tufail Ahmad: Dairy Plant Systems Engineering KitabMahal, Allahabad, India (1985)
3. Edger Spreer & AxelMixa: Milk and Dairy Product technology Mercel dekker Inc. N.Y. (1998)
4. National Institute of Industrial Research,Modern Technology of Milk processing and Dairy products, II Edition, NIIR Publications, India, 2004.

REFERENCE BOOKS:

1. Arthur W. Farral: Engineering of Dairy and food Products (II Edition 1970)Robert E. Krieger Publishing Co. New York
2. Garret Smit: Dairy Processing (Improved Quality) Woodhead Publishing Ltd. CRC Press (2003).
3. W.M. Clunie Harvey and Harry Hill: Milk Products Bio Tech Books, New Delhi (1999) Department of Food Processing Engineering
4. Prof. H.G. Kessler: Food Engineering and Dairy Technology Verlog Kessler Publishing House, Germany (1981).

ACTIVITIES:

- *Perform an experiment on various platform tests conducted in dairy industry*
- *Study on various regulatory standards implemented in dairy UNIT.*

DETAILED COURSE STRUCTURE

I YEAR I SEMESTER					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
17CE001	Theory of Elasticity	3	1	0	4
17CE003	Structural Dynamics	3	0	3	5
17CE005	Advanced Reinforced concrete Design	3	0	3	5
17CE007	Mathematical Methods	4	0	0	4
				Total Core Credits	19
	Elective -1	3	0	0	3
	Elective -2	3	0	0	3
				Total Elective Credits	6
				Total Semester Credits	24

I YEAR II SEMESTER					
Course Code	**Course title**	**L**	**T**	**P**	**C**
17HS001	Research Methods	3	0	0	3
17HS002	Employment Orientation Program (EOP)	2	0	0	2
17CE002	Matrix methods & Finite Element Analysis	3	1	2	5
17CE004	Earthquake Resistant Design of Structures	3	1	2	5
17CE006	Theory of Plates and Shells	3	1	0	4
17CE008	Repair and Rehabilitation of Structures	3	1	0	4
				Total Core Credits	23
	Elective -3	3	0	0	3
	Elective -4	3	0	0	3
				Total Elective Credits	6
				Total Semester Credits	29

POOL OF ELECTIVES			
S. No	**Course Code**	**Course Title**	**Credits**
1	17CE009	Plastic and Limit State Design of Steel Structures	3
2	17CE010	Fracture Mechanics	3
3	17CE012	Construction Planning and Project management	3
4	17CE014	Advanced Foundation Engineering	3
5	17CE015	Mechanics of Composite Materials	3
6	17CE016	Ground Improvement Techniques	3
7	17CE017	Bridge Engineering	3
8	17CE018	Design of Tall Structures	3
9	17CE011	Advanced Pre-stressed Concrete	3
10	17CE019	Stability of structures	3
11	17CE020	Structural Optimization	3
12	17CE013	Advanced Concrete Technology	3
13	17CE021	Smart Structures and Applications	3
14	17CE022	Pre Engineered Buildings	3
15	17CE023	Experimental Stress Analysis	3
16	17CE024	Soil Structure Interaction	3
17	17CE025	Advanced steel and Concrete Composite Structures	3

II YEAR I SEMESTER					
Course Code	**Course title**	**L**	**T**	**P**	**C**
17PR001	Project/ Internship Phase 1				15
Total Semester Credits					15

II YEAR I SEMESTER					
Course Code	**Course title**	**L**	**T**	**P**	**C**
17PR002	Project/ Internship Phase 2				15
Total Semester Credits					15

L= Lecture; T= Tutorial; P= Practical; C= Credits

Total Number of Credits : 83

I YEAR	COURSE CONTENTS	
I SEMESTER	17CE001	Theory of Elasticity
	17CE003	Structural Dynamics
	17CE005	Advanced Reinforced concrete Design
	17CE007	Mathematical Methods

Course Code	Course Title	L	T	P	C
17CE001	THEORY OF ELASTICITY	3	1	0	4

Course Objectives:

1. To make students understand the principles of elasticity.
2. To familiarize students with basic equations of elasticity.
3. To expose students to two dimensional problems in Cartesian and polar coordinates.
4. To make students understand the principle of torsion of prismatic bars.

Course Outcomes:

At the end of the course student will be able

1. To apply elastic analysis to study the fracture mechanics.
2. To apply linear elasticity in the design and analysis of structures such as beams, plates, shells and sandwich composites.
3. To apply hyper elasticity to determine the response of elastomer-based objects.
4. To analyze the structural sections subjected to torsion.

Activities:

1. Determination of Plane stress and plain strain for any 2D element using Excel and Mat-lab.
2. Determination of principle stress on 2D element by using Mat Lab.
3. Determination of Torsion in straight bars by using Mat Lab.

Skills:

1. Ability to analyze the elasticity problems using Mat Lab coding.
2. Developing the capability to use Mat Lab coding in elasticity problems

UNIT-I: Plane Stress and Plane Strain

Elasticity – Notation for forces and stresses – components of stresses and strains – Hooke's Law - Plane Stress – Plane strain – Differential Equations of equilibrium – Boundary conditions –Compatibility equations - Stress function – Boundary Conditions.

UNIT –II: Two Dimensional problems in Rectangular co-ordinates

Solution by polynomials – Saint Venant's principle – Determination of displacements – Bending of simple beams – cantilever and simply supported

UNIT-III: Two Dimensional problems in Polar co-ordinates

General equations in polar co-ordinates – Stress function and equation of compatibility with zero body forces – Analysis of thick cylindrical shells with symmetrical loading about the axis – Pure bending of curved bars – Strain components in Polar coordinates – rotating disk

UNIT-IV: Three Dimensional State of Stress

Analysis of stress and strain in three dimension - Principal stresses – Determination of principal stresses - Maximum shear stress – Homogeneous Deformation – General Theorems - Differential equations of equilibrium – Conditions of compatibility – Equations of equilibrium in terms of displacements – Principle of superposition – Uniqueness of solution –Reciprocal theorem.

UNIT-V: Torsion

Torsion of prismatic bars –St.Venant solution, stress function, Warp function - Bars with elliptical cross section – Other elementary solution – Membrane analogy – Torsion of rectangular bars

TEXT BOOKS:

1. Timoshenko & Goodier, "Theory of Elasticity" , McGraw Hill Company, 2006.

2. Martin H. Sadd, "Elasticity: Theory, Applications and Numeric", Academic Press, 2010

REFERENCES

1.C.T. Wang, "Applied Elasticity", McGraw Hill, 1953.

2.L.S. Srinadh, "Advanced Mechanics of Solids", TMH Publishing Company Limited, 1992.

3.Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1997.

Course Code	Course Title	L	T	P	C
17CE003	STRUCTURAL DYNAMICS	3	0	3	5

Course Objective:

1. The objective is to provide the fundamental understanding of the structural dynamics.
2. The problem solving ability for dynamic response in civil engineering design, analysis and research.
3. Introduce students to analytical and numerical methods in structural dynamics with emphasis on vibration.
4. Opportunities to optimize system for desired dynamic response.
5. To provide the basic framework for studying time-dependent response of mechanical systems to external excitations.

Course Outcomes:

The students will be able to

1. Write equation of motion for single and multi-degree of freedom systems
2. Understand the impact of damping on characteristics of vibrating system
3. Gain knowledge about arbitrary and pulse excitation
4. Write generalized equation to represent dynamic behavior of multi degree of freedom systems in global scale

Activities:

1. Construct a working model spring and Damper system
2. Make a mathematical model of a residential building and write equation of motion to find out natural frequency and amplitude
3. Construct a working model to demonstrate free and forced vibration

Skills:

1. Determine vibration characteristics of structures like frequency, amplitude, impedance, and time period
2. Differentiate the response of single and multi-degree of freedom systems
3. Determine the response of structures for pulse excitation like blast load

UNIT-I: Introduction

Introduction to Dynamic analysis; Elements of vibratory systems; single degree of freedom system, natural frequency ,force displacement relationship, damping force.

UNIT-II: Equation of Motions, Problem Statement, Solution Methods of Single Degree of Freedom Systems (SDOF)

Equation of motion, mass-spring-damper system, methods of solution of differential equation. Undamped free vibration, viscously damped free vibration, energy in free vibration.

UNIT-III: Response to Harmonic and Periodic Excitations (SDOF)

Harmonic vibration of undamped systems, Harmonic vibration with viscous damping, response to vibration generator, natural frequency and damping from harmonic test, force transmission and vibration isolation, vibration measuring instruments, energy dissipated in viscous damping. Response to periodic force.

UNIT-IV: Response to Arbitrary, Step and Pulse Excitations (SDOF)

Response to unit impulse, response to arbitrary force, step force, ramp force, response to pulse excitations, solution methods, effects of viscous damping.

Numerical Evaluation of Dynamic Response (SDOF)
Time stepping methods, methods based on interpolation of excitation, central difference method, Newmark's method, stability and computational error, analysis of nonlinear response by Newmark's method.

UNIT-V: Multi -degree of freedom systems (MDOF)
Equation of motions: simple system-two storey shear building, general approach for linear systems, static condensation, symmetric plan systems: ground motion. Multiple support excitation, methods of solving the equation of motions.
Free Vibration (MDOF) Natural frequencies and modes: systems without damping, modal and spectral matrices, orthogonality of modes, normalization of modes. Solution of undamped free vibration systems, solution methods for eigen value problem.

TEXTBOOKS:

1. Anil K Chopra, "Dynamics of structures" ; Prentice-Hall of India Limited, New Delhi.3rd edition 2006.
2. Mario Paz and leigh; "Structural dynamics", CBS Publishers, 1st edition 1985.

REFERENCES:

1. G. C. Hart & K. Wang; "Structural Dynamics for Structural Engineers", John Wiley & Sons.1st edition 1991.
2. R.W. Clough and P.E. Penzien, "Dynamics of Structures" , McGraw-Hill. 1st edition,1975.

LABORATORY EXPERIMENTS

List of experiments:

1. Basic programming in MATLAB
2. Plotting of SFD, BMD and deflection diagrams for propped cantilever &simply supported beams in MATLAB
3. Study of Free and forced damped vibration using MATLAB
4. Plot the response spectrum for El-Centro ground motion using MATLAB
5. Generate time history response by Newmark's method using MATLAB
6. Generate time history response by CDM and impulse method using MATLAB

Course Code	Course Title	L	T	P	C
17CE005	ADVANCED REINFORCED CONCRETE DESIGN	3	0	3	5

Course Objectives:

1. To make the students be familiar with the limit state design of RCC beams and columns.
2. To design special structures such as Deep beams, Corbels, Deep beams, and Grid floors
3. To make the students confident to design the flat slab as per Indian standard.

Course Outcomes:

At the end of the course student will be able

1. Acquire knowledge on strength and serviceability of reinforced concrete elements.
2. Design special Reinforced Concrete elements such as deep beams, corbels, shear wall and grid floors.
3. Analyse and design the RC structures using software packages

Activities:

1. Design of reinforced concrete beam (Singly/Doubly)
2. Design of reinforced concrete slab (one-way/Two-way).
3. Analysis and design of multi storey buildings and Industrial building
4. Calculation of wind load as per IS 875 Part III.

Skills:

1. Ability to design of reinforced concrete beam
2. Ability to design of reinforced concrete slab
3. Ability to analysis and design of multi storey building and Industrial building

UNIT-I: Design of RC Elements and Serviceability Criteria

Limit state design - beams, slabs and columns according to IS Codes. Calculation of deflection and crack width according to IS Code.

UNIT –II: Design of Special RC Elements

Design of RC walls – Ordinary and shear walls – Design of corbels – Design of deep beams

UNIT-III: Flat Slabs and Grid Floor

Design of flat slabs and flat plates – Limitations - Analysis and design of Grid floors -Yield line analysis of slab

UNIT-IV: Inelastic Behaviour of Concrete Beams

Moment – Curvature (M - φ) relation of Reinforced Concrete Sections - Moment redistribution – Advantages and Disadvantages of Moment Redistribution

UNIT-V: Design Loads other than Earthquake Loads

Dead Loads – Imposed Loads (IS 875 Part 2) – Loads due to Imposed Deformations – General Theory of Wind Effects on Structures. Application of software packages and computer programming.

TEXT BOOKS:

1. P.C.Varghese, “Advanced Reinforced Concrete Design”, Prentice Hall of India, 2008
2. N. Krishna Raju, “Advanced Reinforced Concrete Design”, CBS Publishers and Distributors, 2007.
3. Punmia B.C, Ashok Kr. Jain, Arun Kr. Jain, “RCC Designs (Reinforced Concrete Design)” , 10th Edition, Lakshmi Publishers, 2006

REFERENCE BOOKS:

1. Park & Paulay , “Reinforced Concrete”, Robert Publisher,1975
2. Ashok.K. Jain, Nem Chand & Bors. “Reinforced Concrete”, Tata McGraw-Hill Publishing Company Limited, New. Delhi, 2003

LABORATORY EXPERIMENTS

List of experiments:

Any 6 of the following experiments are to be carried out

1. Design of High Performance Concrete Mix
2. Strength test, Durability test, NDT.
3. Testing of Simply supported reinforced concrete beams for flexure.
4. Testing of Simply supported reinforced concrete beams for shear
5. Wind Analysis and design of multi storey buildings by using STAAD Pro
6. Analysis and design of earthquake resistant buildings by using STAAD Pro
7. Analysis and design of Industrial building by using STAAD Pro
8. Drawing and detailing of Beam/Column/Slab
9. Calculation of wind load as per IS 875 Part III by using Excel.

Course Code	Course Title	L	T	P	C
17CE007	MATHEMATICAL METHODS	4	0	0	4

Course Objectives:

1. To impart knowledge about various methods of analysing linear equations numerically.
2. To familiarize students in the field of Interpolation
3. To expose the students to calculus of Numerical integration and differentiation techniques.
4. To familiarize the students in the field of partial differential equations to solve boundary value problems associated with engineering applications.
5. To expose students to the concept of linear programming optimization techniques.

Course Outcomes:

At the end of the course student will be able

1. To apply Eigen value problems in finding natural time period and mode shapes of structures.
2. To apply interpolation and differentiation formulas for calculating deflection of beams, analysis of columns and simply supported beams.
3. To apply numerical integration and differentiation techniques in calculation of slopes and deflections of beams.
4. To analyze one dimensional heat flow equations using partial differential equations.
5. To learn linear optimization techniques.

Activities:

1. Form Mass matrix and Stiffness matrix for any 3 story building and Find its Natural time period and Mode shapes using Eigen values and vectors.
2. Analyze any simply supported beam using numerical solutions of interpolation and differential techniques.
3. Calculate slope and deflection of any beam with different boundary conditions.
4. Apply partial differential technique for solving any 1-D heat problem
5. Optimize any quantity related to civil engineering problems using Linear Programming Techniques.

Skills:

1. Ability to develop Eigen values and vectors for finite element analysis
2. Develop the caliber to generate mathematical equations for elasticity problems
3. Optimization of structures by forming Linear Programing Techniques
4. Analysis of heat transformation using partial differential equations

UNIT-I: Solutions Of Linear Equations

Direct method – Cramer's rule, Guass – Elimination method - Gauss – Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods Jacobi – Iteration method – Gauss – Siedel iteration, Eigen values and Eigen vectors: Jacobi method for symmetric matrices- Given's method for symmetric matrices-Householder's method for symmetric matrices-Power Method.

UNIT –II: Interpolation
Linear Interpolation - Higher order Interpolation - Lagrange Interpolation- Interpolating polynomials using finites differences, differentiation formulas by Interpolating parabolas – Backward, Forward and Central differences- Derivation of differentiation formulas using Taylor series**,** Boundary conditions- Beam deflection Numerical solution to spatial differential equations – Application to Simply Supported Beams, Columns.

UNIT-III: Numerical Integration And Differentiation
Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length– Partial differentiation.
Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method– Double integration using Trapezoidal and Simpson's method New Marks Method and Application to Beams – Calculations of Slopes & Deflections.

UNIT-IV: Applied Partial Differential Equations

One-dimensional Heat equation Cartesian, cylindrical and spherical coordinates (problems having axi-symmetry). Two-dimensional Laplace Equation in Cartesian, cylindrical and spherical coordinates (problems having axi-symmetry) – Analytical solution by separation of variables technique.

UNIT-V: Linear And Nonlinear Programming Techniques
Linear Programming Problem Formation, Graphical Method, Simplex method, artificial variable method-Big-M method-Two Phase Method. Non Linear Programming Problem Gradient method, Steepest Ascent Descent Methods
TEXT BOOKS:

1. M.K.Jain- S.R.K.Iyengar "Numerical Methods for Scientific and Engineering Computations". R.K.Jain Willey Eastern Limited. New Age International (p) Ltd., Publishers, 2004
2. Duffy, D.G. "Solutions of Partial Differential Equations", CBS Publishers, 1988

REFERENCES:

1. Dr. M.Shanta Kumar, "Computer based numerical analysis", Khanna Book publishers New Delhi.
2. Sankara Rao K., "Introduction to Partial Differential Equations", Prentice Hall of India Pvt. Ltd., New Delhi, 1997.

I YEAR	COURSE CONTENTS	
II SEMESTER	17CE002	Matrix methods & Finite Element Analysis
	17CE004	Earthquake Resistant Design of Structures
	17CE006	Theory of Plates and Shells
	17CE008	Repair and Rehabilitation of Structures

Course Code	Course Title	L	T	P	C
17CE002	MATRIX METHODS AND FINITE ELEMENT ANALYSIS	3	1	2	5

Course Objectives:

1. To study the energy concepts, analysis of structures by stiffness and flexibility approaches
2. To introduce finite element method and its importance in civil engineering applications.
3. To familiarize students in deriving shape functions of different elements.
4. To expose the students to write global stiffness matrix and its solution techniques.
5. To familiarize the students in the field of iso-parametric elements.

Course Outcomes:

At the end of the course student will be able

1. Apprehend the knowledge of analysis of structures using matrix method and flexibility method
2. Solve problems in beams, frames and trusses
3. Develop computer programs for matrix methods
4. Apprehend the knowledge of basics of Finite Element Method
5. Formulate element properties for structural engineering problems
6. Apply Finite Element Method for common structural Engineering problems

Activities:

1. Determination of the static and kinematic indeterminacy of frames and trusses
2. Analyze any truss structure using direct stiffness method and its solution techniques (use any programming software for analysis)
3. Analyze any beam in ANSYS with different boundary conditions and compare the results using finite element technique.
4. Solve any plane strain problem using constant strain triangle and compare the result with four node Iso parametric element

Skills:

1. Ability to determine the static and kinematic indeterminacy of frames and trusses
2. Ability to analyze any truss structure using direct stiffness method and its solution techniques (use any programming software for analysis)
3. Ability to analyze any beam in ANSYS with different boundary conditions and compare the results using finite element technique.
4. Ability to solve any plane strain problem using constant strain triangle and compare the result with four node iso parametric element

UNIT-I: Stiffness Method

Indeterminacy - Static, Kinematic– Degrees of Freedom – Structure stiffness matrix for beams, frames and trusses using displacement transformation matrix and coordinate transformation matrix - Internal forces due to thermal expansion and lack of fit

UNIT –II: Flexibility Method

Flexibility method applied to statically determinate and indeterminate structures; Choice of redundant; Primary structure- General formulation- Structures flexibility matrix using force transformation matrix – Internal forces due to thermal expansion and lack of fit.

UNIT-III: Introduction and Basics of FEM

A brief history of FEM, Need of the method, Equilibrium equations boundary conditions, Compatibility; Strain-displacement relations, Linear constitutive relations, Principle virtual work; Principle of stationary potential energy. Different types of elements, Shape functions.

UNIT-IV: Analysis of Trusses, Beams and Frames

Stiffness matrix for an axial element – transformation of vectors – plane truss analysis – beam stiffness – solution for beam problems – Two-Dimensional beam element – rigid plane frames.

UNIT-V: Plane Stress and Plane Strain Problems

Basic concepts of plane stress and plane strain – derivation of stiffness matrix for constant – strain, linear strain triangular elements – rectangular elements – iso parametric elements – Lagrange and Serendipity elements – axisymmetric elements.

TEXT BOOKS:

1. Madhujit Mukhopadhyay and Sheikh Abdul Hamid “Matrix and finite element analysis of structures”
2. Daryl L.Logan, “Finite Element Method”, Thomson Canada Ltd., India Edition, 2016
3. Singiresu.S.Rao, “The Finite Element Method in Engineering”, Butterworth-Heinemann, India
4. Edition, 2001.
5. Pandit.G.S and Gupta.S.P, “Structural Analysis – a Matrix Approach”, Tata Mc Graw Hill Publishing Company, 2004
6. Rajasekaran.S, “Finite Element Analysis in Engineering Design”, S.Chand and Company Ltd., 2003.

REFERENCES:

1. Moshe. F. Rubinstein, “Matrix Computer Analysis of Structures”, Prentice Hall, 1986.
2. Weaver. J.R and Gere. J. M, “Matrix Analysis of Framed Structures”, CBS Publishers, New Delhi, 1986.
3. Devdas Menon, “Advanced Structural Analysis”, Narosa Publishing House, Daryagang, New Delhi, 2009.
4. Finite Element Analysis: Theory and Programming by C. S. Krishnamoorthy, Tata McGraw-Hill, 1995
5. Finite Element Procedures in Engineering Analysis by K. J. Bathe, Prentice Hall Inc.,1996.

LABORATORY EXPERIMENTS

Using ANSYS (ANY 3)

1. Analysis of Beams with UDL Loads and different Boundary Conditions.
2. Analysis of Beam with Multiple Loads
3. Analysis of 2D Trusses
4. Non Linear Analysis of Cantilever Beams

Using ABACUS (ANY 3)

5. Basics in Abacus (Mesh Generation, Geometry etc.,)
6. Analysis of Beams in Abacus
7. Analysis of Portal frame in Abacus
8. Analysis of Plates in Abacus

Course Code	Course Title	L	T	P	C
17CE004	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES	3	1	2	5

Course Objective:

1. Deals with calculation of earthquake forces by different methods
2. This course integrates information from various engineering and scientific disciplines in order to provide a rational basis for the design of earthquake-resistant structures.
3. The course deals with special provisions and requirements of structures for their safety against earthquake forces.

Course Outcomes:

The students will be able to:

1. Gain knowledge about principles of earthquake engineering and design procedures
2. Analyze the structures for lateral forces like wind and earthquake using different dynamic approaches
3. Understand the working principle of different response control systems like base isolation and dampers
4. Understand the importance of ductility of building in Earthquake resistance design

Skills:

1. Calculation of Earthquake forces on structures
2. Determination of total base shear by using Static and Dynamic approaches
3. Ductile detailing of structures
4. Design of base isolation systems
5. Design and analysis of steel structures for lateral forces

Activities:

1. Take plan of a 6 storied residential building and calculate base shear using Static equivalent method
2. Using mode superposition technique find out total base shear for a residential building in your zone
3. Conduct dynamic analysis on a 4 storied residential building using STAAD Pro
4. Take any ongoing construction project and do ductile detailing by using IS 13920
5. Make a working model of a building to demonstrate base isolation.

UNIT-I: Design forces for buildings:

Introduction; Equivalent static method; Mode superposition technique; Dynamic inelastic-time history analysis; Advantages and disadvantages of these methods; Determination of lateral forces as per IS1893 (Part 1) – Equivalent static method, Model analysis using response spectrum.

UNIT-II: Earthquake resistant design of a long two-storey, two-bay RCC building:

Determination of lateral forces on an intermediate plane frame using Equivalent static methods and Model analysis using response spectrum; Analysis of the intermediate frame for various load combinations as per IS1893(Part 1); Identification of design forces and moments in the members.

UNIT-III: Steel Buildings:

Behavior of steel; Materials and workmanship; Steel frames – unbraced, braced; Ductile design of frame members; Flexural members; Frame members subjected to axial compression and bending; Connection design and joint behavior ; Steel Panel zones; Bracing members

UNIT-IV: Seismic protection of structures:

Introduction; Considerations for seismic isolation; Basic elements of seismic isolation; seismic- isolation design principle, Implementation of energy dissipation devices; Metallic yield dampers, friction dampers, viscoelastic dampers, tuned mass dampers, tuned liquid dampers; Shape memory alloy dampers; Modelling, linear and nonlinear procedures; Detailed system requirements; Application to multi-storey buildings; Testing of energy dissipation devices.

UNIT-V: Ductility considerations in earthquake resistant design of RCC buildings:

Introduction; Impact of ductility; Requirements for ductility; Assessment of ductility–Member/element ductility, Structural ductility; Factor affecting ductility; Ductility factors; Ductility considerations as per IS13920.

TEXT BOOKS :

1. Pankaj Agarwal and Manish Shrikhande, "Earthquake resistant design of structures" ,Prentice- Hall of India, 2006.
2. T.Paulay and M.J.N.Priestley, "Seismic design of reinforced concrete and masonry buildings", John Wiley & Sons, 1991.

REFERENCE BOOKS:

1. SK Duggal , "Earthquake resistant design of structures", Oxford University Press. 2007
2. F.Naeim, Kluwer "The seismic design handbook", Academic publishers, 2001

LABORATORY EXPERIMENTS

List of experiments

1. Perform Equivalent Static analysis on G+6 building using SAP2000
2. Perfom Linear dynamic analysis using SAP2000
3. Perform Non Linear Pushover Analysis on Bay frame of high rise building using SAP2000
4. Perform Non Linear Pushover Analysis with infill wall Bay frame of high rise building using SAP2000
5. Perform Non Linear time history Analysis considering different response spectrums of El centro, Kobe earthquakes etc using SAP2000.

Course Code	Course Title	L	T	P	C
17CE006	THEORY OF PLATES AND SHELLS	3	1	0	4

Course Objectives:

1. To introduce the concept of plate theory.
2. To study the behaviour and analysis of thin plates.
3. To study the behaviour and analysis of rectangular plates and circular plates.
4. To present the foundations of the classical theory of shells based on the Kirchhoff-Love assumptions.
5. To study the classification of shell surfaces

Course Outcomes:

At the end of the course student will be able

1. To assess the strength of plate panels under point, linearly varying and uniformly distributed loads.
2. To analyse plates under different boundary conditions by various classical methods and approximate methods.
3. To be familiar with classification of shells and classical shell theories and apply them in engineering design
4. To be exposed to singly curved shells, doubly curved shells and cylindrical shells.

ACTIVITIES:

1. Determination of maximum deflection in plates with different boundary conditions by using classical method and approximate methods
2. Create the rectangular and circular plate by using Ansys
3. Create a typical dome element by using any finite element software
4. Analysis of plate With/Without Central Hole

SKILLS

1. Ability to analyze the plate with different boundary conditions.
2. Ability to understand the basis of finite element software.

UNIT-I: Introduction To Plate Theory

Thin Plates with small deflection. Laterally loaded thin plates, governing differential equation, various boundary conditions

UNIT-II: Rectangular Plates

Rectangular plates. Simply supported rectangular plates, Navier solution and Levy's method, Rectangular plates with various edge conditions, plates on elastic foundation.

UNIT-III: Symmetrical Bending Of Circular Plates

Differential equation for symmetrical bending of laterally loaded circular plates - Simply supported edges - Clamped edges - Circular plate with a circular hole at the center - Circular plate concentrically loaded.

UNIT-IV: Introduction To Shells

Structural behaviour of shells - classification of shells - translational and rotational shells - ruled surfaces - Gaussian curvature - synclastic and anticlastic surfaces. Principal curvatures and lines of curvature

UNIT-V: Cylindrical Shells

Membrane theory of cylindrical shells; Bending theory of cylindrical shells loaded Symmetrically –Approximate solution by Schorer's method, Beam method of analysis

TEXT BOOKS :

1. S.P.Timoshenko and S.Woinowsky-Krieger, "Theory of plates and shells" McGraw-Hill, 1959.
2. A.C.Ugural, "Stresses in Plates and Shells", McGraw-Hill, 1999.
3. Chandrashekahara, K., "Theory of Plates", University Press (India) Ltd., Hyderabad, 2001.

REFERENCE BOOKS:

1. T.K.Varadan and K.Bhaskar , "Analysis of plates", Narosa Publishing House, 1999.
2. Flugge. "Stresses in Shells" , Blaisdell Publishing Co, 1966
3. G.S.Ramaswamy, "Design and construction of concrete shell roofs", CBS Publishers& Distributors,1986.
4. Szilard.R, "Theory and Analysis of Plates – classical and numerical methods", Prentice Hall Inc., 2004
5. Reddy J N, "Theory and Analysis of Elastic Plates and Shells", McGraw Hill Book company, 2006.

Course Code	Course Title	L	T	P	C
17CE008	REPAIR AND REHABILITATION OF STRUCTURES	4	0	0	4

Course Objectives:

1. To understand the causes of failure of structures.
2. To enable students to diagnose distress of structures.
3. To expose students to modern techniques of retrofitting.
4. To familiarize students with case studies.
5. To understand various seismic retrofitting strategies

Course Outcomes:

At the end of the course student will be able

1. To understand the causes of failure of structures.
2. To diagnose distress of structures.
3. To analyze the debonding pattern of externally plated members
4. To understand the significance of orientation of RC buildings.

Activities:

1. Compare the rate of corrosion for completely submerged and partially submerged structural steel.
2. Identify any distress observed in the university premises and suggest remedial measures.
3. Perform the cost analysis of various bonding techniques.
4. Illustrate the effect of discontinuity on load with the help of a working model.

Skills:

1. Ability to judge the rate of corrosion in various exposure conditions.
2. Developing the caliber to provide practical remedial solutions for distress.
3. Ability to select a suitable bonding technique as per the requirements.
4. Ability to judge the effect of seismic loads on discontinuities.

UNIT-I: Introduction

Deterioration of structures with aging – Need for rehabilitation – effects due to climate, temperature, chemicals, wear and erosion, design and construction errors, corrosion mechanism – effects of cover thickness and cracking – Method of corrosion production – corrosion inhibitors – corrosion resistant steel – coatings – cathodic production – causes of distress in structural members – Holistic models for deterioration of concrete – Types of damages – sources or causes for damage – case studies.

UNIT –II: Diagnosis and Assessment of Distress

Visual inspection – non-destructive tests – ultrasonic pulse velocity method – rebound hammer technique – ASTM classifications – pullout tests – Bremor test – Windsor probe test – crack detection techniques – case studies – single and multistoried buildings – Fibre optic method for prediction of structural weakness – An overview of structural Health monitoring – SHM Vs NDT

Case studies – buildings - heritage buildings - high rise buildings - water tanks – bridges and other structures.

UNIT-III: Materials and Methods of Repair and Repair Strategies

Definitions: Maintenance, Repair, Rehabilitation – Facets of Maintenance – Preventive measures on various aspects - Selection of repair materials for concrete - Essential parameters for repair materials - Strength and durability aspects, cost and suitability aspects - Materials for repair- Special concrete and mortar - concrete chemicals – Ferro cement – fibre reinforced concrete - Premixed cement concrete and mortars - polymer modified mortars and concrete – Shotcreting – Grouting – Jacketing - epoxy and epoxy systems including epoxy mortars and concrete, polyester resins, coatings

UNIT-IV: Bonded Installation Techniques

Externally bonded Steel - Externally bonded FRP- Wet layup sheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms-intermediate crack debonding- CDC debonding- plate end debonding- strengthening of floor of structures.

UNIT-V: Seismic Retrofitting of Reinforced Concrete buildings

Introduction – considerations in retrofitting of structures – sources of weakness in RC frame building – structural damage due to the discontinuous load path – structural damage due to lack of deformation – quality of workmanship and materials – classification of retrofitting techniques – Retrofitting strategies for RC buildings – Structural level (Global) retrofit methods – Member level (Local) retrofit methods – comparative analysis of methods of retrofitting.

TEXT BOOKS:

1. Raikar, R. N., "Learning from Failures – Deficiencies in Design", Construction and Service R&D Centre (SDCPL), Raikar Bhavan, 1987.
2. R.N.Raikar, "Diagnosis and Treatment of Structures in Distress", published by R&D Centre of Structure Designers & Consultants Pvt. Ltd., Mumbai, 1994
3. Pankaj Agarwal and Manish Shrikhande, "Earthquake resistant design of structures", Prentice – Hall of India, 2006.

REFERENCES

1. Dov Kaminetzky , "Design and Construction Failures", Galgotia Publication, New Delhi, 2001.
2. Santhakumar A.R., "Concrete Technology", Oxford University Press, New Delhi, 2007.
3. Govt of India Press, "CPWD Handbook on Repair and Rehabilitation of RCC buildings" New Delhi, 2002.
4. Shen-En Chen, R. Janardhanam, C. Natarajan, "Forensic Practices - Investigation Techniques and Technology", Ryan Schmidt, Ino-U.S. ASCE, U.S.A., 2010

POOL OF ELECTIVES

S. No	Course Code	Course Title
1	17CE009	Plastic and Limit State Design of Steel Structures
2	17CE010	Fracture Mechanics
3	17CE012	Construction Planning and Project management
4	17CE014	Advanced Foundation Engineering
5	17CE015	Mechanics of Composite Materials
6	17CE016	Ground Improvement Techniques
7	17CE017	Bridge Engineering
8	17CE018	Design of Tall Structures
9	17CE011	Advanced Pre-stressed Concrete
10	17CE019	Stability of structures
11	17CE020	Structural Optimization
12	17CE013	Advanced Concrete Technology
13	17CE021	Smart Structures and Applications
14	17CE022	Pre Engineered Buildings
15	17CE023	Experimental Stress Analysis
16	17CE024	Soil Structure Interaction
17	17CE025	Advanced steel and Concrete Composite Structures

Course Code	Course Title	L	T	P	C
17CE009	PLASTICITY AND LIMIT STATE DESIGN OF STEEL STRUCTURES	3	0	0	3

Course Objectives:

1. The objectives are to provide students with advanced knowledge of steel structural design.
2. Application of the underlying principles to solve a wide range of structural steel problems.
3. This subject will provide students the basic principles of reliability based design on steel structures
4. Understanding of the relationship between structural analysis and design provisions.

Course outcomes:

The students will be able to

1. Gain knowledge about Plastic analysis of structures
2. Understand different types of connections in steel structures
3. Analyze industry buildings
4. Understand behaviour of Unstiffened and Stiffened Elements

Activities:

1. Design a 4 storey steel building in STAAD Pro using IS 800 code book
2. Conduct laboratory test of two welded plates to test strength of the connection
3. Analyse a steel tower using ETABS and do detailing
4. Design a steel industry building subjected to lateral loads such as wind or Earthquake load and analyze the structure

Skills:

1. Design and analysis of continuous beams for different loading systems
2. Different methods in welding the steel components
3. Design and analysis of steel towers both for gravity and lateral loads
4. Design and analysis of industry buildings

UNIT-I: Plastic Analysis of Structures

Introduction, Shape factor, Moment redistribution, Combined mechanisms, Analysis of portal frames, Effect of axial force - Effect of shear force on plastic moment, Connections - Requirement – Moment resisting connections. Design of Straight Corner Connections – Haunched Connections – Design of continuous beams.

UNIT-II: Design of Connections

Types of connections – Welded and riveted – Throat and Root Stresses in Fillet Welds – Seated Connections – Unstiffened and Stiffened seated Connections – Moment Resistant Connections – Clip angle Connections – Split beam Connections– Framed Connections.

UNIT-III: Analysis and Design of Steel Towers

Analysis and Design of Microwave / Transmission Line Towers - Types of bracing patterns -Sag and Tension calculations. Design of Self-supporting Chimney – Design of Base Plates, Foundations and Anchor bolts and Guyed Steel Chimney - Guy ropes - Stresses due to wind. Along with load calculation - Gust Factor Method.

UNIT-IV: Design of Industrial Structures

Design of members subjected to lateral loads and axial loads, Analysis and design of Industrial Buildings and bents, Sway and non-sway frames, Design of Purlins, Louver rails, Gable column and Gable wind girder - Design of Moment Resisting Base Plates – Analysis of Gable Frames.

UNIT-V: Design of Light Gauge Steel Structures

Behaviour of Compression Elements - Effective width for load and deflection determination – Behaviour of Unstiffened and Stiffened Elements – Design of webs of beams – Flexural members – Lateral buckling of beams – Shear Lag – Flange Curling – Design of Compression Members – Wall Studs.

TEXTBOOKS:

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, 2008.
2. Dayaratnam.P, "Design of Steel Structures", A.H.Wheeler, India, 2007.

REFERENCES

1. Linton E. Grinter, "Design of Modern Steel Structures", Eurasia Publishing House, New Delhi, 1996.

Course Code	Course Title	L	T	P	C
17CE010	FRACTURE MECHANICS	3	0	0	3

Course Objectives:

1. To examine the concept of failure in members with pre-existing flaws.
2. To familiarize students in the field of fracture mechanics.
3. To expose the students about linear and nonlinear fracture mechanics.
4. To familiarize the students on fracture process of concrete.
5. To expose students about behavior of fracture for different materials and its testing methods.

Course Outcomes:

At the end of the course student will be able

1. To acquire basic skills in fracture mechanism of brittle materials like concrete.
2. To apply fracture mechanics theory to calculate stress areas.
3. To examine failure of structural components from both the mechanics and micro structural point of view.
4. To calculate the "energy release rate'' around crack tips
5. To examine crack growth due to fatigue.

ACTIVITIES:

1. Design based on linear elastic fracture mechanics.
2. Fracture toughness as a function of specimen thickness using experimental determination of fracture zone for concrete
3. Examine variation of plastic zone over the thickness using experimental analysis.
4. Slip planes in plane strain and plane stress using experimental evidence

Skills:

1. Able to design based on linear elastic fracture mechanics.
2. Able to find out the variation of plastic zone over thickness of various elements.
3. Able to know about the plane strain and plane stress in slip planes.

UNIT-I: Introduction to Fracture Mechanics of Concrete:

Structural failure based on material performance; Concepts of linear elastic fracture mechanics; Fracture mechanics of concrete.

UNIT-II: Principles of Linear Elastic Fracture Mechanics:

Airy stress functions for problems in elasticity; Complex stress function; Elastic stress and displacement fields at crack tip; Stress intensity factors and crack opening displacements for useful geometries; Superposition of stress intensity factors; Plastic zone at crack tip; Griffith's fracture theory; Strain energy release rate for crack propagation; Relationship between stress intensity factor and strain energy release rate; Design based on linear elastic fracture mechanics.

UNIT-III: Principles of Non-Linear Fracture Mechanics:
Energy principles for crack propagation in non-linear materials; J-integral for nonlinear elastic materials; Fracture resistance (R curve); Crack tip opening displacement
UNIT-IV: Structure and Fracture Process of Concrete:
Constituents and microstructure of concrete; Fracture behaviour and strain localization of concrete; Fracture process zone and toughening mechanisms; Experimental determination of fracture zone; Influence of fracture process zone on fracture behaviour of concrete.

UNIT-V: Fracture Behavior of Different Materials and Test Methods:
Variation of plastic zone over the thickness, Slip planes in plane strain and plane stress, Experimental evidence, Minimum thickness for fracture toughness specimen based on plastic zone, Fracture testing – early attempts, Fracture toughness as a function of specimen thickness, Requirements of the test, Concrete fracture toughness, Compact tension and three point bend specimens, Chevron notch – visualization exercise

TEXT BOOKS:

1. Prashant Kumar, “Elements of Fracture Mechanics”, Wheeler Publishing, 1999.
2. Surendra P. Shah, Stuart E. Swartz, Chengsheng Ouyang, “Rock and Other Quasi-Brittle Materials”, Publisher :Wiley , 1995.
3. David Broek, “Elementary Engineering Fracture Mechanics”, 3rd Rev Edition, Springer,June 1982.

REFERENCES:

1. L. Elfgren, “Analysis of Concrete Structures by Fracture Mechanics” Publisher: Routledge,1990.
2. Victor C.Li and Z.P.Bazant, “Fracture mechanics – Applications to concrete” , ACI SP118.
3. CT Suri and ZH Jin, “Fracture Mechanics”, 1st Edition, Elsevier Academic Press, 2012.

Course Code	Course Title	L	T	P	C
17CE012	CONSTRUCTION PLANNING AND PROJECT MANAGEMENT	3	0	0	3

Course Objectives:

1. To understand planning of construction projects
2. To understand scheduling of activities using network diagrams
3. To study the importance of cost and budget control
4. To understand quality control and safety in construction industry
5. To study various equipment being used for performing various construction activities.

Course Outcomes:

At the end of the course student will be able

1. To divide any project into manageable activities.
2. To perform scheduling using network techniques.
3. To familiarize with the importance of cost, budget, quality control and safety in construction field.
4. To understand the selection criteria behind the equipment used for performing various construction activities.

Activities:

1. Prepare WORK BREAKDOWN STRUCTURE for construction of 3 storey building and assign resources to each activity.
2. Schedule the given activities using bar chart, CPM and PERT methods.
3. Crash and level resources of activities according to the resource availability.
4. Articles in Workmen compensation act.
5. Usage of various equipment for construction activities like earth moving, erection, material transport, dewatering and concreting.

Skills:

1. Develop WBS of any structure and can estimate resources
2. Schedule activities using CPM, PERT
3. Crash and level resources to execute construction economically
4. Assess safety norms to be followed or being followed in construction
5. Decide the right equipment to be used in the construction.

UNIT- I: Introduction to Project Management:

Basic forms of organization with emphasis on Project and matrix structures- project life cycle-planning for achieving time, cost, quality- feasibility study.

Construction Planning

Basic concepts in the development of construction plans-choice of Technology and construction method-Defining Work Tasks-Precedence relationships among activities- Estimating Activity Durations-Estimating Resource Requirements for work activities- coding system.

UNIT- II: Scheduling Procedures and Techniques:

Relevance of construction schedules-Bar charts-The critical path method-Calculations for critical path scheduling. Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on –node and with leads, Lags and Windows. Calculations for scheduling with leads, Lags and Windows-Resource oriented scheduling-Scheduling with resource constraints and precedencies- Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost tradeoffs-Improving the Scheduling process.

UNIT- III: Cost Control Monitoring and Accounting:
The cost control problem-The project Budget-Forecasting for Activity cost control-Financial accounting systems and cost accounts-Control of project cash flows-Schedule and Budget updates-Relating cost and schedule information.

UNIT-IV: Quality Control Monitoring and Safety Engineering:
Quality and safety concerns in Construction-Organizing for Quality and safety-Work and Material Specifications. Total Quality control- Quality control by statistical methods- Statistical Quality control with sampling by Attributes-Statistical Quality control by Sampling and Variables, safety measures and safety policies to be adopted- determination of safety parameters- personal protective equipment- Workmen Compensation Act.

UNIT- V: Construction Methods and Equipment:
Factors affecting selection of equipment - technical and economic, construction engineering fundamentals, Analysis of production outputs and costs, Characteristics and performances of equipment for Earth moving, Erection, Material transport, Pile driving, Dewatering, Concrete construction (including batching, mixing, transport, and placement) and Tunneling.

TEXT BOOKS:

1. Chitkara,K.K., "Construction Project Management Planning, Scheduling and Control", Tata McGraw-Hill Publishing Co., New Delhi, 1998.
2. Srinath,L.S., "PERT and CPM Principles and Applications", Affliated East West Press, 2001.
3. Sharma S.C., "Construction Equipment and Management", Khanna Publishers, New Delhi,2011.
4. Kumar Neeraj Jha, "Construction Project Management Theory & practice", Pearson,2012.
5. Punmia B.C., Khandelwal K.K., "Project planning and Control with CPM and PERT", 4th Edition, Laxmi Publications Pvt. Ltd., 2016.

REFERENCE BOOKS:

1. Chris Hendrickson and Tung Au, "Project management for Construction-Fundamentals Concepts for Owners, Engineers, Architects and Builders", Prentice Hall,Pitsburgh,2000.
2. Moder.J., C.Phillips and Davis, "Project management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., Third Edition, 1983.

Course Code	Course Title	L	T	P	C
17CE014	ADVANCED FOUNDATION ENGINEERING	3	0	0	3

Course Objectives:

The primary objective of this course is

1. To equip the student with the knowledge of how to explore the soil
2. To estimate the bearing capacity of soil, design the foundations for different conditions and check the stability of structures.
3. To understand the basics of dynamics – dynamic behavior of soils – effects of dynamic loads and the various design methods

Course Outcomes:

At the end of the course student will be able to

1. Determine the earth pressures on foundations and retaining structures.
2. Analyse shallow and deep foundations.
3. Calculate the bearing capacity of soils and foundation settlements.
4. Able to design foundation for different machines.
5. Able to assess the influence of vibrations.

Activities:

1. Analyze active and passive earth pressures acting on to a retaining wall with the properties of the soil given, using any theory, using some soft wares
2. Determining the actual active pressure and the actual failure plane for a retaining wall backfill using Culmann's Graphical Method
3. Suggest a suitable foundation for the given soil and load conditions and justify it.
4. Make a working model of spring and dashpot system to understand behavior of foundation under vibrations
5. Take example for machine foundation and find out various modes of failures using Linear Elastic weightless spring method, Elastic half space method and Analogue models.

Skills:

1. Able to explore and examine a site
2. Able to analyze lateral soil pressures acting on to a wall
3. Able to determine bearing capacity of a soil using different theories at different conditions
4. Able to analyze various dynamic forces
5. Able to design a special foundations for vibrating machinery
6. Able to understand Indian codal specification for analysis and design of foundations for dynamic conditions

UNIT-I: Sub–Soil Investigation and Sampling:

Introduction; Methods of exploration; Methods of Boring; Soil Samples; Soil samplers and Sampling; Number and disposition of trial pits and borings; Depth of exploration; Ground water observations; Field test, Laboratory tests; Plate load test; Penetrometer tests; Geophysical methods.

UNIT-II: Shallow Foundations:

Concept of foundations; Types of foundations and their applicability; General requirements of foundations; Location and Depth of foundation, Bearing Capacity & Settlement Methods for bearing capacity estimation, total and differential settlements of footing and raft, code provisions. Design of individual footings, strip footing, combined footing.

UNIT-III: Deep Foundations:

Pile Foundations Estimation load carrying capacity of single and pile group under various loading conditions. Pile load testing (static, dynamic methods and data interpretation), settlement of pile foundation, code provisions, design of single pile and pile groups, and pile caps

Well Foundations Types, components, construction methods, design methods (Terzaghi, IS and IRC approaches), check for stability, base pressure, side pressure and deflection.

UNIT-IV: Lateral Earth Pressure & Retaining Walls:

Introduction; Effect of wall movement on Earth Pressure; Earth Pressure at rest; Rankine's theory of Earth pressure; Coulomb's theory of earth pressure; Culmann's graphical method for active earth pressure; Types of retaining walls, Design of cantilever retaining wall, design of cantilever sheet pile wall, design of anchored sheet pile wall.

UNIT-V: Dynamic Soil Properties:

Stresses in soil element; Determination of dynamic soil properties; Field tests; Laboratory tests; Model tests; Stress-strain behavior of cyclically loaded soils; Cyclic plate load test; Liquefaction.

Machine Foundations

Types of machines; Basic design criteria; Methods of analysis; Mass-Spring-Dashpot model; Elastic-Half-Space theory; Tschebotarioff's reduced natural frequency method; Types of foundations; Modes of vibrations; Vertical, sliding, torsional (yawing) and rocking (and pitching) modes of oscillations; Design guidelines as per codes; Typical design problems.

TEXT BOOKS:

1. Bowles, J.E., "Foundation Analysis and Design", 4th ed., McGraw-Hill Publishing company, Newyork, 1988.
2. Manoj Datta, Shashi K Gulhati,, "Geotechnical Engineering", Tata McGraw – Hill Education (2005).
3. K. R. Arora, "Soil Mechanics and Foundation Engineering", 7th ed., Standard Publishers and Distributors, Delhi, 2009.
4. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundation", 16th ed., Laxmi Publications Pvt. Ltd., New Delhi, 2005.

5. P. Srinivasalu, C. V. Vaidyanathan, "Handbook of Machine Foundations" 1st Edition Tata McGraw - Hill Education (2004).

REFERENCES

1. B. J. Kasmalkar, "Foundation Engineering", 6th ed., Pune Vidyarthi Griha Prakashan, Pune, 1989.
2. Dass, B.M, "Principles of Geotechnical Engineering", 5th ed., Thompson books, Singapore, 2002.

Course Code	Course Title	L	T	P	C
17CE015	MECHANICS OF COMPOSITE MATERIALS	3	0	0	3

Course Objectives:

1. To study the behaviour of composite materials.
2. To investigate the failure modes of composite materials.
3. To understand the fracture mechanics of composite materials.

Course Outcomes:

At the end of the course student will be able
1. Apprehend the stress strain relationship of orthotropic and anisotropic materials.
2. Analyze laminated composites.
3. Assess the failure criterion and fracture mechanics of composites.

Activities:
1. Investigation of failure and fracture characteristics of composite materials
2. Presentation
3. Case study of different composite materials

Skills:
1. Ability to investigate the failure and fracture characteristics of composite materials.
2. Ability to use the composite materials

UNIT-I: Introduction:
Introduction to Composites, Classifying composite materials, commonly used fiber and matrix constituents, Composite Construction, Properties of Unidirectional Long Fiber Composites, and Short Fiber Composites

UNIT-II: Stress Strain Relations:
Concepts in solid mechanics, Hooke's law for orthotropic and anisotropic materials, Linear Elasticity for Anisotropic Materials, Rotations of Stresses, Strains, Residual Stresses

UNIT-III: Analysis of Laminated Composites:
Governing equations for anisotropic and orthotropic plates. Angle-ply and cross ply laminates. Static, dynamic and stability analysis for simpler cases of composite plates. Inter laminar stresses.

UNIT-IV: Failure and Fracture of Composites:
Netting Analysis, Failure Criterion, Maximum Stress, Maximum Strain, Fracture Mechanics of Composites, Sandwich Construction.

UNIT-V: New Cement Composites:
FRC-Ferro cement-Nano cement composite- SIFCON-Polymer concretes.

TEXT BOOKS:
1. Daniel and Ishai, "Engineering Mechanics of Composite Materials", Oxford University Press, 2005.

1. Jones R.M., "Mechanics of composite materialsMcGraw-Hill, Kogakusha Ltd., Tokyo, 1975.

REFERENCE BOOKS:

1. Agarwal.B.D. and Broutman.L.J., "Analysis and Performance of fiber composites", John- Wiley and Sons, 1980.
2. Michael W.Hyer, "Stress Analysis of Fiber-Reinforced Composite Materials", McGraw Hill, 1999.
3. Mukhopadhyay.M, "Mechanics of Composite Materials and Structures", University Press, India, 2004.

Course Code	Course Title	L	T	P	C
17CE016	GROUND IMPROVEMENT TECHNIQUES	3	0	0	3

Course Objectives:

1. To understand the engineering properties of soil and problems associated with weak deposit.
2. To understand the need for ground improvements.
3. To study the concept of soil stabilization.
4. To familiarize students in recent ground improvement techniques.
5. To get exposure to soil reinforcement techniques and geo-synthetics.

Course Outcomes:

At the end of the course student will be able

1. To understand the engineering properties of soil and problems associated with weak deposit.
2. Identify ground conditions and suggest method of improvement
3. Design and assess the degree of improvement
4. Understand the principles of soil reinforcement and confinement in engineering constructions
5. Design reinforced soil structures

Activities:

1. Design and make a model of a Reinforced Earth Wall
2. A model of stone columns in a clayey strata and observation of ground water depletion
3. Design a stone column and determine its load carrying capacity and settlements
4. Case studies on usage of different geo synthetics in soils
5. Test and compare the strength of the soil with different additives and justify the difference observed

Skills:

1. Able to suggest a suitable ground improvement technique
2. Able to design stone columns, reinforced earth walls
3. Able to diagnose problems associated with problematic soils
4. Able to design mix for various cement, lime and bitumen stabilization techniques
5. Able to suggest various grouting techniques for different problems and their design

UNIT-I: Ground Improvement in Cohesion less Soil:

Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement. Shallow and deep compaction requirements, Principles and methods of soil compaction, Shallow compaction and methods. Properties of compacted soil and compaction control, Deep compaction and Vibratory methods Dynamic compaction.

UNIT-II: Ground Improvement in Cohesive Soil:

Drainage and Dewatering-Drainage techniques - Well points - Vacuum and electro osmotic methods. Preloading with and without vertical drains. Compressibility, vertical and radial consolidation, preloading methods. Types of Drains, Design of vertical Drains, Construction techniques. Stone Column: Function Design principles, load carrying capacity, construction techniques, settlement of stone column foundation.

UNIT-III: Reinforced Earth:

Principles, components of reinforced earth, governing design of reinforced earth walls, design principles of reinforced earth walls. Geotextiles-Introduction, types of Geotextiles, functions and their applications, tests for Geotextiles, Geogrids and their functions.

UNIT-IV: Mechanical Stabilization:
Soil aggregate mixtures, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. In situ soil treatment methods-Soil nailing, rock anchoring, micro-piles, construction techniques.

UNIT-V: Chemical Stabilization:
Cement Stabilization-Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization-Type of admixtures, mechanism, factors affecting, design of mixtures, construction methods-Grouting Techniques-Types of grouts - Grouting equipment and machinery - Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals - Stabilization of expansive soils.

TEXT BOOKS:

1. Purushothama Raj. P, "Ground Improvement Techniques", 2nd ed., Laxmi Publications (p) Ltd., New Delhi, 1998.
2. Craig, R.F., "Soil Mechanics", 3rd ed., Van Nostrant Reinhold Co.,New York, 1993.
3. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", 3rd ed., McGraw Hill, 1994.

REFERENCES:

1. Moseley M.P., "Ground Improvement Blockie Academic and Professional", 2nd ed., Chapman and Hall, Glasgow, 1993.
2. Jones J.E.P., "Earth Reinforcement and Soil Structure", 3rd ed., Butterworths, 1995.

Course Code	Course Title	L	T	P	C
17CE017	BRIDGE ENGINEERING	3	0	0	3

Course Objectives:

1. To understand the various types of bridges
2. To understand the codal provisions for loading and design standards of bridges.
3. To design the superstructure of bridge using different methods and loading conditions.
4. To understand the design of bearings

Course Outcomes:

At the end of the course, student will be able

1. To familiarize with the usage of codal provisions in the design of bridges
2. To analyze and design substructure elements of bridges
3. To analyze and design various types of bridges like T-Beam bridge, Slab bridge, box culvert.
4. To understand the suitability of bearings for bridges.

Activities:

1. Determination of suitability of bridge to the site condition.
2. Make a model of bridge.
3. Analyse and design a bridge from substructure to super structure.

Skills:

1. Identify the type of bridge suitable for different soil and environmental conditions.
2. Design the bridge under primary and secondary loading conditions.

UNIT I: Introduction:

Introduction - Classification – Investigation for bridges - Economic span length- Loading standards – IRC and Railway loads – Impact.

UNIT-II: Bridge sub structure:

Evaluation of sub structures – Pier and abutments caps – Design of pier – Abutments – Type of foundations.

UNIT-III: Bridge super structure:

Super Structure: Slab bridge- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- box culvert.

UNIT-IV: T-Beam Bridge:

Design of T beam bridge- Pigeaud's method- design of longitudinal girders- Guyon-Messonet method- Hendry Jaegar method- Courbon's theory. (Ref: IRC-21).

UNIT-V: Bearings for Bridges:

Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges – Electrometric bearing – Joints – Expansion joints. Understand the complexities in design of bridges.

TEXTBOOKS:

1. CBRI, "Building materials and components", India, 1990.
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994

REFERENCES:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

Course Code	Course Title	L	T	P	C
17CE018	DESIGN OF TALL STRUCTURES	3	0	0	3

Course Objectives:

1. To study the behaviour of tall structures.
2. To learn analysis and design of buildings for wind loads
3. To study design criteria for tall structures.
4. To familiarize the students about stability analysis of tall structures.
5. To study behaviour of various structural systems under wind loads.

Course Outcomes:

At the end of the course student will be able

1. To apply all types loads on tall buildings according IS code
2. To analyze and Design tall buildings.
3. To understand behaviour of various structural systems under different loading conditions.
4. To design towers, chimneys and shear walls.
5. To check stability of tall structures against buckling, Torsion.

Activities:

1. Design any Tall building using IS code method and compare it using any design software.
2. Design a shear wall using IS code method and compares it using any design software.
3. Design a RCC Chimney using IS code method and compare it using any design software.
4. Design steel Chimney using IS code method and compares it using any design software.
5. Design a Tower Structure using IS code method and compare it using any design software.

Skills:

1. Able to design tall building as per IS code.
2. Able to design shear wall using IS code manually and using software.
3. Able to design tower structures and chimney using IS code.

UNIT-I: Introduction:

Basic Introduction and Importance of Tall Structures, Dead load, Live load, Impact load, Construction load, Sequential loading. Wind Loading – Static and Dynamic Approach, Analytical method, Wind Tunnel Experimental methods. Earthquake Loading – Equivalent lateral Load analysis, Response Spectrum Method, Combination of Loads.

UNIT –II: Analysis and Design of Tall Buildings:

Modelling for approximate analysis, Accurate analysis and reduction techniques, Analysis of structures as an integral unit, Analysis for member forces. Analysis of tall building for lateral loads, cantilever method, Portal method, Factor method; Design of structures for wind drift and Twist, Computer application in analysis & design

UNIT-III: Behaviour of Structural Systems:

Factors affecting the growth, height and structural form, Behaviour of Braced frames, Rigid Frames, In-filled frames, Shear walls, Coupled Shear walls, Wall–Frames, Tubular, Outrigger braced, Hybrid systems under wind loads.

UNIT-IV: Design of Various Tall Structures:

Introduction, Loads on towers, Analysis of towers, Masts, Trestles, Stresses in trestles due to vertical loads and horizontal loads, Design of members in towers. Design of Chimneys (RCC and Steel) and Design of shear wall according to IS code for wind loads.

UNIT-V: Stability Analysis:
Overall buckling analysis of frames, wall–frames, Approximate methods, Second order effect of gravity loading, P–Delta Effects, Simultaneous first order and P-Delta analysis, Translational instability, Torsional Instability, Out of plumb effects, Effect of stiffness of members and foundation rotation in stability of structures.

TEXT BOOKS:

1. Bryan Stafford Smith and Alex Coull, "Tall Building Structures - Analysis and Design", John Wiley and Sons, Inc., 1991.
2. S.N. Manohar, "Tall Chimneys: Design and Construction", McGraw-Hill, 1988.

REFERENCES:

3. Taranath B.S, "Structural Analysis and Design of Tall Buildings", McGraw-Hill, 1988
4. Design of Reinforced Concrete Structures by Pillai and Devdas Menon.

Course Code	Course Title	L	T	P	C
17CE011	ADVANCED PRESTRESSED CONCRETE	3	0	0	3

Course Objectives:

1. To develop an advanced understanding of the behavior, analysis and design of pre-stressed concrete members and connections.
2. By the end of the course, students should be able to calculate pre-stress losses.
3. Design a post-tensioned continuous beam for transfer, serviceability and strength.
4. Design a post-tensioned slab and Specify detailing and material.

Course Outcomes:

The student will be able to

1. Understand the basic concepts about prestressed concrete.
2. Analyze pre-stressed concrete structures.
3. Calculate deflections of pre-stressed members.
4. Gain the knowledge about composite structural members.

Activities:

1. Make a pre-stressed beam and analyze
2. Make a pre-stressed column and analyze
3. Find out deflections of pre-stressed
4. Design and analyze pre stressed frame

Skills:

1. Design and analysis of pre tensioned and post tensioned concrete members
2. Determination of deflections of prestressed members
3. Calculation of losses of prestress, creep and shrinkage.

UNIT-I: Introduction, Prestressing Systems and Material Properties:

Basic concepts of pre-stressing; Historical development; Advantages and Types of Prestressing, Pre-tensioning Systems and Devices, Post-tensioning Systems and Devices, Need for High strength steel and High strength concrete; Losses Of Prestress: Nature of losses of pre-stress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.

UNIT-II: Analysis of Prestressed Member:

Analysis of Members under Axial Load: Analysis at Transfer, Analysis at Service, Analysis for Ultimate Strength, Analysis of Member under Flexure:, Analysis at Transfer and at Service, Cracking Moment, Kern Point, Pressure Line, Analysis for Ultimate Strength, design loads and strength, Calculation of Crack Width, Variation of Stress in Steel, Analysis of a Rectangular Section, Analysis of a Flanged Section.

UNIT-III: Deflections of Prestressed Concrete Members:

Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members. Long term deflection of cracked member; Transmission Of Pre-Stress: Transmission of Pre-stressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre –tensioned and post – tensioned grouted beams, stress distribution in end block, Anchorage zone reinforcements. Shear And Torsion Resistance of Prestressed Concrete Member Shear and Principal stresses; Ultimate shear resistance of pre-stressed concrete members; Design of shear reinforcement, pre-stressed concrete members in torsion, Design of reinforcements for torsion, shear and bending.

UNIT-IV: Design of Pre-Stressed Members:

Design of sections for flexure, Design of Sections for Axial Tension, Design of Sections for compression and bending, design of pre-stressed section for shear and torsion, design of prestressed member for bond. Dimensioning of flexural member, design for pre-tensioning member, design of post-tensioning members.

UNIT-V: Composite Construction of Prestressed Concrete:

Composite structural member, types of composite construction, analysis of stresses, differential shrinkages, deflection of composite member, flexural strength of composite sections, shear strength of composite section; Design of Continuous Prestressed Concrete Member Advantages of continuous members, ultimate load analysis of continuous pre-stressed member, design of continuous pre-stressed concrete beams.

TEXT BOOKS:

1. N. Krishna Raju , “Prestressed Concrete”, Tata Mc Graw - Hill Publishing Company Limited, New Delhi.3rd edition, 1995.
2. T.Y. Lin & Ned H. Burns, “Design of Prestressed Concrete Structures”, John Wiley & Sons, 3rd edition, 1981.

REFERENCE BOOKS:

1. N. Rajagopalan, “Prestressed concrete”, Narosa Publishing House.2nd edition, 2005.
2. A. Nilson, “Design of Prestressed Concrete”, John Willey & Sons.2nd edition, 1987.

Course Code	Course Title	L	T	P	C
17CE019	STABILITY OF STRUCTURES	3	0	0	3

Course Objectives:

1. To evaluate and compare modern techniques and methods in structural stability.
2. The students will become familiar with calculation and experimental methods for defining critical external loads of sleek construction elements and constructions where unstable situations appear, which makes the construction unstable and results in inward or outward flexing.

Course Outcomes:

At the end of the course student will be able to

1. Apprehend the concepts of various structural elements.
2. Precise knowledge about buckling of diverse element.
3. Application of available methods in structural stability issues.

Activities:

1. Analysis of buckling of columns using energy methods and methods of neutral equilibrium
2. Analysis of beam column with concentrated and distributed load condition.
3. Analysis of frame with the methods of neutral equilibrium, matrix method and slope deflection equations.
4. Analysis of plates with different end conditions using energy and finite difference method.

Skills:

1. Able to analyze plate, frame and beam column.
2. Able to form differential equations for plate bucklings.

UNIT-I: Buckling of Columns:

Introduction – concepts of stability – methods of Neutral Equilibrium– Euler column – Eigen value problem – Axially loaded column – Eccentrically loaded column.

UNIT-II: Energy Principle:

Raleigh Ritz method – Galerkin method – Numerical methods (New mark's difference and matrix methods).

UNIT-III: Beams and Beam Columns:

introduction – lateral buckling of beams – beam column with concentrated and distributed loads – effect of axial load on bending stiffness.

UNIT-IV: Buckling of Frames:

Introduction – modes of buckling – critical load using various methods –Neutral equilibrium – slope deflection equations, matrix method.

UNIT-V: Buckling of Plates:

Differential equation of plate bucklings – critical load on plates for various boundary conditions – Energy method – Finite difference method.

TEXT BOOKS:

1. Alexandar Chajes, "Principles of Structural Stability Theory", Prentice Hall, New

Jersey,1980.

2. Timoshenko and Gere, “Theory of Elastic Stability”, Dover Publications, 1961.

REFERENCE BOOKS:

1. Allen and Bulson, “Background to buckling”, McGraw-Hill, 1980.
2. N.G.R.Iyengar, “Elastic stability of structural elements”, Macmillan India Ltd., 2007.

Course Code	Course Title	L	T	P	C
17CE020	STRUCTURAL OPTIMISATION	3	0	0	3

Course Objectives:

1. To introduce the concepts of design optimization and review major conventional and modern optimization methods used in structural optimization applications.
2. To understand the formulation of structural optimization problems.
3. To get familiarized with the application of linear and non-linear programming to structural optimization.
4. To get exposed to unconstrained and constrained optimization.
5. To understand direct and indirect methods, direct search and gradient methods.

Course Outcomes:

At the end of the course student will be able

1. To understand the causes of failure of structures.
2. To diagnose distress of structures.
3. To analyze the debonding pattern of externally plated members
4. To understand the significance of orientation of RC buildings.

Activities:

1. Identify the variables affecting a complex phenomenon and to perform a sensitivity analysis on them.
2. Solve a given Simplex problem using Mat-Lab.

Skills:

1. Aptitude to select the variables affecting a given phenomenon, so as to model the same.
2. Ability to apply optimization techniques using Mat-Lab.

UNIT-I: Introduction:

Formulation of Structural Optimization problems: Design variables - Objective function – constraints - Fully stressed design - Review of Linear Algebra: Vector spaces, basis and dimension, canonical forms.

UNIT –II: Linear and Non Linear Programming:

Linear Programming: Revised Simplex method - Application to structural Optimization - Nonlinear Programming: Deterministic Methods - Unconstrained and constrained Optimization - Kuhn-Tucker conditions, Direct search and gradient methods - One dimensional search methods - DFP and BFGS algorithms, constrained Optimization - Direct and Indirect methods – Successive Linear Programming(SLP), Sequential quadratic programming(SQP) and SUMT, Application of Non-Linear Programming (NLP) methods to optimal structural design problems.

UNIT-III: Optimality Criteria Based Methods:

Reanalysis techniques - Approximation concepts - Design sensitivity, Optimization of sections, steel and concrete structures - framed structures, bridge structures.

UNIT-IV: Stochastic Optimization Methods

Stochastic Optimization Methods: Genetic Algorithms - Binary coding - Genetic Operators - Simple Genetic Algorithm (SGA) and variable length Genetic Algorithm (VGA) - Simulated annealing - Applications to discrete size, Configuration and shape optimization problems.

UNIT-V: Artificial Intelligence and Neural networks

Artificial Intelligence and Artificial Neural Networks based approaches for structural optimization problems.

TEXT BOOKS:

1. Haftka, R. T. and Gurdal, Z., “Elements of Structural Optimization”, Springer, 3rd Edition, 1992.
2. Gurdal, Z, Haftka, R. T., and Hajela, P., “Design and Optimization of Composite Materials”, Wiley, 1998.
3. K. K. Choi and N. H. Kim, “Design Sensitivity Analysis for Linear and Nonlinear Structures”, Springer, 2005.

REFERENCES:

1. Arora, J. S., “Introduction to Optimum Design”, Elsevier, 2nd Edition, 2004.
2. Rao. S. S. “Optimization Theory and Applications”, Wiley Eastern (P) Ltd., 1984.

Course Code	Course Title	L	T	P	C
17CE013	ADVANCE CONCRETE TECHNOLOGY	3	0	0	3

Course Objectives:

1. To know the advancements in the field of concrete technology.
2. To understand the use of various chemical and mineral admixtures in concrete.
3. To understand the behavior of green materials for sustainable construction.
4. To be familiarize with the available Non-Destructive testing techniques for the testing of strength parameters of concrete.

Course Outcomes:

At the end of the course student will be able

1. To show understanding of concrete behavior, admixtures and polymers and their applications
2. To show appreciation of the factors affecting durability of concrete and know how durable concrete and special concretes are produced.
3. To be familiar with concepts of social, environmental and economic sustainability and engineering for sustainable development.

Activities:

1. Perform NDT on beams of Surveying lab to find strength.
2. Perform experimental investigation on strength of concrete in both fresh and hardened state when mineral admixtures are added to it.
3. Perform experimental investigation on strength of concrete in both fresh and hardened state when chemical admixtures are added to it
4. Analyze the behavior of concrete when green materials are used in concrete.

Skills:

1. Able to correlate the NDT test results to the strength of concrete.
2. Able to identify the effect of mineral and chemical admixtures on the strength of concrete.
3. Able to select the good material for the preparation of green concrete for the sustainable construction.

UNIT-I: Introduction:

Concrete - Understanding the quasi-brittle nature of concrete - Failure of concrete under low stress - Micro— cracking, crack propagation - stress concentration at openings –Destructive, semi-destructive & Non-destructive testing methodology - Rebound hammer test - Ultrasonic Pulse Velocity (UPV) Test - Penetration resistance test - Pull-out Test - Pull-off Method - Break-off test - Cover Measurement - Core Sampling and Testing - Half-cell electrical potential method - Resistivity Mapping Problems faced during Non-destructive evaluation - Microscopic Analysis – XRD, SEM, TEM Analysis.

UNIT-II: Admixtures and Polymers:

Chemical Admixtures- Mechanism of chemical admixture, Plasticizers and super Plasticizers and their effect on concrete property in fresh and hardened state, Marsh Cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, and new generation super plasticiser.

Mineral Admixture-Fly ash, Silica fume, GGBS, and their effect on concrete property in fresh state and hardened state.

Polymers -Structural Plastics and Composites- Polymer Membranes Coatings.

UNIT-III: Durability Properties:

Permeability – chemical attack – Sulphate attack – Carbonation - Quality of water – marine conditions – Thermal properties of concrete – fire resistance – methods of making durable concrete

UNIT-IV: Special Concrete:

Light weight concrete, Fiber and Hybrid Fiber reinforced concrete, Polymer Concrete, Super plasticized concrete, Epoxy resins and screeds for rehabilitation Fly ash and High volume flyash concrete, -High performance concrete - Self compacting concrete - Self curing concrete – Recycled aggregate concrete - Bacterial concrete – Nanoconcrete

UNIT-V: Sustainability:

Introduction - Need for sustainability - Concept of sustainability - social, environmental and economic sustainability concepts. Sustainable development - Engineering for sustainable development - Threats for sustainability - Low Impact development techniques-Green materials -Material selection for sustainable design.

TEXT BOOKS:

1. Shetty M.S., “Concrete Technology”, S.Chand and Company Ltd. Delhi, 2013.
2. Gambhir.M.L., “Concrete Technology”, Tata McGraw Hill, Publishing Co. Ltd New Delhi, 2013.
3. Santhakumar .A.R.,” Concrete Technology”, Oxford University Press, NewDelhi 2006.

REFERENCE BOOKS:

1. Neville, A.M., “Properties of Concrete”, Pitman Publishing Limited, London, 2012.
2. Mehta P.K. and Montreio P.J.M., "Concrete Structure Properties and Materials", 2nd edition, Prentice Hall, 1993.
3. A. M. Neville & J. J. Brooks, “Concrete Technology”, 4th Impression, Pearsons Education Ltd, 2009.

Course Code	Course Title	L	T	P	C
17CE021	SMART STRUCTURES AND APPLICATIONS	3	0	0	3

Course Objectives:

1. To introduce passive and active systems.
2. To familiarize students with components of smart systems.
3. To make students exposed to different types of smart materials.
4. To make students understand control systems.
5. To introduce the methods and techniques for developing and designing multifunctional structures.

Course Outcomes:

At the end of the course student will be able

1. To understand the concept of passive and active systems.
2. To be familiar with components of smart systems.
3. To be exposed to different types of smart materials.
4. To better understand control systems.
5. To be familiar with the methods and techniques for developing and designing multifunctional structures.

Activities:

1. Presentation by students on the currently used Active and Adaptive Systems
2. Cost comparison for synonymously used Active & Passive Systems or Adaptive & Active Systems.
3. Debate on whether to integrate smart systems with the internet or not (IoT).

Skills:

1. Ability to gain knowledge on the available Smart Systems currently in practice.
2. Aptitude to choose a suited smart system based on requirement.
3. Ability to understand the economic, social and security implications of smart systems.

UNIT-I: Introduction:

Introduction to - passive and active systems - need for active systems - smart systems - definitions and implications - active control and adaptive control systems - examples.

UNIT –II: Components of Smart Systems:

Components of smart systems – system features and interpretation of sensor data – pro-active and reactive systems – demo example in component level – system level complexity.

UNIT-III: Materials and Modelling:

Materials used in smart systems – characteristics of sensors – different types of smart materials – characteristics and behavior of smart materials – modeling smart materials – examples.

UNIT-IV: Control Systems and Applications:

Control Systems – features – active systems – adaptive systems – electronic, thermal and hydraulic type actuators – characteristics of control systems – application examples.

UNIT-V: Integration of sensors and control systems:

Integration of sensors and control systems – modeling features – sensor - response integration – processing for proactive and reactive components – FE models – examples.

TEXT BOOKS:

1. Srinivasan, A. V. and Michael McFarland, D., “Smart Structures: Analysis and Design”, Cambridge University Press, 2000.
2. Yoseph Bar Cohen, “Smart Structures and Materials”, The International Society for Optical Engineering, 2003.

REFERENCES:

1. Brian Culshaw, “Smart Structures and Materials”, Artech House, Boston, 1996.
2. M. V. Gandhi and B. S. Thompson, “Smart Materials and Structures”, Chapman and Hall, 1992.
3. Afzal Suleman, “Smart Structures Applications and Related Technologies”, (International Centre for Mechanical Sciences, Courses and Lectures No. 429), Springer, 2014.

Course Code	Course Title	L	T	P	C
17CE022	PRE ENGINEERED BUILDINGS	3	0	0	3

Course Objectives:

1. To understand the importance of Prefabrication
2. To know the process of prefabrication of various structural elements
3. To understand the assembling and dismantling of prefabricated components
4. To study the design considerations in the process of prefabrication
5. To understand the joining techniques in prefabrication

Course Outcomes:

At the end of the course the student will be able

1. To know the procedure of prefabrication
2. To design the structural prefabricated elements.
3. To familiarize with joining techniques used for prefabrication
4. To know abnormal loads which are hazardous to the prefabricated structures.

UNIT I: Introduction:

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection.

UNIT II: Prefabricated Components:

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III: Design Principles:

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV: Joint in Structural Members:

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V: Design for Abnormal Loads:

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TEXTBOOKS:

1. CBRI, “Building materials and components”, India, 1990.
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994.

REFERENCES:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

Course Code	Course Title	L	T	P	C
17CE023	EXPERIMENTAL STRESS ANALYSIS	3	0	0	3

Course Objectives:

1. To understand the different strain gauge systems available.
2. To understand the utilization of strain gauges.
3. To study the importance of Non Destructive Testing.

Course Outcomes:

At the end of the course student will be able

1. To understand the mechanical properties of strain gauges
2. To understand the different methods in design the strain gauges.
3. To have a brief idea regarding two dimensional photo elasticity.

Activities:

1. Conduct an NDT test on various structural components using Rebound hammer.
2. Make Electrical Resistance strain gage using any of the design methods.
3. Conduct a laboratory experiment to determine Elastic moduli using a self-made Electrical Resistance strain gage.

Skills:

1. Ability to perform NDT Test and interpret the results
2. Ability to understand the science behind working of a strain gauge.
3. Understanding the practical applications of a strain gauge.
4. Determine the stress distribution in a acrylic block using the concept of photo elasticity.

UNIT-I: Introduction and Strain Measurement Methods:

Model & Prototype – Dimensional analysis-Factors influencing model design – Scale factors and Model material properties – Methods of model design - Definition of strain - its relation to experimental determinations - properties of strain gauge systems – Mechanical - Optical, Acoustic and Pneumatic types.

UNIT-II: Electrical Resistance Strain Gauges:

Introduction – gauge construction – strain gauge adhesives - mounting methods – gauge sensitivities and gage factor – performance characteristics of wire and foil strain gauges – environmental effects - Analysis of strain gauge data – the three element rectangular rosette – the delta rosette – correction for transverse sensitivity.

UNIT-III: Non – Destructive Testing:

Introduction - objectives of non destructive testing - Ultrasonic pulse velocity method – Rebound Hammer method – Acoustic Emission application to assessment of concrete quality

UNIT-IV: Photo Elasticity:
Introduction – temporary double refraction – Index ellipsoid and stress ellipsoid – the stress optic law – effects of stressed model in a polariscope for various arrangements - fringe sharpening.

UNIT-V: Two Dimensional Photo Elasticity:
Introduction - iso-chromatic fringe patterns – isoclinic fringe patterns – compensation techniques – calibration methods – separation methods – materials for photo- elasticity – properties of photo-elastic materials

TEXT BOOKS:

1. J.W. Dally and W.F. Riley, "Experimental Stress Analysis", McGraw-Hill, 1991.
2. L.S. Srinath, M.R. Raghavan, K. Lingaiah, G. Gargesa, B. Pant, and K. Ramachandra, "Experimental Stress Analysis", Tata McGraw Hill, 1984.

REFERENCES:

1. K. Ramesh, Digital Photoelasticity – Advanced Techniques and Applications, Springer, 2000.
2. George Hamor Lee, "An Introduction Experimental Stress Analysis", John Wiley & Sons Publishers, 1950.
3. Sadhu Singh, "Experimental Stress Analysis", Khanna publications, 1990.

Course Code	Course Title	L	T	P	C
17CE024	SOIL STRUCTURE INTERACTION	3	0	0	3

Course Objectives:

1. To understand various principles governing soil-structure interaction effect.
2. To familiarise the students with design and analysis of sub-structures incorporating with the effect of soil-structure interaction.

Course outcomes:

The student will be able to

1. Understand scope of soil-foundation interaction effect
2. Gain knowledge about modelling of elastic foundation
3. Predict settlement and deflections of laterally loaded piles

Activities:

1. Model two different substructure in STAAD Pro with and without soil structure. Analyse the models to quantify soil structure interaction effect
2. Design a pile subjected to lateral load and find settlements and deflections
3. Make a mathematical and computer model to understand pile group interaction effect

Skills:

1. Determination of deflection of a laterally loaded pile
2. Differentiate the computer models of substructure with and without soil-structure interaction effect consideration

UNIT I: Soil-Foundation Interaction

Introduction to soil - Foundation interaction problems, Soil behaviour, Foundation behaviour, Interface, behaviour, Scope of soil-foundation interaction analysis, soil response models,

Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour.

UNIT II: Beam on Elastic Foundation - Soil Models:

Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness.

UNIT III: Plate on Elastic Medium:

Infinite plate, Winkler, Two parameters, Isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions.

UNIT IV: Elastic Analysis of Pile:

Elastic analysis of single pile, Theoretical solutions for settlement and load distribution, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap.

UNIT V: Laterally Loaded Pile:

Load deflection prediction for laterally loaded piles, subgrade reaction and elastic analysis, Interaction analysis, and pile raft system, solutions through influence charts.

TEXTBOOKS:

1. Hemsley, J.A, "Elastic Analysis of Raft Foundations", Thomas Telford, 1998.
2. McCarthy, D.F. "Essentials of Soil Mechanics and Foundations", (6th Edition), Prentice Hall, 2002.
3. Selvadurai, A.P.S., "Elastic Analysis of Soil Foundation Interaction", Elsevier, 1979.

REFERENCES:

1. Poulos, H.G., and Davis, E.H., "Pile Foundation Analysis and Design", John Wiley, 1980.
2. Scott, R.F. "Foundation Analysis", Prentice Hall, 1981.
3. "Structure Soil Interaction - State of Art Report", Institution of structural Engineers, 1978.
4. ACI 336, "Suggested Analysis and Design Procedures for Combined Footings and Mats", American Concrete Institute, Delhi, 1988.

Course Code	Course Title	L	T	P	C
17CE025	ADVANCED STEEL AND CONCRETE COMPOSITE STRUCTURES	3	0	0	3

Course Objectives:

1. To develop an understanding of the behaviour, analysis and design of Steel concrete composite elements and structures.
2. To familiarize with the design and analysis procedure of steel and concrete composite elements.

Course Outcomes:

At the end of the course student will be able to

1. Analyze steel concrete composite structures.
2. Design composite structures and its connections.
3. Conduct case studies related to steel concrete composite constructions of buildings.

Activities:

1. Analysis and design of Composite structures using Software Packages
2. Cast the model using composite materials
3. Presentation

Skills:

1. Ability to analyse the composite structures by using software.
2. Ability to create the composite structure model

UNIT-I: Introduction:

Introduction to steel - concrete composite construction - theory of composite structures- Introduction to steel - concrete - steel sandwich construction

UNIT –II: Design of Composite Members:

Behavior of composite beams, columns, design of composite beams, steel, concrete composite columns - design of composite trusses.

UNIT-III: Design of Connections:

Types of connections, Design of connections in the composite structures - shear connection, Design of connections in composite trusses

UNIT-IV: Composite Box Girder Bridges:

Introduction - behaviour of box girder bridges - design concepts

UNIT-V: General Case Studies:

General case studies on steel - concrete composite construction in buildings - seismic behaviour of Composite structures

TEXT BOOKS:

1. Johnson.R.P, “Composite structures of steel and concrete”, Blackwell Scientific Publications (Third Edition), UK, 2013.

REFERENCES:

1. Owens.G.W and Knowels.P, "Steel Designers manual", (Fifth edition), Steel Concrete Institute (UK), Oxford Blackwell Scientific Publications, 1992.
2. Proceedings of workshop on "Steel Concrete Composite Structures", conducted at Anna University,2007.
3. IRC 24:2010 Standard Specifications and code of practice for Road Bridges. Section V-Steel Road Bridges.

I YEAR	COURSE CONTENTS FOR COMMON COURSES	
II SEMESTER	17HS001	Research Methods
	17HS002	Employment Orientation Program (EOP)

17HS001 Research Methods

L	T	P	C
3	0	0	3

Objective of the Course:
Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I
Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondary data, probability and non-probability sampling techniques.

UNIT-II
Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III
Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion, measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminate analysis, cluster analysis, conjoint analysis

UNIT-IV
Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution in Interpretation, Significance of Report writing, Different steps in writing Report, Layout of the Research Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V
Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. *Intellectual Property Rights:* copy rights.

Text Books:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17HS002 Employment Orientation Program

L	T	P	C
2	0	0	2

Preamble

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.
ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.
iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

Assessment:

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- ✓ 5 Marks for attendance
- ✓ 5 Marks for formative assessment
- ✓ 40 Marks for summative assessment

I

YEAR

M.Tech.

FARM MACHINERY (FM)

I SEMESTER

17AG501	-	Design of Farm Power Machinery System
17AG502	-	Tractor Systems Design
17AG503	-	Alternative Energy Design
17AG504	-	Computer Aided Design and Manufacturing
	-	Elective Course - I
	-	Elective Course - II

II SEMESTER

17HS001	-	Research Methods
17HS002	-	Employement Orientation Program (EOP)
17AG506	-	Soil dynamics in Tillage and Traction
17AG507	-	Ergonomics in Agro Systems
17AG508	-	Testing of Tractors and Agricultural Machinery
17AG509	-	Credit Seminar
	-	Elective Course - III
	-	Elective Course - IV

COURSE CONTENTS

I SEM & II SEM

17AG001 DESIGN OF FARM MACHINERY SYSTEM

Hours Per Week :

L	T	P	C
2	1	3	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description and Objectives:

To acquaint and equip with the latest design procedures of farm power and machinery systems.

Course Outcomes:

· able to design the agricultural machines for tillage, planting/ sowing, threshing and combine harvesting etc.
· able to testing of agricultural machines for tillage, planting/ sowing, threshing and combine harvesting etc.
· mastering the methods and processes of design.
· having fundamental knowledge of theories of agricultural machinery and equipment.

· having knowledge and transfer of new technologies in the field of design and construction of agricultural machines and equipment.
· monitoring and implementation of new and contemporary solutions

SKILLS:

✓ Design tillage equipment

✓ Design weeding equipment

ACTIVITIES:

- *Design of MB Plough*
- *Design of cultivator.*
- *Design and prototype development of wheel hoe.*

UNIT –I

Modern trends, principles, procedures, fundamentals and economic considerations for design and development of farm machinery systems. Design considerations, procedure and their applications inagricultural machines. Reliability criteria in design and its application.

UNIT –II

Mechanics of tractor chassis, Forces acting upon tillage implement, Mechanics of tillage

UNIT –III

Design of selected farm equipments: – tillage, seeding, planting, interculture, plant protection, harvesting and threshing. Design of rotary, vibrating and oscillating machines.

UNIT –IV

Tractor –Implement matching and operation, Tractor Implement performance

UNIT – V

Safety devices for tractors & farm implements. Cabs & HVAC designs- designs of ROPS and FOPS, safety locations of PTO

Practical:

Statement and formulation of design problems of

1. Mould board ploughs
2. Disc ploughs
3. Harrows
4. Cultivators
5. Rotary tiller
6. Seed drills and planters
7. Transplanters and fertilizer applicators
8. Harvesters
9. Threshers
10. Forage handling equipment

Text books:

1. Bernacki C, Haman J &Kanafajski CZ.1972. *Agricultural Machines.* Oxford & IBH.
2. Bindra OS & Singh Harcharan 1971. *Pesticides Application Equipments*. Oxford & IBH.
3. Bosoi ES, Verniaev OV & Sultan-Shakh EG. 1990. *Theory, Construction and Calculations of Agricultural Machinery.* Vol. I. Oxonian Press.

Reference books:

1. Klenin NI, Popov IF &Sakoon VA. 1987. *Agricultural Machines. Theory f Operations, Computing and Controlling Parameters and theCondition of Operation.*
2. Lal R &Dutta PC. 1979. *Agricultural Engineering* (through solved examples). SarojParkashan.
3. Ralph Alcock.1986. *Tractor Implements System*. AVI Publ.
4. Raymond N, Yong Ezzat A & Nicolas Skiadas 1984. *Vehicle Traction Mechanics*. Elsevier.
5. Sharma PC &Aggarwal DK. 1989. *A Text Book of Machine Design*. Katson Publishing House.

17AG003 TRACTOR SYSTEM DESIGN

Hours Per Week :

L	T	P	C
2	1	3	5

Total Hours :

L	T	P
45	-	36

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

- *To acquaint and equip with the latest design procedures of tractor and its systems.*

Course Outcomes:

At the completion of the course the student will:

- have knowledge and skills on power transmission system of a tractor
- know the design procedures of hydraulic systems and steering system.
- understand design features and selection of engine for tractor.
- know the testing procedures for tractor
- knowing the design of engine components
- knowledge and skills on, hydraulic, pumps used in machinery.
- knowledge on different kinds of valves.
- skills on trouble shooting in valves.
- knowledge on safety features and service requirements of various hydraulic and pneumatic circuits

SKILLS:

- ✓ *Desgin hydraulic system for tractor*
- ✓ *Design ergonomical seat for agricultural tractor*

ACTIVITIES:

- *Collection of rquistite parameters for design of hydraulic system* for tractor
- *Collection of relevant data for ergonomical desing of seat of agricultural*

UNIT – I

Technical specifications of tractors available in India, modern trends in tractor design and development, special design features of tractors in relation to Indian agriculture.

UNIT – II

Engine performance. Selection of engine for tractors. Design of principal engine components. Design of engine systems. Parameters affecting design of tractor engine and their selection.

UNIT – III

Hydraulic system & hitching, chassis, Tractor stability analysis. Single and three point hitch systems. Drawbar performance. Quick attaching couplers.

UNIT – IV

Tractor clutches and brakes. Design of power transmission systems. Power measurement of tractor, Tire selection

UNIT – V

Design and performance evaluation of traction and transport devices. Human factors engineering in tractor design. Driver's seat, work-place area and controls. Computer application and automation in tractor design

Practical:

1. Measurement of Rolling resistance and slip
2. Measurement of engine performance parameters
3. Study of dynamometers
4. Measurement of draft of tillage implement
5. Design problems of hydraulic system
6. Design problems of hydraulic system
7. Design problems of tractor mechanics
8. Design problems of tractor mechanics
9. Design problems of tractor transmission
10. Design problems of tractor transmission

Text books:

1. Barger EL, Liljedahl JB &McKibben EC. 1967. *Tractors and their Power Units*. Wiley Eastern.
2. Macmillan RH. *The Mechanics of Tractor - Implement Performance, Theory and Worked Example*. University of Melbourne.

Reference books:

1. Maleev VL. 1945. *Internal Combustion Engines*. McGraw Hill.
2. Ralph Alcock 1986. *Tractor Implements System*. AVI Publ. Co.
3. Arther W Judge 1967. *High Speed Diesel Engines*. Chapman & Hall.

17AG005 ALTERNATIVE ENERGY SOURCES

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description & Objective:

To acquaint with the knowledge on various energy sources like biofuels, wind and solar systems, their use, design and applications in different farming activities.

Course outcomes:

After completion of the course, students will be able to:

1. describe the fundamentals and main characteristics of renewable energy sources and their differences compared to fossil fuels.
2. explain the technological basis for harnessing renewable energy sources
3. recognize the effects that current energy systems based on fossil fuels have over the environment and the society
4. describe the main components of different renewable energy systems
5. compare different renewable energy technologies and choose the most appropriate based on local conditions
6. perform simple techno-economical assessments of renewable energy systems
7. perform and compare basic environmental assessments of renewable energy systems and conventional fossil fuel systems
8. design renewable/hybrid energy systems that meet specific energy demands, are economically feasible and have a minimal impact on the environment
9. suggest the best combination of technological solutions to minimize the emission of greenhouse gases and increase the sustainability of the energy system in specific areas/ regions
10. discuss how to utilize local energy resources (renewable and non-renewable) to achieve the sustainable energy system.

SKILLS:

- ✓ *Use renewable energy sources for desing of farm equipment*
- ✓ *Use biomass energy for engine power.*

ACTIVITIES:

- o *Design of solar operated power sprayer*
- o *Visit to biodiesel manufacturing plant*

UNIT I

Introduction to alternative energy sources-Types, advantages, disadvantages, conventional energy sources, World energy scenario, Applications of renewable energy in agriculture

UNIT II

Solar radiation and its measurement, Solar energy collectors, solar energy storage, applications of solar energy, Design of solar energy operated systems for heating, cooling, distillation, drying, water pumping and power generation for application in agriculture.

UNIT III

Wind energy, Types of wind mills and their characteristics. Mechanics of wind mills, Design of wind mills Applications, Utilization of wind energy for generation of electricity and mechanical power.

UNIT IV

Biomass conversion and biogas generation, types of biogas plants- construction and working, digester design considerations, Factors affecting biogas production, Design of biogas systems for heating, lighting and running IC engines, Economics of biogas utilization.

UNIT V

Thermo-chemical conversion of biomass, direct combustion, Pyrolysis and gasification, chemical combustion process, carbonization , briquetting, pelletization and densification of biomass, bioconversion into alcohols, methyl and ethyl esters, organic acids, solvents of amino acids, bio-fuels.

Practicals

1. Measurement of direct and diffuse radiation,
2. Study of solar cooker.
3. Study of solar water heater.
4. Study of solar sprayer.
5. Design problems on solar photovoltaic cell.
6. Design problems on collection of solar radiation.
7. Design problems on wind mill.
8. Design of biogas plant.
9. Briquetting.
10. Study of bio-fuel.

Text books:

1. James F. Manwell, Jon G. McGowan, Anthony L. Rogers. 2009. Wind Energy Explained: Theory, Design and Application, 2nd Edition, Wiley Publishers.
2. V V N Kishore. 2010. Renewable Energy Engineering And Technology: Principles And Practice, The Energy and Resources Institute

Refernce Books:

1. John A. Duffie, William A. Beckman. 2013. Solar Engineering of Thermal Processes, John Wiley & Sons.
2. Hemant Pathak. 2013. A Hand Book of Energy Conservation and Management, CreateSpace Independent Publishing Platform
3. SolankiChetan Singh. 2011. Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI; 2 edition.

17AG007 COMPUTER AIDED DESIGN AND MANUFACTURING

Hours Per Week :

L	T	P	C
3	1	3	4

Total Hours :

L	T	P
45	-	-

XXXX

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:
To acquaint and equip with the computer aided design and manufacturing of farm machinery with the help of CAD.

Course outcomes:
Successful achievement of master level outcomes is required to receive a passing grade in the course. .

1. Ability to create fully constrained solid models that can be quickly modified using standard software tools.
2. Ability to use, identify and explain standard features in solid modeling including protrusions, revolutions, cutouts, and patterns
3. Ability to use standard software tools to create engineering drawings, or other documents, to fully describe the geometries and dimensions of parts, as well as to document assemblies according to standard practice
4. Ability to use standard software tools to create part assemblies and check for clearances.
5. Ability to create the drawings of farm implements and their analysis.
6. Ability to write the CNC part programming

SKILLS:

✓ *Draw the different farm machinery components using drawing software*

ACTIVITIES:

- *Design drawing of different machine components*
- *Writing program for cutting of machinery*

UNIT I

Introduction: Introduction of CAD/CAM, Definition of CAD & CAM Tools, Design Process, Design criteria,Geometric modeling, entities, 2D & 3D Primitives.
2D & 3D Geometric Transformations: Translation, Scaling, Rotation, Reflection and Shearing, Conlatenation.

UNIT II

Wire frame modeling: Curves: Curve representation. Analytic curves – lines, Circles, Ellipse, Conis. Synthetic curves – Cubic, Bezier, B-Spline.
Surface Modeling: Surface entities, Surface Representation.Analytic Surface – Plane Surface, Ruled Surface, Surface of Revolution, Tabulated Cylinder.
Solid Modeling: Solid modeling techniques, Geometric and Topology, Types of solid modeling, Algorithms, CSG representation, 3D base primitives.

UNIT III

Application to farm machinery scheduling problem. Application to farm –factory co-ordination – case study. Design of farm machinery with the help of CAD.

UNIT IV

Introduction to Computer Control in NC, Computer Numerical control, Direct Numerical control, Combined DNC/CNC System, Adaptive control system. Introduction to NC Part programming,Manual Part Programming, Computer assisted part programming APT language, G&M codes and examples.

UNIT V

Introduction:Fundamentals of Rapid Prototyping, Advantages and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.

Practical:

1. Understanding CAD software and its uses and application in design of farm machinery.
2. Description of the machinery scheduling problem in harvesting and transport system.
3. Development of 2D drawings
4. Development of part drawings for various components in the form of orthographic and isometric.
5. Generation of various 3D Models through pad,shaft ,shell sweep
6.Exercise on Feature based and Boolean based modeling
7. Assembly Modeling.
8. Demonstration on CNC machine
9. Exercise on G&M codes
10. Demonstration onRapid Prototyping machine

Text books:

1. Martenson, E. Micheal, Geometric Modelling, John Wiley & Sons, 1995.
2. Grover Mikell P. 2003. *Automation, Production Systems and Computer Integrated Manufacturing*. Prentice-Hall of India.

Reference books:

1. Radhakrishnan P, Subramanyan S &Raju V. 2003. *CAD/CAM/CIM*. New Age International.

17HS001 RESEARCH METHODS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

Objective of the course is to enable research scholars to have a general understanding of research methods and application of statistical tools in the analysis and interpretation of findings and guidelines for report writing.

UNIT - I

Introduction: Nature and Importance of research, the role of business research, aims of social research, research process, types of research. Data Base: discussion on primary data and secondarydata, probability and non-probability sampling techniques.

UNIT-II

Research design: Meaning of research design. Functions and goals of research design. Questionnaire and Schedule.

UNIT – III

Measurement and scaling concepts: Attitude measurement, levels of measurement and types of scales, criteria for good measurement. Measures of central tendency, measures of dispersion,measures of variation, Correlation and Regression. Statistical Inference. Tests of significance for small samples, t-test, Chi-Square test and ANOVA-one way and two way classifications. Discriminateanalysis, cluster analysis, conjoint analysis

UNIT-IV

Technical Report Writing: Pre-writing considerations, Thesis writing, formats of report writing, Formats of publications in Research Journals. Technique of Interpretation, Precaution inInterpretation, Significance of Report writing, Different steps in writing Report, Layout of theResearch Report, Types of Reports, Report Format, Typing Instructions, Oral Presentations.

UNIT-V

Research Ethics and Morals: Issues related to plagiarism, collaborative models and ethics, Acknowledgements. Intellectual Property Rights: copy rights.

Text Books:

1. Bhattacharya, D. K., Research Methodology, Excel Books, New Delhi.
2. Gupta S.P., Statistical Methods, Sultan Chad, New Delhi, 2001.
3. Pannerselvam, Research Methodology, Prentice Hall of India, New Delhi, 2005.

Reference Books:

1. Andrews, F.M. and S.B. Withey Social Indicators of well being, Plenum Press, 1976.
2. Bennet, Roger, Management Research, ILO, 1983.
3. Murray.R. How to write a Thesis:, Tata Mc Graw-Hill.
4. Nanda Gopal, Research Methods Using Computers, Excel Books, New Delhi.
5. Salkind. Neil.J, Exploring Research, Prentice Hall of India, New Delhi, 1997.
6. Shajahan.S, Research Methods for Management, Jaico Publishing House, 2005.
7. C.R. Kothari: Research Methodology, Methods & Techniques, 2nd Edition, New Age International Publications

17HS002 EMPLOYMENT ORIENTATION PROGRAM

Hours Per Week :

L	T	P	C
2	-	-	2

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Preamble:

It is common knowledge that students opting for the Masters Programme after B.Tech do so either because they have been unsuccessful in securing employment after their Bachelors or because they have not crystallized their career plan. Hence, students opting for M.Tech are found to be deficient not only in the technical knowledge but also in their communication skills and overall personality. There is a need to groom them and shape them into employable resources.

Program Objectives:

i. To impart employability skills to M.Tech. final students by honing their interpersonal and presentation skills.

ii. To equip them with the latest tools and techniques for effective communication through discussions, group work, presentation exercises, assignments, projects etc.

iii. To impart training for their overall personality development and shape them into confident, positive and ambitious professionals.

Course Contents

The course content, designed for 50 Hrs will comprise two modules:

- Communication skills & Overall personality improvement (10 * 2.5 = 25 Hrs)
- Pedagogy of Engineering Subjects & Making Project Presentations (10 * 2.5 = 25 Hrs)

Rationale for the Programme

On a more holistic view of higher education, the term “academic development” refers to development of multiple aspects of a student’s personality under this EOP for M.Tech

students, different types of development are envisaged like personal, interpersonal skills, career development and life planning. “Development” in the engineering education

according to national accreditation bodies like NBA and NAAC is understood to happen through activities and programmes designed to improve the ability to work to teams, express themselves confidently to their peers and present their views boldly before an audience and

get things accomplished through management of men and materials. This programme will improve student’s overall communication skills and raise his/ her potential as an employee graduate.

About this Programme

The 50 Hrs course will be rolled out in two spells of 25 Hrs each with the help of in-house and invited experts. It is aimed at improving the presentation skills in general and teaching ability of the M.Tech students in particular. AFD will seek the cooperation of all the Deans, HoDs and senior professors as subject experts, mentors from the departments to provide the essential knowledge and skill inputs for the trainees so that the course outcomes can be realized.63

Expected Outcomes:

Having gone through the 50 hrs rigorous training on presentation skills, pedagogy and overall personality grooming, the trainees will get equipped to face any interview confidently, make short and effective presentations during interviews and gain the confidence to handle engineering topics and perhaps also develop an aspiration for a career in teaching.

The trainees will be assessed for a total of 50 marks, which will be incorporated into the II year project marks. The summative assessment will be carried out by a special panel constituted for the purpose in consultation with the Dean, Evaluation and respective HoD.

- 5 Marks for attendance
- 5 Marks for formative assessment
- 40 Marks for summative assessment

17AG002 SOIL DYNAMICS IN TILLAGE AND TRACTION

Hours Per Week :

L	T	P	C
4	1	3	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

To acquaint and equip with the dynamic properties of soil, soil failure and design of tillage tools, prediction of traction performance and dimensional analysis of different variables related to soil- tire system.

Course outcomes:

Upon completion of this course, students will:

1. be able to measure and utilize physical and mechanical properties of soil in order to interpret and predict soil stress-strain behavior.
2. be able to design and implement safe and cost-effective mechanical soil tillage systems for producing desired physical states
3. be able to design and implement and cost-effective mechanical traction/transport systems which produce specified performance and acceptable alteration of affected soil profiles
4. understand the need to learn and apply improved methodologies through continuing education.

SKILLS:

- ✓ *Measure dynamic properties of soil*
- ✓ *Apply traction parameters in design of tractor*

ACTIVITIES:

o=Measurement of different dynamic properties of soil

o Measurement of traction parameters

UNIT I

Dynamic properties of soil and their measurement, stress-strain relationships, theory of soil failure.

UNIT II

Mechanics of tillage tools and geometry of soil tool system, design parameters and performance of tillage tools.

UNIT III

Dimensional analysis of different variables related to soil-tyre system; soil vehicle models; mechanics of steering of farm tractor; special problems of wet land traction and floatation.

UNIT IV

Introduction of traction devices, tyres-types, function & size, their selection; mechanics of traction devices. Deflection between traction devices and soil, slippage and sinkage of wheels.

UNIT V

Evaluation and prediction of traction performance, design of traction and transport devices. Soil compaction by agricultural vehicles and machines.

Text books:

1. Daniel Hill. 1962. *Fundamentals of Soil Physics*. Academic Press.

2. Gill & Vandenberg.1968. *Soil Dynamics in Tillage and Traction*. Supdt. Of Documents, U.S. Govt. Printing Office, Washington, D.C.

Reference books:

3. Sineokov GN. 1965. *Design of Soil Tillage Machines*. INSDOC, New Delhi.

4. Terzaghi K & Peck Ralph B.1967. *Soil Mechanics in Engineering Practices*. John Wiley & Sons.

Practicals:

1. Direct shear test.
2. Vane shear test.
3. Field measurement of soil strength.
4. Measurement of cone index by cone penetrometer.
5. Design problems on tillage tools.
6. Study of tractive performance parameters.
7. Study of tractive performance parameters.
8. Study of tire size, load, and air pressure Relationship.
9. Problems on tire selection.
10. Problems on dimensional analysis.

17AG004 ERGONOMICS IN AGRO SYSTEMS

Hours Per Week :

L	T	P	C
3	1	3	5

Total Hours :

L	T	P
-	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

To acquaint and equip with the ergonomic aspects in the design of farm machinery for safety of human beings

Course outcomes:

1 demonstrate an awareness of the unique attributes involved with farm work and planning for safety on a farm

2 understand the impact of near misses, injuries and fatalities on the farm, including the daily workings, business finances, the wide range of people affected, etc.

3 understand what hazards are, how they manifest, and how they impact business efficiency

4 understand the elements involved in creating a farm safe plan

5 understand how developing a farm safe plan can be valuable tool for business management, risk management, and human resources management

6 understand basic occupational health and safety principles (including terminology) demonstrate an awareness of the legal responsibilities in farm safety planning

7 demonstrate an awareness of available resources and supports in the area of farm safety conduct an inspection of their own operations to identify areas for improvement create standard work procedures (swp) and general safety guidelines as they relate to farming practices

8 understand the difference between swp and general safety guidelines and when to use each understand how attitudes on a farm emerge and how farm climate can be altered regarding the importance of safety

SKILLS:

Apply knowledge of ergonomics in design of agricultural machinery

Apply knowledge of ergonomics in design of tractor components

.

ACTIVITIES:

- Ergonomic design of tractor seat
- Ergonomic design of wheel hoe

UNIT I

Importance of ergonomics and its application in agriculture , Anthropometry and Biomechanics: Anthropometric data and measurement techniques, analysis and application of anthropometric data, joint movement and method of measurement, , measurement of physical and mental capacities. Man-machine system concept. Human factors in adjustment of man and his work

UNIT II

liberation and transfer of energy in human body, concept of indirect calorimeter, work physiology in various agricultural tasks. Physiological stress indices and their methods of measurement: Mechanical efficiency of work, fatigue and shift work.

UNIT III Vibration and noise: Theory, Classification of vibrations, Governing equations, Energy methods. Sensors: Types, Theory and concept, Applications. use of isolators, application in tractor seat design. Biomedical aspects of tractor operation; Visual perception in tractor control panel design..

UNIT IV

Noise and vibration and their physiological effects, thermal environment; heat stress, thermal comfort, effect on performance and behavior, field of vision, color discrimination, Principle and design of ROPS, International standards and testing of ROPS. Simulation of tractor cabin enclosure in view of ergonomics

UNIT V

General guidelines for designing visual display, Design aspects of foot and hand controls on tractors and farm equipment, safety standards at workplace during various farm operations and natural hazards on the farm. Farm safety legislation. Design of operator's seat for agricultural equipment.

Practical:

1. Study of anthropometric data of agricultural workers
2. Identification of anatomical reference planes and directional terms of human body
3. Identification of anthropometric dimensions for agricultural machinery design.
4. Measurement of identified anthropometric dimensions of sample objects.
5. Measurement of identified anthropometric dimensions of sample objects.

Text books:

1. Bridger RS. 1995. *Introduction to Ergonomics*. McGraw Hill.
2. Charles D Reese. 2001. *Accident / Incident Prevention Techniques*. Taylor & Francis.
3. Gavriel Salvendy. 1997. *Hand Book of Human Factors and Ergonomics*. John Wiley & Sons.

Reference books:

1. Kromer KHE. 2001. *Ergonomics*. Prentice Hall.
2. Mathews J & Knight AA.1971. *Ergonomics in Agricultural Design*. National Institute of Agric. Engineering, Wrest Park Silsoe, Bedford.
3. Mathews J Sanders, CormicksMS &MCEj. 1976. *Human Factors in Engineering and Design*. 4th Ed. McGraw Hill.

17AG008 TESTING OF TRACTORS AND AGRICULTURAL MACHINERY

Hours Per Week :

L	T	P	C
4	-	3	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description and Objectives:

To acquaint and equip with the test procedures of agricultural machinery and tractors

Course outcomes:

Upon completion of this course, students will be able to:

1. understand the standard testing procedures and rules.
2. familiarize with different instruments used in testing of agricultural machinery.
3. understand different test codes of ISO, RNAM, ASTM, ASABE etc.
4. carry out performance evaluation of different agricultural implements

SKILLS:

✓ *Test different form Implements.*

ACTIVITIES:

- *Testing of rotavator*
- *Testing of seed cum fertilizer drill*

UNIT I

Introduction to testing, ISO, RNAM, BIS standards, Importance of testing, benefits of testing, history of tractor testing, types of tests

UNIT II

Testing of Tractor- PTO performance, drawbar performance, air cleaner oil pull over tests, engine testing, hydraulic system testing

UNIT III

Testing of agricultural machinery- tillage implements, Rotavators, , intercultural implements.

UNIT IV

Testing of agricultural machinery- plant protection equipment, sowing and planting implements

UNIT V

Testing of agricultural machinery- harvesting and threshing equipment, chaff cutters, Dangerous machines act

Practical:

The following experiments may be conducted for this lab

1. Testing of tractor- PTO performance test
2. Testing of tractor- drawbar performance test
3. Performance evaluation of tractor and power tiller drawn tillage implements
4. Performance evaluation of seeding machinery
5. Performance evaluation of weeding machinery
6. Performance evaluation of plant protection machinery
7. Performance evaluation of harvesting and threshing machines.
8. Testing of animal drawn and manually drawn operated implements.
9. Testing of crop processing equipments.
10. Using Test codes of agricultural machines.

Text books:

1. Testing and evaluation of agricultural machinery; M L Mehta, S R Verma, S K Mishra, V R Sharma ,ISAE and ASABE Test codes

17AG009 MACHINERY SYSTEMS FOR PRECISION AGRICULTURE

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description &Objective:

To acquaint and equip with the farm machinery used for natural resources management and machinery for precision farming.Use of GIS and GPS in farm machinery.

Course outcomes:

1. Students interested in technology will learn how satellite based guidance systems and other related technologiescan be utilized to track and manage agricultural inputs (i.e. seed, fertilizer, fuel) and better manage their farming operation
2. Take this knowledge directly to industry working for agricultural consults and manufacturers
3. Understanding how to set up an auto guidance system is only a small piece of the puzzle.
4. Students master precision agriculture technologies like soil and crop health sensors, yield monitors, GNSS, GIS and mapping, variable rate controllers, and automated guidance.
5. Graduates of this program are challenged to understand management and troubleshooting of the entire agricultural system

SKILLS:

- ✓ *Study various farm implements and off-road vehicles specifications*
- ✓ *Implement and vehicles selection*

ACTIVITIES:

- o Assembling and dissembling of laser land leveler
- o Study and analysis of off-road vehicles specifications.

UNIT I

Functional design, specifications, requirements and working of farmmachinery needed for natural resources management like rotavator,Precision sowing and planting machines, laser guided leveller, powersprayer ,straw chopper cum spreader, straw bailer , combine harvester etc.

UNIT II

Ag GPS parallel swathing option, data base management, functional systems documentation. Application of relevant software.

UNIT III

An introduction to precision farming. GIS/GPS positioning system for precision farming, Yield monitoring and mapping, soil sampling andanalysis. Computers and Geographic information systems.Precisionfarming- Issues and conditions.Role of electronics in farm machinery forprecision farming.

UNIT IV

Engineering fundamentals related to earth moving machinery: Swell,shrinkage and compaction measurements. Use of tractors & Crawlers andeffects of altitude & temperature on their performance.Grade resistanceand gradability.

UNIT V

Land cleaning and reclamation equipment. Land leveling equipment. Powershovels, drag lines, cam shells. Rubber tire for earth moving machinery.Trenching machineries and wagons.Economic analysis of landdevelopment machinery. Application of PERT and CPM to the problemsrelated to land development.

Text books:

1. De Mess M. N. Fundamental of Geographic Information System. John Willy and Sons, New York

2. Dutta SK. 1987. Soil conservation and land management. International distributors, Dehradun.

Reference books:

1. Kuhar, John. E. 1977. The precision farmimg guide for agriculturalist. Lori J. Dhabalt, USA.

2. Lille Sand, T and Kaiffer, R. Remote Sensing and Image Interpretation, John Willy and Sons, London.

3. Nichols HL& Day DH.1998. Moving the earth. The work book of excavation. Mcgraw Hill.

4. Peurifoy RL 1956.Construction, planning, equipment and methods. Mcgraw Hill

5. Sabbins, F. Remote Sensing Principle and Interpretation. Freeman, New York

6. Singh G.1991. Manual of soil and water conservation engineering. Oxford and IBH, Co.
7. Sigma & Jagmohan.1976. Earth moving machinery. Oxford & IBH

17AG011 INSTRUMENTATION AND RESEARCH TECHNIQUES

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	-	-	-	-	-	-	-

Course Description & Objective:

To acquaint and equip with the concept of instrumentation used in farm power & machinery and measuring devices for force, torque and other parameters.

Course outcomes:

By the end of the module the student should be able to...

1. understand and respond to the need for rigorous and formal metrology concepts in designing and using measurement systems.
2. recognize the limits on data imposed by measurement and analyse uncertainty in an appropriate manner.
3. use basic statistical methods to aid data evaluation and decision making.
4. appreciate how to identify and specify sensors (or complete instruments) for controlling machines and processes.
5. understand the operating principles of a range of widely used instrumentation techniques and appreciate how to use them in the design of measurement systems

Skills:

- *Study of various sensors*
- *Recording and analysis of vibration.*
- *Knowledge of various mechanical gauges*

UNIT I

Strain and stress, strain relationship, strain gauges.Mechanical, optical,electrical acoustical and pneumatic etc. and their use. Various methods ofdetermining strain/stresses experimentally.

UNIT II

Measuring devices fordisplacement (linear and rotational), velocity, force, torque and shaftpower. Strain gauges: types and their application in two and threedimensional force measurement. Design and analysis of strain gauges.

UNIT III

Introduction to functional elements of instruments.Active and passivetransducers, Analog and digital modes, Null and deflection methods.Performance characteristics of instruments including static and dynamiccharacteristics.

UNIT IV

Devices for measurement of temperature, relative humidity, pressure,sound, vibration, flow etc. Recording devices and their type.Measuringinstruments for calorific value of solid, liquid, and gaseous fuels.Measurement of gas composition using GLC.

UNIT V

Basic signal conditioning devices - data acquisition system – microcomputers for measurement and data acquisition. Data storage and their application.

Practicals:

1. Study of temperature measuring instruments.
2. Study and calibration of Bourdon pressure gauge.
3. Measurement of load using load cell
4. Measurement of torque of rotating shaft using torsion meter/strain gauge torque transducer.
5. Measurement of speed of a motor shaft with the help of no-contact type pick-ups.
6. Study of LVDT.
7. Measurement of stress and strain using strain gauges mounted on simply supported beam/ cantilever beam.
8. Measurement of vibration.
9. Measurement of angular displacement using capacitive transducer.
10. Study of flow measuring devices.

Text books:

1. Ambrosius EE. 1966. *Mechanical Measurement and Instruments*. The Ronald Press.
2. BeckwithTG. 1996. *Mechanical Measurements*. Addison-Wesley.

Reference books:

1. Doeblin EO. 1966. *Measurement System - Application and Design*. McGraw Hill.
2. Ernest O Doebelin.1995. *Measurement Systems - Application and Design*. McGraw Hill.
3. Holman P 1996. *Experimental Methods for Engineers*. McGraw Hill.

o Vibration recording, analysis by using DEWESOFT and accelerometers at different locations in tractors

o Measurement of tractor engine speed using laser Tachometer

17AG013 PRODUCTION TECHNOLOGY FOR MACHINERY COMPONENTS

Hours Per Week :

L	T	P	C
4	-	3	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description & Objective:

To equip with awareness on the methodology related to production aided manufacturing and its technology.

Course outcomes:

1. Promote, implement and maintain procedures that support safety, health, the environment, quality and risk management.
2. Prepare for and set-up production machines in an automotive or related environment.
3. Troubleshoot machine functioning in an automotive components environment. Discuss the importance of changing and setting tooling for production machines

SKILLS:

Knowledge on various production processes

Manufacturing of simple machine components

.

UNIT I

Elasticity-forms - Stress and strain relationship in engineering materials - Deformation mechanism -Strengthening material - Strain hardening, alloying, polyphase mixture, martensitic precipitation, dispersion, fibre and texture strengthening - iron carbon diagram.

UNIT II

Powder metallurgy process, process variables, Manufacture of friction lining materials for clutches and brakes – plastics-raw material –automobile components – molding – injection, compression and blow – PU foam molding - Machining of plastics. Forging materials - process flow chart, forging of valves, connecting rod, crank shaft, cam shaft, propeller shaft, transmission gear blanks, steering column.

UNIT III

Extrusions: Basic process steps, extrusion of transmission shaft, housing spindle, steering worm blanks, piston pin and valve tappets. Hydro forming - Process, hydro forming of manifold and comparison with conventional methods- Hydro forming of tail lamp housing – forming of wheel disc and rims. Stretch forming - Process, stretch forming of auto body panels –Super plastic alloys for auto body panels.

UNIT IV

Sand casting of cylinder block and liners - Centrifugal casting of flywheel, piston rings, bearing bushes, and liners, permanent mould casting of piston, pressure die casting of carburetor other small auto parts. Machining of connecting rods - crank shafts - cam shafts - pistons - piston pins - piston rings - valves - front and rear axle housings - fly wheel - Honing of cylinder bores - Copy turning and profile grinding machines.

UNIT V

Powder injection molding - Production of aluminum MMC liners for engine blocks - Plasma spray coated engine blocks and valves - Recent developments in auto body panel forming – Squeeze Casting of pistons - aluminum composite brake rotors. Sinter diffusion bonded idler sprocket – gas injection molding of window channel – cast con process for auto parts.

Practicals:

1. Moulding
2. Forging
3. Heat treatment
4. Extrusion
5. Testing of hardness of metals
6. Grinding
7. Casting
8. Drilling
9. Turning
10. CNC machining

Text books:

1. Kalpakjian, “Manufacturing Engineering and Technology”, 4th ed., Pearson ducation, 2005.

2. P.C. Sarma, “Production Technology”, 3rd ed., S. Chand, 2009.

Reference books:

3. M.P. Groover, “Automation, Production Systems and Computer Integrated Manufacturing”, 3rd ed., PHI Publications, 2008.

4. Kodgire UD, “Material Science & Matellurgy”, 12thed., Eve rest Publishing House.

5. William D. Callister, “ Materials Science and Engineering an Introduction”, Eigth edition - John Wiley & Sons, Inc.
2005.

2. P.C. Sarma, “Production Technology”, 3rd ed., S. Chand, 2009.

ACTIVITIES:

- *Manufacturing of connecting rods.*
- *Production of different types of nuts, bolts and studs*

17AG015 AGRO-ENERGY AUDIT MANAGMENT

Hours Per Week :

L	T	P	C
3	1	0	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description & Objective:

To equip with the applications of land grading machinery, their design, operation and maintenance.To understand the different types of earth moving systems and their applications.

Course outcomes:

On completion of this course, the student would be able to:

1. clarify basic concepts associated with earth-moving machinery
2. understand the properties of soil and ground in earth-moving
3. recognize the basic tools used in the mechanization of leveling of land for what purpose these tools, learning how to use and where to use

SKILLS:

Study various off-road vehicles specifications

Study of various land levelers.

.

UNIT I

Engineering fundamentals related to earth moving machinery, swell, shrinkage and compaction measurements, use of tractors and crawlers and effect of altitude and temperature on their performance.

UNIT II

Grading of sloppy lands. Principles of mechanisms used in crawler mounted tractors. Dump trucks and their mechanisms. Load hoisting equipment.

UNIT III

Land cleaning and reclamation equipment, power shovels, drag lines and cam shells, rubber tyre for earth moving machinery.

UNIT IV

Earth diggers and ditchers. Bull dozers and scrapers. Elevating and self powered graders.Trenching machineries and wagons.

UNIT V

Automation of earth moving and grading machines.Boring machines.Different methods of boring.Economic analysis of land development machinery.

Text books:

1. Dutta S K. 1987. Soil conservation and land management, International Distributors, Dehradun.

2. Sigma and Jagmohan. 1976. Earth moving machinery, Oxford and IBH

Reference books:

3. Wood and Stuart. 1977. Earth moving machinery, Prentice Hall.

4. Nicolas H L, Day D H. 1998. Moving the earth, The work book of excavation, McGraw Hill

ACTIVITIES:

- Earth Moving by using Dozers
- PERT and CPM analysis of real time vehicles used in land grading in University.

17AG019 OPTIMIZATION TECHNIQUES

Hours Per Week :

L	T	P	C
3	1	0	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-	-	-	-

Course Description & Objective:

To familiarize the students with the modeling of mechanical engineering systems and obtaining the optimum solution.

Course outcomes:

Upon completion of the subject, students will be able to

1. analyze real-life problems, especially, logistics problems, through the use of mathematical modeling techniques;
2. gain familiarity with various modeling techniques to build mathematical models for real problems;
3. employ some optimization methods and techniques and apply them to some practical problems.

SKILLS:

Application of optimization techniques for agricultural produce

.

UNIT - I

Introduction& Linear Programming Problems- Introduction: Engineering applications of optimization, statement of an optimization problem, classification of optimization problems. Linear programming: Simplex method, Applications of linear programming, Two-phases of simplex method, Big-M method.

UNIT - II

Transportation & Assignment Problems: Allocation problems: Formulation - Optimal solution, unbalanced transportation problems. Assignment problem – Formulation – Optimal solution – Variations i.e., non (m x n) Matrix.

UNIT - III

Classical optimization techniques: Single variable optimization with and without constraints, multivariable optimization without constraints, multi – variable optimization with constraints – solution, by method of constrained variation method of Lagrange multipliers, Kuhn – Tucker conditions.Non linear programming unconstrained optimization techniques: (Numerical methods foroptimization)Direct search methods – Random search methods; Univariate method Pattern Directions, Hookeand Jeeves' method, Powell's method, Nelder Mead's Simplex search method.

UNIT - IV

Non Linear programming unconstrained optimization techniques:Indirect search methods: Gradient of a function, Steepest descent method, Newton's method.Davidon-Fletcher – Powell method, types of penalty methods for handling constraints.

UNIT - V

Non – traditional optimization algorithms: Genetic algorithms (GA) – working principle,reproduction, crossover, mutation, advanced GA operators. GA for constrained optimization, multimodalfunction optimization.Simulated annealing, working principle, Metropolis algorithm, differences and similarities betweenconventional and non-conventional algorithms, introduction to Neural networks and fuzzy logic as anoptimization tool.

Text books:

1. S.S.Rao, "Engineering Optimization", 3rd Edition, New Age Publishers, 2008.
2. Kalyanmoy Deb, "Optimization for Engineering Design", 1st Edition, PHI Publishers, 2009.

Reference books:

1. JasbirArora, "Optimal Design", McGraw Hill (International) Publishers.
2. D.E.Goldberg, "Genetic algorithms in Search, Optimization and Machine Learning", 1st Edition, John Wiley Publishers, 2009.
3. Kalyanmoy Deb, "Multi Objective Optimization Using Evolutionary Algorithms", 1st Edition, PHI Publications

ACTIVITIES:

- Analysis of chilly production using optimization techniques

17AG010 INTRODUCTION TO INTELLECTUAL PROPERTY LAW

Hours Per Week :

L	T	P	C
3	0	0	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

To equip with the fundamentals of intellectual property rights, its significance and applications.

Course outcomes:

At the end of the course, the participants should be able to:

1. define in a very clear manner the role of intellectual property in the modern economy;
2. discuss the fundamentals of copyright protection and the laws pertaining thereto;
3. examine the fundamentals of patent law in the international community; and
4. explain the trademark law, what can be trademarked, and the various treaties and conventions which cover the law in the international realm.

SKILLS:

- ✓ Use renewable energy sources for desing of farm equipment
- ✓ Use biomass energy for engine power.

UNIT I

Place of Intellectual Property in other Forms and Kinds of Property and Respective Characteristics

UNIT II

Development of Right Jurisprudence and Significance of Proprietary Rights, Need for Development and Protection of Intellectual Property,

UNIT III

Types of Intellectual Property: Patent, Copyright, Design, Trademark, Farmer and Breeders Right on Plant Breeding, Integrated Circuit, Trade Secret,

UNIT IV

Geographical Indication, Nature, Term and Conditionality in Each Right, process of applying for a patent

UNIT V

Laws Dealing with the Rights, Expiration of the Right.Requirements and limitations of patentability

Suggested Readings:

1. Merges, Menell&Lemley, Intellectual Property in the New Technological Age (5th edition, Aspen 2010) (IPNTA)

Reference books:

1. Merges, Menell&Lemley, Intellectual Property in the New Technological Age: 2011 Case and Note Supplement (Aspen 2011)

2. Bagley, and Dauchy. Chapter 14 in *The Entrepreneur's Guide to Business Law*. Cengage Learning, 2011, pp. 558–69. ISBN: 9780538466462.

17AG012 SIMULATION MODELING IN FARM MACHINERY AND POWER ENGINEERING

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

To acquaint and equip with the mathematical modeling of farm machinery, development of models using various techniques.

Course outcomes:

1. Student will be acquainted with the concepts of modelling and simulation from an interdisciplinary point of view.
2. Student will be able to implement and simulate models using MATLAB®.
3. Depending on the selected applications in the selectable chapters section student will acquire further knowledge of Image Processing, Optical Character Recognition, Machine Learning, Business Case Modelling and Knowledge Management.
4. If you are an enthusiastic student with only rudimentary programming knowledge Student can acquire an understanding of basic MATLAB programming.

SKILLS:

- ✓ Knowledge on designing of agriculture implements by using softwares like CREO.
- ✓ Knowledge on real time simulation of agriculture implements by using softwares like ANSYS.

ACTIVITIES:

- Modeling and simulation of cultivator with any one soil conditions.

UNIT I

System performance and modelling methodologies – transformation ofunits of measurement – dimensional homogeneity. Buckingham's PiTheorem. Simulation for system modelling, Formulations of simulation model, validation and testing of the simulation model.

UNIT II

Experimentation with physical models and their application in farm machinery design. Sensitivity of models, scale effects, scale factors. Use of models. Complete similarity, kinematics and dynamic similarity.

UNIT III

Modellaws, empirical methods in model engineering. Principle of similarity in mathematical investigations.Mathematical modelling and its limitations,etc.

UNIT IV

Mathematical modelling through ordinary differential equation of firstorder, second order, partial differential equations.Similarity conditions andbstract parameters determining characteristics of engines.

UNIT V

Similitude intillage tool studies, prediction models for traction devices.Analysis ofmodellingbehaviour in problems related to tillage, traction andearthmoving equipment.

Practical:

Simulation and modeling of

1. cultivator
2. rotavator
3. MB plough
4. disc plough
5. disc harrow
6. reaper
7. thresher
8. chaff cutter
9. sugarcane planter
10. transplanter

Text books:

1. Langhaar HL.1954. *Dimensional Analysis and Similitude*. McGraw Hill.

Reference books:

1. Sedov LI. 1991. *Similarity and Dimensional Methods in Mechanics*. Mir Publ., Moscow.

17AG014 ADVANCES IN HYDRAULICS AND ELECTRO PNEUMATIC CONTROLS

Hours Per Week :

L	T	P	C
3	1	2	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

To acquaint and equip with the latest developments in the field of hydraulics and pneumatics with special reference to the usage of these on the modern d ay tractors.

Course outcomes:

Upon completion of this chapter, the student should be able to:
1. explain the meaning of fluid power.
2. list the various applications of fluid power.
3. differentiate between fluid power and transport systems.
4. list the advantages and disadvantages of fluid power.
5. explain the industrial applications of fluid power.
6. list the basic components of the fluid power.
7. list the basic components of the pneumatic systems.
8. differentiate between electrical, pneumatic and fluid power systems.
9. appreciate the future of fluid power in india.

SKILLS:

Knowledge on different logic circuits using hydraulics and electro pneumatics components.

Design of circuits for various applications(Sequencing,timing,safety etc)

UNIT I

Fluid power, its advantages, properties of hydraulic fluids, viscosity, bulkmodulus, density. Concepts of energy of hydraulic systems, laws of fluidflow.

UNIT II

Distribution system, pressure rating of tubing and hoses, couplings.Basicsof hydraulic flow and hydraulic circuit analysis – pumps, types and theoryof operation.Pressure intensifiers.

UNIT III

Fluid power actuators, hydraulic rams,gear motors, piston motors and their performance characteristics, electrohydraulic motors and hydrostatic transmissions, control components.

UNIT IV

Directional pressure safety and servo valves. Hydraulic circuit design.Regenerative pump unloading, pressure intensifier circuits. Speed controlof hydraulic motors, mechanical hydraulic servo systems for tractors.

UNIT V

Pneumatic circuits – properties of air. Compressors, control elements.Design of pneumatic circuits.Electrical control for fluid power circuits.Electronic sensors/ circuits used as controls in modern farm equipment.Maintenance of hydraulic and pneumatic circuits and devices.Troubleshooting.

Practical:

1. Study of properties of hydraulic fluids.
2. Design problems on hydraulic pumps.
3. Design problems on hydraulic pumps.
4. Design problems on hydraulic motors.
5. Design problems on hydraulic motors.
6. Design problems on hydraulic cylinders.
7. Study of hydraulic circuits.
8. Design of hydrostatic transmission.
9. Study of hydraulic valves.
10. Design of pneumatic circuits.

Text books:

1. Anthony Esposito. 2003. *Fluid Power with Applications*. PearsonsEdu.
2. Krutz G.1984. *Design of Agricultural Machines*. John Wiley & Sons.

Reference books:

1. Merritt HE. 1991. *Hydraulic Control System*. John Wiley a& Sons.
2. Majumdar SR. 2003. *Oil Hydraulic System*. Tata McGraw Hill.

ACTIVITIES:

- o *Simulation of logic circuits and troubleshooting.*
- o *Seeding application using pneumatics.*

17AG016 ADVANCED INTERNAL COMBUSTION ENGINES

Hours Per Week :

L	T	P	C
3	0	3	5

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

This course studies the fundamentals of how the design and operation of internal combustion engines affect their performance, operation, fuel requirements, and environmental impact.

Course outcomes:

Upon completing the course the student should be able to:

1. describe and explain different types of reciprocating internal combustion engines (ICE), their typical design features and performance characteristics.
2. describe and analyse the power cycle of internal combustion engines using ideal gas cycles, air cycles, and fuel-air cycles. Compute indicated power and thermal efficiency.
3. describe and explain the gas exchange process and power boosting by means of turbo charging.describe and explain engine heat transfer and its relation to thermal loading of engine components and cooling.
4. compute rate of heat release based on measured dynamic cylinder pressure.
5. explain the characteristic of homogeneous combustion in SI-engines and spray combustion in CI-engines.
6. fuel quality requirements of SI- and CI-engines.
7. describe the main components of exhaust emissions and explain the mechanisms of emission formation.

SKILLS:

Knowledge on various engines,fuels,power developed

Knowledge on engine advancements like CRDI,MPFI,HCCI etc

UNIT I

Introduction Engine classification, Engine Design and Operating Parameters Engine geometry Brake Performance, Indicated Performance, Friction Relationships among performance parameters

UNIT II

Ideal Properties Models of Engine Processes and Cycles Constant volume (Otto) Constant pressure (Diesel) Limited pressure (Dual) Comparisons of ideal cycle results Ideal intake/ exhaust processes Open Cycle calculation with residual. Combustion Thermodynamics Air and Fuels Combustion Stoichiometry First law analysis of open reacting systems Combustion efficiency

UNIT III

Thermodynamic Properties of Engine Working Fluids Working fluids for engine processes Ideal gas mixtures Tables for species properties Curve fits for species properties Computer routines for properties and composition, Fuel/Air Cycle Analysis Fuel/air cycle computer simulation Fuel/air cycle results: efficiency and performance Comparison with actual cycles Deviation from Ideal Cycle Behavior

UNIT IV Spark-Ignition Engine Combustion Features of process Flame structure and propagation Factors affecting burning rate Abnormal combustion and knock Combustion chamber design 8. Diesel Engine Combustion Features of diesel combustion process Ignition delay Knock in diesel engines, SI and Diesel Engine Emissions

U**NIT V**

IC Engines: The Future Engine development prospects Stratified charge, direct injection systems Homogeneous charge, compression ignition Low temperature diesel combustion Advanced electronic-controlled engines Hybrids and fuel cells.

Practical:

1. Study of construction and working of two-stroke and four-stroke petrol engine.
2. Study of construction and working of two-stroke and four-stroke diesel engine.
3. Disassembly and assembly of engines.
4. Measurement of brake horse power of engine.
5. Analysis of exhaust gases of engine.

Text books:

1. V Ganesan. Internal Combustion Engines.
2. Maleev VL. 1945. *Internal Combustion Engines*. McGraw Hill.

Reference books:

1. Mathur ML & Sharma RP. 1988. *A Course in Internal Combustion Engines*. DhanpatRai& Sons.
2. John B Heywood, Internal Combustion Engine Fundamentals
3. Charles Fayette Taylor. The Internal Combustion Engine in Theory and Practice: Vol. 1 & 2

ACTIVITIES:

o *Measurement of engine efficiency by different fuels in different farm operations*

17AG018 ENERGY CONSERVATION AND MANAGEMENT IN FARM MACHINERY AND POWER ENGINEERING

Hours Per Week :

L	T	P	C
3	1	0	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:
To acquaint and equip with the energy use pattern in agriculture production systems, conservation of energy, energy planning and economics.

Course outcomes:
1. Determine what farm practices use the most energy for producing a crop.
2. Describe farm equipment options for reducing energy use.
3. Describe management options for reducing energy use

SKILLS:

Knowledge on various engines,fuels,power developed

Knowledge on engine advancements like CRDI,MPFI,HCCI etc

UNIT I

Energy requirement of different operations in agricultural production systems viz. crop, livestock and aquaculture.

UNIT II

Energy conservation through proper management and maintenance of farm machinery

UNIT III

Planning and management of agricultural production systems for energy conservation and energy returns assessment.

UNIT IV

Development of computer program for efficient energy management in agiven agricultural production system.

UNIT V

Energy use planning and forecastingfor a given system.

Text books:

1. Mittal JP, Panesar BS, Singh S, Singh CP &Mannan KD. 1987. *Energy in Production Agriculture and Food Processing*. ISAE and School of Energy Studies, Ludhiana. ISAE Publ.

Reference books:

1. Pimental D. 1980. *Handbook of Energy Utilization in Agriculture*. CRC Press.

ACTIVITIES:

- *Energy forecasting and budgeting for paddy crop and chilly crop.*

17ME020 MECHANICAL VIBRATIONS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

To enlighten the concepts of natural frequencies and resonance of mechanical systems.

Course outcomes:

1. Appreciating the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions

2. Ability to analyze the mathematical model of a linear vibratory system to determine its response

3. Ability to obtain linear mathematical models of real life engineering systems

4. Ability to use Lagrange's equations for linear and nonlinear vibratory systems

5. Ability to determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation

6. General notion on frequency and time response of vibratory systems

SKILLS:

Study of various sensors

Recording and analysis of vibration

UNIT-1

Introduction:Harmonic and periodic motions, vibration terminology, Vibration model,Single-DOF Free Vibrations: Equation of motion-Natural Frequency,Energy method, Rayleighmethod, damping models.Viscously damped free vibrationSpecial cases: oscillatory, non-oscillatory and critically damped motions.Logarithmic decrement, Experimental determination of damping coefficient.Forced harmonic vibration, Magnification factor.Rotor unbalance, Transmissibility, Vibration Isolation, Equivalent viscous damping, Sharpness of resonance.

UNIT-2

Two-DOF Free Vibrations: Generalized and Principal coordinates, derivation of equations of motion, Lagrange's equation, Coordinate coupling, Forced Harmonic vibration, Vibration Absorber:Tuned absorber, determination of mass ratio.Tuned and damped absorber.

UNIT-3

Multi-DOF: Derivation of equations of motion, influence coefficient method, Properties of vibrating systems: flexibility and stiffness matrices, reciprocity theorem, Modal analysis: undamped, Modal analysis: dampedCalculation of natural frequencies: Rayleigh method, Stodala method, Matrix iteration method, Holzer method and Dunkerley's methodTorsional vibration: Simple systems with one or two rotor masses, Multi-DOF systems-transfer matrix method, Geared system

UNIT-4

Continuous systems: closed form solutions, Vibration of strings, Longitudinal and torsional vibration of rods, Transverse vibration of beams: equations of motion and boundary conditions, Transverse vibration of beams: natural frequencies and mode shapesContinuous systems: Approximate solutions, Rayleigh's energy method, Rayleigh-Ritz method, Assumed modes and Galerkin's method

UNIT-5

Signature analysis and preventive maintenance: Vibration testing equipment's: signal generation, measuring and conditioning instruments, Vibration testing equipment's: signal analysis instruments

Practical:

1. Verification of relation of simple pendulum.
2. Determination of radius of gyration of given compound pendulum.
3. Study of torsional vibrations of single rotor system.
4. Study of damped torsional oscillation & determination of damping coefficient.
5. Study of longitudinal vibration of helical spring and determination of frequency and time period of oscillation.
6. Study of undamped free vibration or equivalent spring mass system.
7. Study of forced damped vibration of equivalent spring mass system.
8. Study of forced vibration of the bean for different damping.

Text books:

1. Meirovitch, "Fundamentals of Vibration Analysis", 3rdEdition, McGraw Hill, 2001.
2. G.K. Groover, "Mechanical Vibrations", 8thEdition, S Chand and Brothers, 1996.

Reference books:

1. S. Graham Kelly, "Theory and Problems of Mechanical Vibrations", 8th Edition,
2. W.T. Thomson, "Theory of vibration with applications", 5thEdition, Prentice Hall, 1997.
3. Singiresu S. **Rao, "**Vibration of Continuous Systems, John Wiley & Sons, 2007

ACTIVITIES:

- Vibration recording, analysis by using DEWESOFT at different locations in tractors

17AG017 LAND GRADING AND EARTH MOVING MACHINERY

Hours Per Week :

L	T	P	C
2	1	-	3

Total Hours :

L	T	P
45	-	-

WA/RA	SSH/HSH	CS	SA	S	BS
-	-	-	-	-	-

Course Description & Objective:

To equip with the applications of land grading machinery, their design, operation and maintenance.To understand the different types of earth moving systems and their applications.

Course outcomes:

On completion of this course, the student would be able to:

1. clarify basic concepts associated with earth-moving machinery
2. understand the properties of soil and ground in earth-moving
3. recognize the basic tools used in the mechanization of leveling of land for what purpose these tools, learning how to use and where to use

SKILLS:

Study various off-road vehicles specifications.
Study of various land levelers.

UNIT I

Engineering fundamentals related to earth moving machinery, swell, shrinkage and compaction measurements, use of tractors and crawlers and effect of altitude and temperature on their performance.

UNIT II

Grading of sloppy lands. Principles of mechanisms used in crawler mounted tractors. Dump trucks and their mechanisms. Load hoisting equipment.

UNIT III

Land cleaning and reclamation equipment, power shovels, drag lines and cam shells, rubber tyre for earth moving machinery.

UNIT IV

Earth diggers and ditchers. Bull dozers and scrapers. Elevating and self powered graders.Trenching machineries and wagons.

UNIT V

Automation of earth moving and grading machines.Boring machines.Different methods of boring.Economic analysis of land development machinery.

ACTIVITIES:

- o Earth Moving by using Dozers
- o PERT and CPM analysis of real time vehicles used in land grading in University.

Text books:

1. Dutta S K. 1987. Soil conservation and land management, International Distributors, Dehradun.
2. Sigma and Jagmohan. 1976. Earth moving machinery, Oxford and IBH

Reference books:

3. Wood and Stuart. 1977. Earth moving machinery, Prentice Hall.
4. Nicolas H L, Day D H. 1998. Moving the earth, The work book of excavation, McGraw Hill

I YEAR

MASTER OF BUSINESS ADMINISTRATION

MBA

I SEMESTER

17MB101	-	Principles of Management and Organizational Behavior (PMOB)
17MB103	-	Business Economics (BE)
17MB105	-	Accounting for Managers (AFM)
17MB107	-	Business Statistics (BS)
17MB109	-	Business Laws (BL)
17MB111	-	Business Environment & Ethics (BEE)
17MB113	-	Managerial Communication- I (MC I)
17MB115	-	Essential Skills for Managers- I (ESM-I)

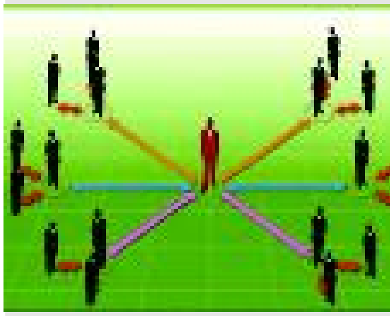
II SEMESTER

17MB102	-	Marketing Management (MM)
17MB104	-	Financial Management (FM)
17MB106	-	Human Resource Management (HRM)
17MB108	-	Business Research Methods (BRM)
17MB110	-	IT for Managers (ITM)
17MB112	-	Operations Management (OM)
17MB114	-	Managerial Communication- II (MCII)
17MB116	-	Essential Skills for Managers II (ESM-II)

COURSE CONTENTS

I SEM & II SEM

17MB101 PRINCIPLES OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR



Hours Per Week :

L	T	P	C
4	0	0	4

Course Objective:

- To gain basic understanding of principles of management including planning, organizing, directing and controlling
- To gain basic understanding of concepts for managing people including motivating, leading
- To improve ability to examine managerial issues and problems and to develop feasible alternatives that can result in better decision making
- To develop an awareness of multiple approaches that can be used to resolve managerial problems
- To give basic perspectives of theories underlying organizational behavior. This will form foundation for further study of functional areas of management and give a conceptual framework for understanding of individual behavior in Organization.

Course Outcomes:

On completion of this course, learners will be able to:

- Ananlise the functions of management of your educational organisation
- Draw the organisational structure of any software company
- Identify the power source of any manufactureing company
- visit any public sector unit and observe conflict resolution system of it.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *Different types of Organization Charts (structure).*
- ✓ *Chart of Staffing.*
- ✓ *Graphic representation of Maslow's Theory.*
- ✓ *Chart on Media of Communication.*
- ✓ *Draft Control chart of different industry/business groups.*
- ✓ *Prepare list of corporate strategies that are adopted by Indian Companies to face the challenges of competition.*
- ✓ *Select a successful retail store and give details of factor leading to its success.*
- ✓ *Select a failed venture, if any known to you, and bring out reasons for its failure (Note what we learn from these success & failure stories).*
- ✓ *Select a company and prepare a SWOT analysis for the same.*
- ✓ *Mention the characteristics and skills of managers in the 21st century.*

Unit-1 **10 Hrs**

Managers and management: Meaning of management, roles of managers, skills of managers, process of management, functions of management, evolution of management

Unit-2 **10 Hrs**

Planning and decision making: Meaning of planning, planning process, types of plans, management by objectives, decision making, decision making process, decision making tools – individual Vs group decision making, organizational design and structures.

Unit-3 **10 Hrs**

Directing: Motivation, theories of motivation, leadership, approaches to leadership, controlling, process of controlling, techniques of controlling.

Unit-4 **10 Hrs**

Introduction to Organizational behavior: Organizational behavior, nature and levels of organizational behavior, individuals in organization, individual differences.

Personality: Personality and determinants of personality, the big 5 model of personality, organizationally relevant personality traits.

Perception: The nature of perception, characteristics of the perceiver, target and situation, perceptual problems.

Unit-5 **10 Hrs**

Group dynamics: group dynamics, types of groups, formation of groups, teams and creating effective work teams. **Power & politics, managing conflicts and group dynamics:** power, identifying sources of power in an organization, politics and personality development for encountering politics.

Conflicts: Understanding conflicts, types of conflicts, Pondy's model of organizational conflict, conflict resolution strategies, allowing functional conflict for organizational effectiveness.

Text books:

1. Samuel C.Certo, S.TrevisCerto: Modern Management, 10/e, Prentice-Hall, New Delhi, 2007
2. Stephen P.Robbins, Timothy A. Judge: Organizational behavior, 17/e, Person, 2015.

Reference Books:

1. Jennifer George and Gareth Jones "Understanding and Managing Organizational Behavior", 6/e, 2011, Published by Pearson Education Inc.
2. John L Pierce and Donald G. Gardner, "Management and Organizational behavior", 1/e, 2001, Cengage Learning India (P) Limited.
3. Richard Pettinger, "Organizational Behaviour", 1/E, 2010 Routledge.
4. Dipak Kumar Bhattacharya, "Organizational Behavior, Concepts and Applications", 1/E, 2009, Oxford.
5. K. Aswathappa, 1/E, 2010, "Organizational behavior", Himalaya Publishing House.
6. R. Satya Raju and A. Parthasarathy, "Management", 2/E, 2009, PHI Learning (P) Limited.
7. John Schermerhorn, Jr., James G. Hunt and Richard N. Osborn, "Organizational Behaviour", 10th edition, 2010, Wiley India Edition.
8. Arun Kumar and N. Meenakshi, "Organizational Behavior, A modern approach", 1/e, 2010,

Vikas.

9. VSP Rao, “Organizational Behavior”, 3/e, 2010, Excel, New Delhi.
10. Jai B.P. Sinha, “Culture and Organizational Behavior”, 1/e, 2009, Sage Publications.
11. Stephen P. Robbins, Timothy A judge, Niharika Vohra, “ Organizational Behaviour”, 16/E, 2016, Pearson Education Inc.
12. Dr. S. S. Khanka, “Organizational behavior”, 4/e, 2010, S. Chand.
13. Sarma VS Veluri, “Organizational Behaviour”, 1/E, 2009, Jaico Publishing House.

17MB103 BUSINESS ECONOMICS

Hours Per Week :

L	T	P	C
4	0	0	4

Course Objective:

This course provides students with the knowledge, tools and techniques to make effective economic decisions under conditions of risk and uncertainty. Demand, cost and pricing decisions are emphasized. Topics include decision-making criteria and procedures, demand and cost theory and estimation, pricing theory and practice (including price positioning), pricing new products and competitive bids and price quotes.

Course Outcomes:

On completion of this course, learners will be able to:

- Apply the economic way of thinking to individual decisions and business decisions.
- Understand how prices get determined in markets, how market participants benefit in the form of consumer surplus and producer surplus, and what are the consequences of government intervention.
- Understand the different costs of production and how they affect short and long run decision.
- Derive the equilibrium conditions for cost minimization and profit maximization.
- Understand economies of scale, diseconomies of scale, economies of scope, and cost complementarities, and how each affects the cost of production.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *To conduct a survey on the practical application of laws of economics.*
- ✓ *To collect data on sales of consumer durable goods and predict the sales for a later year.*
- ✓ *To find different case studies relating to different market conditions and to do an analysis.*
- ✓ *To find out low demand differentiates between normal and inferior goods.*
- ✓ *To analyze the role of a business economist in the everyday functioning of an organization taking live examples.*

UNIT - 1 10HRS

Introduction to Managerial Economics: Definition, Nature and Scope, Relationship with other areas in Economics, Significance of Managerial Economics in functional areas of business. The role of managerial economist. Basic economic principles.

UNIT - 2 10HRS

Theories of firm and Demand & Supply Analysis: Managerial theories of firm, Behavioral theories of firm, Elasticity of demand, types and significance of Elasticity of Demand. Measurement of price Elasticity of Demand, Law of Supply, Elasticity of Supply. Need for Demand forecasting, Types of forecasting techniques.

UNIT - 3 **10HRS**

Production Analysis: Production function, Marginal Rate of Technical Substitution, Production function with one/two variables, Isoquants and Isocosts, Cobb-Douglas Production Function, Returns to Scale and returns to factors.

UNIT - 4 **10HRS**

Cost theory and estimation: Cost concepts, determinants of cost, Cost – output relationship in the short run and long run, Average cost curves, Economies of scale. Cost-volume-profit analysis.

UNIT - 5 10HRS

Pricing and Profit Management: Features and Types of different competitive situations, Price-Output determination in Perfect competition and Monopolistic competition both in the long run and short run. Pricing methods in practice. Profit Management- Nature, scope and theories of profit.

TEXT BOOK:

1. Maheshwari K. L. , Varshney R.L. , Managerial Economics, 22nd Revised Edition 2014, Sultan Chand & Sons.

REFERENCE BOOKS:

1. Dominick Salvatore, Managerial Economics in a global economy, Indian Edition; Fourth Edition, 6/e, 2008, McGrawHill.
2. Craig H Peterson, W.Cris Lewis, Sudhir.k.Jain; Managerial Economics, 4/e, 2005, Pearson Publications.
3. P.L.Mehta; Managerial Economics, 1/e, 2016, Sultan Chand Sons.
4. M.L.Trivedi; Managerial Economics Theory and Applications, 1/e, 2001, McGrawHill.

17MB105 ACCOUNTING FOR MANAGERS

Hours Per Week :

L	T	P	C
4	0	0	4

Course Objective

The objective of the course is to provide an understanding of practical aspects of accounting, managing assets, financial analysis, cost behavior and improve decision making skills.

Course Outcomes:

On completion of this course, learners will be able to:

- Demonstrate knowledge of the business accounting cycle for the corporate form of business.
- Understand the framework for preparation and presentation of financial statements.
- Develop decision making skills in the application of Revenue and monetary Assets.
- Acquire practical knowledge on application of cash flows and Ratio Analysis. Prepare and interpret cost behavior in organization.
- Demonstrate knowledge on cost sheet preparation.

SKILLS:

(*These activities are only indicative, the Faculty member can innovate*)

- ✓ Contact an NGO and find out their system of accounting.
- ✓ Collect information with regard to the practical reasons for charging
- ✓ Depreciation and the methods adopted for calculating the same.
- ✓ Generate different types of financial and cost related reports using excel and tally.
- ✓ Find out the accounting system adopted by a Sole Proprietor
- ✓ Differences between Double Entry and Single Entry systems of Book-keeping.
- ✓ Analyse the differences between Profit & Loss Account and Income & Expenditure Account/ Receipts & Payments Account.

UNIT - I **10HRS**

Basic Accounting Concepts: The nature and purpose of Accounting, Basic Accounting concepts: The Balance sheet, Basic Accounting concepts: Income statement.

UNIT - II **10HRS**

Revenue and Long lived Assets: Revenue and Monetary Assets and their Analysis. Long –lived nonmonetary assets and their amortization.

UNIT - III **10HRS**

Financial statement Analysis: Understanding the Financial Statement and their Analysis: overall Measures- profitability Ratios- Investment Utilization Ratios-Financial Condition Ratios-Dividend Policy-Growth measures-Making Comparisons.

UNIT - IV **10HRS**

The Behavior of costs: Relation of costs to Volume-Profit. Additional Aspects of product Costing Systems: Job Order Costing and process Costing Systems-Measurement of Direct Costs-Allocation of Indirect Costs.

UNIT - V **10HRS**

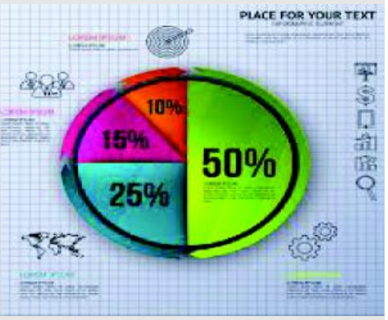
Cost Accounting - Elements of Cost - Types of Costs - Preparation of Cost Sheet.

TEXTBOOK:

1. Accounting Text and Cases by Robert Anthony, David Hawkins and Kenneth Merchant (13th Edition), The McGraw-Hill Companies , 2013.

REFERENCE BOOKS:

1. Financial Accounting by Needles & Powers (11th Edition), South Western Cengage Learning, 2012.
2. Financial Accounting by Gary Porter & Curtis Norton (6th Edition), Cengage Learning, 2007.
3. Managerial Accounting by Garrison, Noreen & Brewer (11th Edition), Tata Mcgraw Hill.
4. Introduction of Management Accounting by Horngreen, Sundem, Stratton, Burgstahler and Schatzberg (14th Edition), Pearson, 2012.
5. Indian Accounting Standards (Ind AS) & IFRSs for Finance Executives by T.P Ghosh (2nd Edition), Taxmann Publications Pvt Ltd., 2013.
6. IFRS – A Briefing for Chief Executives, Audit Committees and Board of Directors issued by IASB, 2012.
7. Red Book on International Financial Reporting Standards issued by IASB, 2014.



17MB107 BUSINESS STATISTICS

Hours Per Week :

L	T	P	C
4	0	0	4

Course Objective:

The objective of this course is to provide the basic knowledge of the various statistical techniques useful to managers in their decision-making. Students will learn statistical tools like measures of central tendency, dispersion, Regression and Correlation analysis, sample tests and Hypothesis testing.

Course Outcomes:

The focus is on the use of statistical techniques to describe the data, thereby enabling the student to

- Define statistics, become aware of wide range of applications in statistics, types of data, tabulation of data, construct a histogram, frequency polygon, an give, pie chart,
- Apply various measures of central tendency –mean, median, mode, GM and H.M for grouped and ungrouped data. Apply various measures of variability-range, MD, QD, standard deviation, and to know percentiles, Deciles.
- Understanding the concepts of various measures of dispersion and its applications in business decisions.
- Understand the concepts of probability and its uses for making decisions in business.
- Understand the concepts of discrete and continuous probability distribution.

Skills:

(These activities are only indicative; the Faculty member can innovate)

- ✓ *Collect statistical information's from Magazines, Newspapers, Television, Internet etc.,*
- ✓ *Collect interesting statistical facts from various sources and paste it in your note book.*
- ✓ *Collect a primary data about the mode of transport of yourschool students. Classify the data and tabulate it.*
- ✓ *From the mark sheets of your class, form the frequencytables, less than and more than cumulative frequency tables.*
- ✓ *Get the previous monthly expenditure of your family andinterpret it into bar diagram and pie diagram. Based on thedata, propose a budget for the next month and interpretedinto bar and pie diagram.Compare the two months expenditure through diagrams*
- ✓ *Measure the heights and weights of your class students.Find the mean, median, mode and compare*
- ✓ *Find the mean marks of your class students in various subjects. Analysis of data by computing standard deviation and coefficient of variation.*
- ✓ *Collect the data from magazines, newspapers, and television, and publications. Present the data in graphs and diagrams.*

UNIT - I **10HRS**

Statistics, Data classification, tabulation and presentation: Meaning of statistics, growth and development of statistics, importance and scope of statistics, Limitations of statistics, Reasons for learning data, Classification of data, organizing data using data array, tabulation of data, graphical presentation of data, types of diagrams, exploratory data analysis.

UNIT - II **10HRS**

Measures of central tendency: Introduction, measures of central tendency, mathematical averages: Simple mean, weighted mean, Geometric mean, harmonic mean, averages of position: median, mode, quartiles, deciles, percentiles, deciles.

UNIT - III **10HRS**

Measures of Dispersion: Introduction, classification of measures of dispersion, distance measures: range, interquartile range, average deviation measures: mean absolute deviation, variance and standard deviation, coefficient of variation.

UNIT-IV **10HRS**

Discrete and continuous probability distributions: Introduction, difference between discrete and continuous random distributions, Discrete probability distributions: Binomial distribution, Poisson distribution: Continuous distribution: Normal distribution.

UNIT-V **10HRS**

Statistical decision theory: Introduction, elements of decision analysis, Decision making under uncertainty: Laplace criterion, Maximin and Minimax criterion, Maximax and Minmin criterion, Hurwicz criterion, regret criterion, Decision making under risk: EMV, EOL, and EVPI.

Text Book:

1. Business Statistics, Naval Bajpai, Pearson.

Reference books:

1. Statistics for management, Richard I. Kevin, Davis S. Rubin, Sanjay Rastogi, Masood Husain Siddiqui, Pearson, 7th edition.
2. J. K. Sharma, Business statistics problems and solutions, Pearson.
3. J. K. Sharma, Business statistics, Vikas, 4th edition.

17MB109 BUSINESS LAWS

Hours Per Week :

L	T	P	C
4	0	0	4

Course Objective:

This course is designed to provide the student with knowledge of the legal environment in which a consumer and businesses operates, and to provide the student with knowledge of legal principles.

Course Outcomes:

On completion of this course, learners will be able to:

- Identify the fundamental legal principles behind contractual agreements.
- Examine how businesses can be held liable in tort for the actions of their employees.
- Understand the legal and fiscal structure of different forms of business organizations and their responsibilities as an employer.
- Acquire problem solving techniques and to be able to present coherent, concise legal argument.

Skills:

(*These activities are only indicative, the Faculty member can innovate*)

- ✓ Draft a ‘rent agreement’ incorporating all the essential features of a valid agreement.
- ✓ Draft the Memorandum of Association of a company.
- ✓ Case laws ‘involving points of law of contracts’.
- ✓ Draft a complaint against ‘unfair trade practice’ adapted by a businessman – to the consumer forum.
- ✓ List out the latest cases of both High Court and Supreme Court on Environmental issues with both facts and judgments [Atleast 2 cases]

Note: Few case studies be discussed in the class.

UNIT - I **10HRS**

The Indian Contract Act, 1872: Establishing the contract, Offer and Acceptance, Consideration, Capacity to Contract, Free consent, Legality of Object, Performance and Discharge of Contract, Remedies for Breach of Contract

UNIT - II **10HRS**

The Sales of Goods Act, 1930: Meaning and Essentials; Conditions and Warranties; Transfer of Property; Rights of Unpaid Seller; Performance of Contract

The Indian Partnership Act, 1932: Meaning and Characteristics; Formation of Partnership; Rights and Duties of Partners; Dissolution of a Partnership Firm.

UNIT - III **10HRS**

The Negotiable Instruments Act, 1881: Meaning and Characteristics; Notes- Meaning and Essential elements; Bills- Meaning and Characteristics; Cheque- Meaning, Crossing, Dishonoring; Discharge of Negotiable Instruments

The Consumer Protection Act, 1986: Aims and objectives; Consumer Protection Council; Consumer Disputes Redressal Agencies.

UNIT - IV **10HRS**

The Companies Act, 1956: Nature and Kinds of Companies; Formation of Companies; Company Management – Appointment of Directors; Company Meetings; Winding Up of a company.

UNIT - V **10HRS**

The Information Technology Act, 2000: Digital and Electronic Signature; Electronic Governance; Attribution, Acknowledgement and dispatch Electronic record; Electronic Signature Certificates; Penalties, Compensation and Adjudication; The Cyber Appellate Tribunal; Offences.

TEXT BOOK:

1. Legal Aspects of Business 3rd Edition, Ravinder Kumar, Cengage Learning.
2. Elements of Mercantile Law by N.D. Kapoor, Sultan Chand & Sons.

REFERENCE BOOKS:

1. Business Law by N.D. Kapoor, Sultan Chand & Sons.
2. Legal Aspects of Business by Akhileshwar Pathak, Tata McGraw Hill.
3. Business Law by Tejpal Sheth, PEARSON.
4. Business Law by D. Chandra Bose, PHI Learning Private Limited.
5. Business Law (6th Edition) by MC Kuchhal & Vivek Kuchhal, Vikas.

17MB111 BUSINESS ENVIRONMENT & ETHICS

Hours Per Week :

L	T	P	C
4	0	0	4

Course Objective:

To analyze the overall business environment and evaluate its various components in business decision making. And provides an analysis and examination of significant contemporary ethical issues and challenges existing throughout the professional business arena. Emphasis will be placed upon the manager's social and environmental responsibilities to a wide variety of stakeholders, including employees, customers and the public.

Course Outcomes:

On completion of this course, learners will be able to:

- Familiarize with the nature of business environment and its components.
- The students will be able to demonstrate and develop conceptual framework of business environment and generate interest in international business.
- Understand the definition of ethics and the importance and role of ethical behavior in the business world today.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *List out the various cyber offences and the penalties for the same.*
- ✓ *List at least 3 MNCs of G-8 Countries operating in India along with products they manufacture.*
- ✓ *Collect the latest Fiscal, Monetary Policies on business*
- ✓ *Students are expected to study any five CSR initiatives by Indian organizations and submit a report for the same.*
- ✓ *A group assignment on "The relationship between Business houses and Society in Indian Context and relating the same with respect to the models studied.*
- ✓ *Mini Project: Collect details of unethical practices by businesses in today's context in the areas of Production, Marketing, HRM, and Financial services and make a report.*
- ✓ *Case studies/Role plays related ethical issues in business with respect to Indian context.*

UNIT - I **10HRS**

The Concept of Business Environment: Meaning of business environment – Types of environment – Nature and scope of business – Business objectives and its characteristics – Environmental Analysis and Forecasting – Importance of business environment.

UNIT - II **10HRS**

Economic systems and their impact on business: Capital Market – Money Market – Investor Protection and role of SEBI –Stock Exchange and its regulation - Liberalization – Privatization – Globalization.

UNIT - III **10HRS**

Industrial Policies: A brief review of industrial policies since independence, Industrial policy of 1991 and recent developments – policy on foreign direct investment in Indian Industry – Privatization and disinvestment.

UNIT - IV **10HRS**

Business Ethics: Nature of ethics - Ethical Principles in Business - Relationship between ethics and business – Ethical organization – Characteristics of ethical organization- ethical corporate code – Ethical leadership.

UNIT - V **10HRS**

Ethics in HRM: Ethics in Marketing - Ethics in Finance - Ethics at workplace – Corporate Social Responsibility – Corporate Governance – KM Birla Committee Report on Corporate Governance - Consumer Protection Act – Small Investor Protection.

TEXT BOOKS:

1. Francis Cherunilam: Business Environment: Text and Cases, 17th Edition, Himalaya, 2011.
2. Manuel G. Velasquez, Business Ethics: Concepts and Cases, 8th Edition, PHI, New Delhi, 2012.

REFERENCE BOOKS:

1. Justin Paul: Business Environment, 1st Edition, Tata MH. 2010
2. Misra and Puri: Indian Economy, 3rd revised edition, Himalaya, 2015.
3. Dutt and Sundaram, Indian Economy, S. Chand, New Delhi, 12th edition, 2016.

17MB113 MANAGERIAL COMMUNICATIONS - I

Hours Per Week :

L	T	P	C
4	0	0	4

Course Objective:

This course is designed to enable students to understand the nature and scope of communication and its implications in the real time business world. Expose to the receptive and productive skills of English language to attain proficiency. Familiarize the basic writing skills which lay a strong foundation for writing business documents.

Course Outcomes:

On completion of this course, learners will be able to:

- Understand the scope of communication and learn its importance and implication strategies.
- Recognize and learn the sub-skills of listening and speaking and be able to deliver effectively in the real time contexts.
- Imbibe the mechanics of writing and construct effective paragraphs which befit in a longer composition.
- Use different forms of written communication techniques to make effective internal and external business correspondence.
- Produce different types of reports with appropriate format, organization and language.

Skills:

(These activities are only indicative, the Faculty member can innovate)

✓ *Findout the barriers of communication by playing story telling games*

✓ *Write a letter to your manager and subordinates*

✓ *write a letter to your supplier about raw material requirement*

✓ *Have a telephone converstion with your clients*

✓ *Write a circular to your department regarding holiday cancellation*

UNIT - I **10HRS**

Communication - Nature and Scope: Communication - Significance - Process - Types - Flow of Communication - Basic Communication Skills - LSRW - Verbal and Non-verbal Communication - Formal Vs Informal Communication - Oral and Written Communication – Barriers to effective communication - organizational communication - Strategic implications of modern communication.

UNIT - II **10HRS**

Aural and Oral Communication: Listening - Active and Passive Listening - Barriers to effective listening – Strategies for effective listening - Introduction to presentations - Conversations - Role play - JAM - Debate - Extempore - Individual and Group Presentations - Group Discussions - Procedure - participation - Interviews - Business presentations - Addressing large groups - Public Speaking.

UNIT - III **10HRS**

Written Communication: Sentence Structure – Requisites of a good sentence – Writing paragraphs – Principles of writing a good paragraph – Development of paragraphs – Describing people, places, things and processes – Narrating events, incidents – Persuasive communication – Longer composition – Common errors in writing.

UNIT - IV **10HRS**

Business Correspondence: Internal Communication – External Communication – Writing a memo – Letter Vs memo – Form and Structure – Circular – Notice – Agenda – Proceedings of meetings – Minutes – Business Letters – Sales Letters – Enquiry – Quotations – Placing orders – Claims – Adjustments – Inviting – Appreciating – Thanking etc. – Writing Emails – Standard Email practices – Email etiquette – Sample Emails.

Communication Media: Meaning – Importance – Media for inter personal communication – Mail, Courier, Telex, Telephone, Fax, e-mail – Mass media – Notice board, Public announcement; Press – Radio – Television – Internet – Media technology.

UNIT - V **10HRS**

Reports, Proposals and Presentations: Purpose of writing Reports – Format and Style – Types of reports – Regular reports – Factual reports – Survey reports – Feasibility reports – Business presentations – Format – Key elements for winning business proposals – Business presentations – Planning – Preparing – Organizing – Rehearsing – Improving – Visual aids – Nuances of delivery.

TEXT BOOKS:

1. Koneru, A., “Professional Communication”, 2008, Tata McGraw Hill.
2. Bill Mascull, “Business Vocabulary in Use”, 2010, Cambridge University Press.

REFERENCE BOOKS:

1. Bovee, C. and Thill, J.V., “Business Communication Today”, 11th edition, 2011, Prentice Hall.
2. Francis Soundararaj, “Speaking and Writing for Effective Business Communication”, 2008, Macmillan.
3. RK Madhukar, “Business Communication”, 2010, Vikas Publishing House Pvt. Ltd.
4. Mallika Nawal, “Business Communication”, 2012, Cengage Learning India.
5. Meenakshi Raman & Prakash Singh, “Business Communication”, 2012, OUP.

17MB115 ESSENTIAL SKILLS FOR MANAGERS - I

Hours Per Week : 2

L	T	P	C
2	0	0	2

Course Objective:

The objective of this course is to familiarize the student with the professional skills required for managers to run the business effectively. The course focuses on practicing the soft skills through different activities to build successful career. This course is extended as Essential Skills for Managers – II in the Semester – II.

Course Outcomes:

At the end of this course, the student will be able to

- Understand the value of professional skills at workplace.
- Exhibit the important soft skills appropriately.
- Apply the managerial skills to the business needs.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *Findout the barriers of communication by playing story telling games*
- ✓ *Write a letter to your manager and subordinates*
- ✓ *write a letter to your supplier about raw material requirement*
- ✓ *Have a telephone converstion with your clients*
- ✓ *Write a circular to your department regarding holiday cancellation*

UNIT - I **10HRS**

Presenting yourself professionally: Managing your image, dressing appropriately, meeting business casual standards

Managing yourself in professional settings: Interacting with others, improving your speech cleaning up your online persona

UNIT - II **10HRS**

Communicating with E-mails: Understanding e-mail messages, Composing the main elements of messages, Creating professional e-mail messages

Developing professional telephone skills: Exploring Telephone Communication, Placing Telephone Calls, Receiving Telephone calls

UNIT - III **10HRS**

Making formal Presentations: Planning effective presentations, Developing, Rehearsing and Delivering a presentation

Improving communication: Making proper introductions, Participating in meetings, Dealing with office politics

UNIT - IV **10HRS**

Working with customers: Understanding customer service basics, communicating empathetically, asking questions to understand problems

Handling different customers: Denying requests, coping with angry customers, Dealing with the unexpected and disabled customers

UNIT - V **10HRS**

Identifying and defining problems: Understanding problem solving, analysing problems, working with problem owners, simplifying complex problems

Solving the problem: Gathering and analysing the data, developing alternatives, evaluating options, verifying the solution

*Use of Computers and Internet is required during the course practice sessions

Text Book:

Soft Skills for Everyone, Butterfield Jeff, Cengage Learning, 2011

Reference:

Training in Interpersonal Skills, Stephen P. Robbins, Philips L. Hunsaker, 5th edition, Pearson, 2009.

17MB102 MARKETING MANAGEMENT

Hours Per Week:

L	T	P	C
4	0	0	4

Course Objective:

The course is designed to provide students with an overview of the decision making process in marketing. Marketing decision-making is a process that is essentially wrapped around the fundamental goal of creating value in the marketplace. This requires a professional knowledge of market drivers, competitors' capabilities, technological trends and the market dynamics of value. The orientation is toward the kinds of marketing decisions that managers must make within the modern business environment. The primary goal of this course aims at making students understand concepts, philosophies, processes and techniques of managing the marketing operations of a firm.

Course outcomes:

By the end of this course it is expected that the student will be able to:

- Understand basic concepts of marketing and elements of marketing environment
- Understand how to segment markets, target and launch with apt product positioning strategies.
- Determine the factors that influence product and pricing decisions.
- Take correct and situational based channel and promotional decisions.
- Understand advanced concepts of marketing, changing trends and their applicability in today's competitive world.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *Visit any website and list the promotion strategy of a sponsoring company.*
- ✓ *Find out the promotion tools of any company.*
- ✓ *Observe the Distribution Network of a Company*
- ✓ *List out Product Line of a company and note line modernization or deletion.*
- ✓ *Draw a Product Life Cycle with regard to a particular product of a company and observe its extension.*

UNIT - I **10HRS**

Introduction- Definition, Importance and Scope of Marketing, Philosophies of Marketing Management, Elements of Marketing - Needs, Wants, Demands, Customer, Consumer, Markets and Marketers; Marketing Vs Selling, Consumer Markets and Industrial Markets.

Concept of Marketing Management, Marketing – Mix, Marketing Organizations – Evolution and functions, Marketing Environment, Factors Affecting Marketing Environment, Marketing Information System and Marketing Research.

UNIT - II **10HRS**

Market Segmentation, Targeting and Positioning- Segmenting the Market – Levels and patterns of segmentation, Market Segmentation Procedure, Basis for Consumer/Industrial Market Segmentation. Market Targeting – Introduction, Factors to be considered for targeting, Evaluating and selecting market segments, Product Positioning - Introduction, Developing and communicating a positioning strategy – Positioning errors and possibilities, positioning strategies.

UNIT - III **10HRS**

Marketing - Mix Decisions - **Product & Pricing Decisions**- New Product Development-Concept and Necessity for Development, Challenges in New Product Development, New Product Planning and Development Process, Product-Mix, Branding and Packaging Decisions, Product Life cycle - Stages and Strategies. Pricing Decisions - Pricing Objectives, Process of pricing, Methods of Setting Price, Pricing Strategies.

UNIT - IV **10HRS**

Marketing - Mix Decisions - Channel and Promotional decisions- Channels of Distribution for Consumer/ Industrial Products, Channel functions, Management of Channels, Factors affecting Channel decisions, Wholesaling and Retailing, Promotion - Promotion-mix, Advertising, Sales Promotion, Personal Selling, Direct marketing, Publicity and Public Relations.

UNIT - V **10HRS**

Changes in Marketing Practices: A brief account of Marketing of Services, Rural Marketing, CRM, Electronic Marketing; B2C,C2B, B2B and C2C, Internet Marketing, International Marketing, Strategic Marketing Planning.

TEXT BOOK:

1. Philip Kotler: "***Marketing Management***", 11th Edition, Pearson Publishers, New Delhi, 2011.

REFERENCE BOOKS:

1. Stanton William.J., Fundamentals of Marketing, , 10th edition, McGraw Hill, New Delhi, 2010.
2. Rajan Saxena: "***Marketing Management***, 4th Edition, Tata McGraw Hill, New Delhi, 2009.
3. VS Ramaswamy, S.Namakumari:, "***Marketing Management***", 4th Edition, Macmillan, New Delhi, 2009
4. Karunakaran: "***Marketing Management***", 1st Edition, Himalaya Publishing House, Mumbai, 2010.
5. M.Govindarajan: "***Marketing Management, Concepts, Cases, Challenges and Trends***", 2nd Edition, PHI Private Limited, New Delhi, 2009.

17MB104 FINANCIAL MANAGEMENT

Hours Per Week:

L	T	P	C
4	0	0	4

Course Objective

This course aims to provide a framework of fundamental concepts, principles and approaches of corporate finance. It enables the students to apply their knowledge in solving problems of corporate organizations and help them to improve their overall capacities in the field of corporate finance.

Course outcomes

Students who successfully complete this course will be able to:

- Understand the concepts of time value of money relating to corporate investment decisions.
- Analyze and evaluate investment opportunities and apply capital budgeting techniques in investment decisions.
- Understand the concepts of time working capital management and ability to communicate their view point's relating to the financial health of firms.
- Demonstrate conceptual and practical knowledge of capital structure and dividend policy and how it affects a firm value.

SKILLS:

*(*These activities are only indicative, the Faculty member can innovate*)*

- ✓ *To collect and scrutinize share application forms of IPOs.*
- ✓ *To calculate the EPS of various companies.*
- ✓ *To determine the operating cycle for a manufacturing and non – manufacturing firm.*
- ✓ *To visit banks and collect information regarding short term and medium term finance offered by them.*
- ✓ *To track the dividend policies of some well known companies.*

UNIT - I **10HRS**

Perspectives on Financial Management: Finance Function & Inter linkages with other functions. Objective of the finance Function, Investment, Financing and dividend, firm value maximization, Agency Problems, Time value of Money.

UNIT - II **10HRS**

Capital Budgeting Decisions: Investment Appraisal Methods- NPV and other techniques. Fundamentals of Capital Budgeting- Forecasting earnings, Risk Analysis in capital Budgeting.

UNIT - III **10HRS**

Working capital management: Cash cycle, operating cycle, estimation, Factors affecting working capital, Types of working capital- Inventory management, Cash Management.

UNIT - IV **10HRS**

Capital Structure: Cost of Capital- Component cost of capital and WACC. Capital structure and impact on firm value- MM Hypothesis with and without taxes, traditional models.

UNIT - V **10HRS**

Dividend Policy: Forms of dividend, Theories of dividend, Dividend payout theories and comparison of dividends versus buy backs.

TEXT BOOK:

1. Ross, Westerfield and Jaffe and Kakani (RWJK) Corporate Finance, 10/e, 2014,Tata Mc Graw Hill.

REFERENCE BOOKS:

1. Michael C Ehrhardt and Eugene F Brigham, Corporate Finance- A Focused Approach, Cengae Learning, 5/e, 2013.
2. Rajiv Srivastava and Anil Misra, Financial Management, Oxford University Press, 2/e, 2011
3. I.M.Pandey, Financial Management (10th edition), Vikas Publishing 2011.
4. Anthony, Hawkins and Merchant, Accounting: Text & Cases, 13/e, 2010.

17MB106 HUMAN RESOURCE MANAGEMENT

Hours Per Week:

L	T	P	C
4	0	0	4

Course Objective:

The course provides an understanding of how the human resources management function is led in organizations. By the end of the course the learner will be able to appraise HRM functions and know how they can be executed in the organizations.

Course outcomes:

By the end of the course the learners are expected to

- Gain knowledge of the overall functions of Human Resource Management and role of HR Dept. in organizations.
- Understand how the specific operational functions of HRM are executed in the organizations.
- Appraise the various HR needs and corresponding programmes to be implemented in organizations.
- Develop perspective to deal with Human Resources in organizations.

Skills*:*

*(*These activities are only indicative, the Faculty member can innovate*)*

- ✓ *Chart out the methods of appraising employees of any (one) organization of your choice.*
- ✓ *List out the HR policies of any one company.*
- ✓ *Select any two companies of your choice and write its HR policies.*
- ✓ *List out any 5 (five) welfare techniques for employees.*
- ✓ *Draft the executive development plan of any company.*
- ✓ *A study of different recruitment models in companies can be made.*

UNIT - I **10HRS**

Introduction: HRM at work - The Changing Environment and Changing Role of HRM - The HR Manger's Proficiencies - Labor Legislations in India - Equal Employment Opportunity, HR Process Outsourcing - Disruptive HRM - Business HR - Employee Engagement.

UNIT - II **10HRS**

Job Analysis: Basics, Methods - Writing Job Descriptions and Job Specifications - The Recruitment and Selection Process: Planning and Forecasting - Effective Recruiting, Internal and External Sources of Candidates, Developing and Using Application Forms - e-Recruitment: Use of social media - Recruitment Process Outsourcing.

UNIT - III **10HRS**

Selection: Importance, Assessment Centre, Types of Testing, Work Samples and Simulations - Background Investigation and other Selection Methods - Basic Features of Interviews - What can Undermine and Interview's Usefulness, Designing and Conducting an Effective Interview - Orientation: Purpose, Process - Training: Process - Training Methods - Management Development, Evaluating the Training Effort.

UNIT - IV **10HRS**

Basic Concepts in Performance Management: Introduction to Appraising Performance – Steps and Methods in Performance Appraisal – Appraising Performance: Problems and Solutions, The Appraisal Interview – Career Management, Career Planning and Career Development – Managing Promotions and Transfers

UNIT - V

10HRS

Factors Determining Pay, Establishing Pay Rates- Payroll Management – Competency Based Pay and other Compensation Trends – Incentives: Individual, Group and Organizationwide Plans – Employee Benefits – Employee Relations – Collective Bargaining Process - Handling Grievances – Trends in HR: HR Metrics, HR Analytics

TEXT BOOK:

1. Dessler, Varkkey: Human Resource Management, 12/e, Pearson Education India, 2014.

REFERENCE BOOKS:

1. Armstrong, Taylor: Armstrong's Handbook of Human Resource Management Practice, 13/e, Kogan Page, 2014.
2. Decenzo, Robbins: Fundamentals of Human Resource Management, 11/e Wiley, 2013.

17MB108 BUSINESS RESEARCH METHODS

Hours Per Week:

L	T	P	C
4	0	0	4

Course Objective:

Business research is a systematic enquiry whose objective is to provide information to solve managerial problems. This course is an introduction on how to do business research with an emphasis on applied problem solving. It has a major emphasis on applied problem-solving strategies and communication skills.

Course outcomes:

Upon completion of this course you should able to:

- Understand the steps in conducting research and survey methods of data collection.
- Understand the concepts of Correlation, Regression and Multiple Regression analysis.
- Understand the concepts of testing Quantitative data using Statistical inference.
- Understand the concepts analyzing Qualitative data and effective way of Report preparation.

SKILLS:

(These activities are only indicative; the Faculty member can innovate)

- ✓ *Choose an area of interest, review a minimum of 4 literature on the same and formulate a topic for prospective research.*
- ✓ *For a given topic – collect data through primary and secondary sources.*
- ✓ *For a given data, analyze data using various statistical tools.*
- ✓ *For a given case study, prepare a research report in the required format.*

UNIT - I **10HRS**

Business Research and Sources of Data: Business Research: Introduction, Difference between Basic and Applied research, Business Research Process Design, Types of research: Exploratory Research, Descriptive Research.

Sources of Data: Secondary Data Sources, Survey methods of data collection.

UNIT - II **10HRS**

Questionnaire design and Sampling: Questionnaire: Introduction, Questionnaire design process-Pre-Construction Phase, Construction Phase, Post-Construction Phase.

Sampling: Introduction, Random Sampling methods: Simple random Sampling, Stratified Random Sampling, Cluster Sampling, Systematic Sampling, Multi Stage Sampling. Non-Random Sampling: Quota sampling, Convenience Sampling, Judgment Sampling.

UNIT - III **10HRS**

Correlation and Linear Regression: Correlation, Karl Pearson's Coefficient of Correlation, Introduction to Simple Linear Regression, Determining the equation of a Regression line, Multiple Regression model, Multiple Regression Model with two independent variables.

UNIT - IV **10HRS**

Hypothesis Testing: Introduction to Hypothesis testing, Hypothesis testing procedure, Two-tailed and One-tailed tests of hypothesis, Type and Type –II errors, Hypothesis testing for single mean, Two Population means using t-test, Hypothesis testing with z Statistic for the difference in the means of two populations, and two proportions, Statistical Inference about the difference between the means of two related Populations.

UNIT - V **10HRS**

Hypothesis Testing for Categorical Data and Report Writing: Introduction, Defining Chi-square statistic, Conditions for applying χ^2 test, - Goodness of fit, test of independence. Analysis of variance, Completely Randomized Design (ONE-WAY ANOVA), Randomized Block Design (TWO-WAY ANOVA), Introduction to Report Writing, Organization of the Writing Report.

TEXT BOOK:

1. Business Research Methods, Navel Bajpai, Pearsons.

REFERENCE BOOKS:

1. Business Research Methods 8e – Zikmund et al, Cengage Learning.
2. Business Research Methods - Donald R. Cooper, Pamela S. Schindler, Tata McGraw-Hill.
3. Statistics for Business and Economics, Anderson et al, 9e, Cengage Learning.

17MB110 IT FOR MANAGERS

Hours Per Week:

L	T	P	C
4	0	0	4

Course Objective:

Considering today's tough job market, it is important that the students should develop the expertise and critical thinking skills that give them a competitive edge. This course is designed to give students an edge when they face the challenges and opportunities that business careers present. It will give students an in-depth look at how today's business firms use information technologies and systems to achieve corporate objectives.

Course Outcomes:

After completion of this course, students will know,

- How today's business firms use information technologies and systems to achieve corporate objectives.
- Information systems are major tools available to business managers for achieving operational excellence, developing new products and services, improving decision making, and achieving competitive advantage.
- The complications and issues associated with each business intelligence system, and discuss the role of the business manager in developing and using these systems.
- How organizations use knowledge management to identify, select, organize, and disseminate that information.
- The description 0f project management knowledge areas of scope, time, cost, quality, human resources, communications, risk, procurement, and integration.

UNIT - I **10HRS**

Organizations, Management, and the Networked Enterprise: The Role, Perspectives and Contemporary Approaches of Information Systems in Business Today, Business Processes and Information Systems function in business, Using Information Systems to Achieve Competitive Advantage, Ethical Dimensions of Information Systems.

UNIT - II **10HRS**

Information Technology Infrastructure: IT Infrastructure and Components, Database Approach to improve Business Performance and Managing Data Resources, Telecommunications and Networking in today's Business World, System Vulnerability and Abuse, Technologies and Tools for Protecting Information Resources.

UNIT - III **10HRS**

Information Technology Applications: Business Process and IT outsourcing, Corporate Governance and IT, Enterprise Resource Planning, Enterprise Architecture, Supply Chain and Customer Relationship Management Systems.

UNIT - IV **10HRS**

Key Systems Applications for the Digital Age: Enterprise Applications, E-commerce and Mobile Digital Platform, Enterprise-Wide Knowledge Management Landscape an Systems, Knowledge Work Systems, Decision Making and Information Systems, Business Intelligence in the Enterprise.

UNIT - V **10HRS**

Building and Managing Systems: Systems as Planned Organizational Change, Systems Development, The Importance and selection of Project Management, Establishing the Business Value of Information Systems.

TEXT BOOKS:

1. Kenneth C Laudon and Jane P. Laudon, "Management Information Systems", 15th Edition, 2018, Pearson.
2. Efraim Turban and Linda Volonino, "Information Technology for Management", 8th Edition, 2010, Wiley.

REFERENCE BOOKS:

1. W S Jawadekar, "Management Information Systems", 5nd Edition, 2009, TMH
2. James A. Obrein, "Management Information Systems", 10/E, 2013,TMH
3. George W. Reynolds, "Information Technology for Managers", Cengage Learning
4. Steven Alter, "Information Systems", 1/E, 2009,Pearson
5. C.S.V. Murthy, "Management Information Systems", 1/E, 2009,Himalaya

17MB112 OPERATIONS MANAGEMENT

Hours Per Week:

L	T	P	C
4	0	0	4

Course Objective:

This course is designed to address the key operations and quality issues in service and manufacturing organizations that have strategic as well as tactical implications.

Course Outcomes:

At the end of the course students will be able:

- To apply analytical skills and problem-solving tools to the analysis of the operations problems
- To understand the strategic role of operations management in creating and enhancing a firm's competitive advantages
- To understand key concepts and issues of OM in both manufacturing and service organizations
- To understand the application of operations management policies and techniques to the service sector as well as manufacturing firms.
- To learn the quality improvement and maintenance aspects of operations management.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *Visit any factory and list out the physical facilities and type of production followed.*
- ✓ *Visit any factory and prepare a report on the production planning and control activities*
- ✓ *Visit a company and draw a chart on plant layout/ suggest suitable methods for productivity improvement.*
- ✓ *List out the functions of materials management in an organization.*
- ✓ *Visit any industry and list out the various quality measures /maintenance methods adopted.*

UNIT - I **10HRS**

Operations Management Systems: Systems concept of production, types of production

Systems- Flow, Shop, Batch, Cellular, flexible Manufacturing.Operations management functions, challenges in operations management, current priorities for operations management, operations strategy, world class manufacturing, emerging trends and implications for operations

UNIT - II **10HRS**

Planning and Controlling of Operations: Production planning and controlling activities,

Aggregate planning, Resources planning: MRP-1, MRP-2

UNIT - III **10HRS**

Productivity Improvement in Operations: Factors affecting productivity, Techniques for

improving productivity, Facility location and factors influencing facility location, Methods for facility location decision, Plant layout: types of layouts – process layout, product layout, hybrid layout, fixed position layout, Work study: method study, time study

UNIT – IV **10HRS**

Purchasing and Inventory Management: Purchase function, Procedures. Economic Order quantity, Inventory analysis Methods – ABC, VED, XYZ methods – their utility. Inventory Valuation Methods: Periodic and perpetual systems; FIFO, LIFO, Average cost and Weighted Average Cost Methods.

UNIT - V **10HRS**

Quality Improvement and maintenance: Inspection, Quality, Statistical Quality Control – Control Charts Deming concepts. Total Quality Management, maintenance management-need equipment life cycle, measurement of maintenance performance Total Productive Maintenance, Six sigma.

TEXT BOOKS:

1. Mahadevan, “Operations Management” , 2nd edition., Pearson, 2010
2. J.K Rajewski, Larry P Ritzman “Operations Management” , 5th edition., Addision Wesley, 1998.

REFERENCE BOOKS:

1. R.Paannerselvam, “Production and Operations Management”, 2nd edition, PHI, 2006
2. S.N.Chary “production and Operations Management”, 6th edition., THM, 2006
3. Buffa, “Production and Operations Management”, 6th edition.,Willey, 2008
4. Joseph S Matrinich, “Production and Operations Management”, 8th edition., Willey 2008

17MB114 MANAGERIAL COMMUNICATION-II

Hours Per Week:

L	T	P	C
4	0	0	4

Course Objectives:

The Business Communication Laboratory course is aimed at improving business communication skills (LSRW – Listening, Speaking, Reading and Writing) of postgraduate students and preparing them for their profession as managers. This course will help students to understand Business communication and personality as two interlinked spheres of influence, and provide them with exposure to conventions of corporate communication involved in the functioning of the business world.

Learning outcomes:

Having gone through the course, students would be equipped to clear industry recognized certification such as BEC Vantage by the University of Cambridge. This will equip them to stand out in the professional and business setting. Since this certification looks at LSRW (Listening, Speaking, Reading and Writing) components in great detail, we hope to equip students to confidently and successfully attempt all the 4 critical components.

UNIT - I **10HRS**

Business English Vocabulary: Glossary of most commonly used words (formal and informal usage)

Elements of Technical Writing: Sentence structure, reducing verbosity, arranging ideas logically, building coherence, paragraph level and document level, topic sentence, cohesive devices, transitional words, paraphrasing and précis-writing.

Mechanics of Writing: Stylistic elements, the rapporteur, the purpose, the reader's viewpoint (audience), elementary rules of grammar, choice of diction, elementary principles of composition, matters of form, punctuation, conventions of business communication, language and professional tone, weak links in business correspondence, ethical concerns in business writing, code of conduct (not sending illegal, offensive, disparaging personal remarks or comments) in written business communication

UNIT - II **10HRS**

Business Correspondence: E-mail: nature and scope, e-mail etiquette, clear call for action, common errors in composing e-mails, office communication such as meeting agenda and minutes of the meeting, notice, circular and memo

Letter-Writing: Formal and informal letters, structure of formal letters, expressions of salutations, different types of letters [such as sales letter, complaint letter, response to the complaint letter (dispute resolution), letter of permission, letter of enquiring, claim letter – letter of apology etc], introductory and concluding paragraphs and clear call for action.

Professional Proposal/Report: Differentiating proposals and reports, Drafting formal business proposals, types of reports such as factual reports, feasibility reports and survey reports, parts of a report (such as title page, declaration, acknowledgements, table of contents, abstract, introduction, findings, conclusion and recommendations, citations, references and appendices)

UNIT - III **10HRS**

Speaking: Speaking in business context, assertiveness, politeness, making requests, queries and questions, negotiations, asking for information, offering suggestions, conflict resolution, contacting clients, initiating, addressing delegates (in public), features of a good power point presentation (making the PPT), delivering the presentation effectively, telephone etiquettes, delivering seminar/proposal/ report effectively, team meeting etiquettes (face to face and conference call), making effective one minute presentations

UNIT - IV **10HRS**

Reading: Reading and comprehending business documents, learning business register, regularizing the habit of reading business news, suitable vocabulary, skimming and scanning text for effective and speedy reading and dealing with ideas from different sectors of corporate world in different business contexts

UNIT - V **10HRS**

Listening: Specific information in business context, listening to telephonic conversations/messages and understanding the correct intended meaning, understanding the questions asked in interviews or in professional settings, summarizing speaker's opinion or suggestion, enable active listening.

Reference Books:

1. Guy Brook Hart (2014): Cambridge English Business Bench Mark: Upper Intermediate, Second Edition: CUP.
2. CUP (2002) Cambridge: BEC VANTAGE: Practice Tests, CUP.

17MB116 ESSENTIAL SKILLS FOR MANAGERS - II

Hours Per Week:

L	T	P	C
2	0	0	2

Course Objective:

This course is an extension to the Essential Skills for Managers – I covered in the Semester-I. The objective of this course is to familiarize the student with the professional skills required for managers to run the business effectively. The course focuses on practicing the soft skills through different activities to build successful career.

Course Outcome:

At the end of this course, the student will be able to

- Understand the value of professional skills at workplace
- Exhibit the important soft skills appropriately
- Apply the managerial skills to the business needs

UNIT - I **10HRS**

Writing for Employment: Understanding job searches, Writing effective cover letters, writing chronological and functional resumes

Developing a Professional Work Ethic: Being dependable and reliable, Managing Time and Stress, Maintaining a professional workspace

UNIT - II **10HRS**

Developing your Interpersonal Skills: Respecting social protocols,Showing basic office courtesies, Networking and socializing professionally

Thinking Critically: Identifying arguments, assessing the credibility of an argument, Exploring weaknesses in an argument

UNIT - III **10HRS**

Negotiations Bargaining Strategies: Effective Negotiations, Behavioral Checklist, Modelling Negotiation Skills-Exercise

Resolving Conflicts: Key Conflict Management Skills, Behavioral Checklist, Modelling Conflict Management Skills-Exercise

UNIT - IV **10HRS**

Leading a team: Preparing to be a team leader, Taking a project management approach, Managing teams diplomatically

Managing Meetings: Planning meetings, Developing Meeting agendas, scheduling and conducting meetings effectively

UNIT - V **10HRS**

Planning and Managing your career: Understanding career management, Researching your options, Developing Long-term and Short-term career plans

Winning at office politics: Understanding the system, Developing diplomacy skills, Dealing with negative politics

*Use of Computers and Internet is required during the course practice sessions

Text Book:

Soft Skills for Everyone, Butterfield Jeff, Cengage Learning, 2011

Reference Book:

Training in Interpersonal Skills, Stephen P. Robbins, Philips L. Hunsaker, 5th edition, Pearson, 2009.

II MBA I Semester
STRATEGIC MANAGEMENT

Course Objective:
The basic objective of this course is to help the students to learn the concept of strategic management and understand the significance of managing the business strategically in the current business environment.

Course Outcome:
At the end of the course students should be able to understand

- Strategic management process and the role of stake holders in the process and importance of vision, mission and objectives in strategy formulation
- The importance of External, Internal, SWOT and value chain analysis in strategy formulation and implementation
- Strategy formulation at various levels i.e., Corporate, Business and function level strategies
- Strategic analysis and choice, issues of strategy implementation and portfolio analysis
- Strategy evaluation and control and contemporary issues of strategic management i.e., ethics, social responsibility and corporate governance

UNIT - I: Introduction to strategic management – Evolution of Strategic Management- Understanding strategy- The Strategic Management Process- Hierarchy of Strategic Intent- The Strategist and Strategic Decision-making – The role of managers, shareholders, board of directors and CEO in strategic management- Establishing Corporate Direction- Vision, mission, business definition and objectives

UNIT - II: Environmental Appraisal- External Environment Scanning and Industry Analysis - Internal Environment- Resources and capabilities- Core competencies- SWOT analysis- Value chain analysis- Competitive strength Assessment- Corporate capability factors- Global Strategic Management – Peculiarities and value creation

UNIT - III: Formulating Strategies- Corporate Level Strategic Alternatives- Strategy formulation- Situation analysis- types of corporate strategies- Strategic alliances- Portfolio restructuring- Business UNIT - Level Strategies – Michael porters generic strategies- Offensive, defensive strategies and competitive advantage- Matching strategy to situation- Functional and Operational Level Strategies

UNIT - IV: Strategy Implementation- Strategic Analysis and Choice – Criteria for evaluating strategic alternatives- The Input stage- The matching stage- Corporate portfolio analysis- BCG, GE matrix- Selection of the matrix- Structural Implementation- Issues in strategy implementation- Organizational structure- Managing strategic change- Behavioural Implementation- Positive attitude and mindset- Leadership- Corporate culture- Values- Power- Organizational change and development- Functional Implementation: Functional Issues.

UNIT - V: Strategic Evaluation and Control – process- Implementing strategic control- Strategic Management in Non-profit Organizations - Social Responsibilities and ethics of Business- Corporate Governance -Corporate Strategic Failures.

TEXT BOOKS:

1. Azar kazmi, Adela Kazmi " Strategic Management", 4e,McGraw Hill, New Delhi, 2015.
2. Fred R. David: Strategic Management, Concepts and Cases-Prentice Hall,13th edition,2011

REFERENCE BOOKS:

1. Thomposn & Strickland: Strategic Management, Concepts and Cases. Tata McGraw-Hill, 12/e, New Delhi, 2007.
2. Gregory Dess and G.T. Lumpkin, Strategic Management – Creating Competitive Advantage, McGraw Hill International, 2006.
3. Lawrence R Jauch, R. Gupta & William F. Glueck: Business Policy and Strategic Management, Frank Bros. Delhi, 2006.
4. Appa Rao C, Business Policy and Strategic Management, Excel publishers,2008.
5. Subba Rao p: Business policy And Strategic Management, Text and Cases- Himalaya Publishing House-2nd revised edition 2010

ENTREPRENEURSHIP AND BUSINESS PLAN

Course Objective: The objective of the course is to make students understand the concept, process, types and promotion of entrepreneurship. This course will develop skills of students in the area of conducting feasibility studies, analysis of opportunities and strategies, exploration of new start-up businesses and to acquaint the students about various issues of entrepreneurship .

Course Outcomes: At the end of the course the student will be able to

- Understand concepts, process and types of entrepreneurship.
- Able to develop skills in the area of conducting feasibility studies, analysis of opportunities and strategies and promotion of entrepreneurship
- To acquaint the students about various other issues of entrepreneurship, like exploration of new start-up businesses and funding .
- To hone their abilities to build their own startups systematically.

UNIT - I: Nature and Forms of Entrepreneurship: Historical background of Entrepreneurship: Concept and Growth, Entrepreneur scenario in India and Abroad, behavior inputs, Entrepreneurial motivation, Ethics in entrepreneur, Characteristics, Essential features, functions of entrepreneur, kinds of entrepreneurs, entrepreneurship and management, corporate entrepreneurship, Intrapreneurs - Introduction to Edupreneurship**,** Agripreneurhsip Tourism entrepreneurship, Social entrepreneurship, Ecological entrepreneurship, Technopreneurship. Family business and new generation entrepreneurs - women and rural entrepreneurship,

UNIT - II: Startups: Concept, need, factors, life cycle, sources of start- up ideas and evaluation criteria ,Technology based start-ups, characteristics of e Tech startup, new startup model, specific type of finance like Angel investors Venture capital, key factors for success and reasons for failure. Recent AP and Telangana government startup and innovation policy, central government support to startups.

UNIT - III: Forms, Promotion and Financial aspects of the Entrepreneurship: Introduction to Types of business firms, proprietary, sole trading, partnership, Joint Stock Company, statutory requirements for startups, Entrepreneurs and legal regulatory systems, patents and trademarks, Intellectual Property Rights, Support agencies, Role of MSME, NSIC and SIDBI like agencies in promotion of entrepreneurship. Financing Commercial Banks, Bank Loans, Venture capital, Angel funding, Informal Agencies In financing entrepreneurs, Government Grants and Subsidies, Institutional support for promoting entrepreneurship in India.

UNIT - IV: Business and Project Planning, Feasibility Studies: The Concept of Business planning and modeling, Importance of Business plan, contents of business plan, opportunity recognization and evaluation (market, industry). Project Life Cycle, Project Planning, Internal and External Environment Analysis, Technological Competitiveness, Feasibility, Source of Capital, Debt-Equity, SWOT Analysis, Product and Process Development, Major steps in product development.

UNIT - V: Entrepreneurial Strategy and Development: Generation of new entry opportunity, Decisions under Uncertainty, entry strategy, new entry exploitation, environmental instability and First-Mover disadvantages, Risk Reduction strategies, Market scope strategy, Imitation strategies and Managing Newness. Need for EDPs, Objectives of EDPs, Scheduling the programme, design inputs, course contents and curriculum of EDPs, Phases of EDPs, & Evaluation of EDPs

TEXT BOOKS:

1. H. Nandan, Fundamentals of Entrepreneurship, PHI, First Edition, New Delhi, 2007.
2. Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, TMH, Sixth Edition, New Delhi, 2006.
3. P. Narayana Reddy, Entrepreneurship – Test and Cases, Cengage Learning, Third Impression, New Delhi, 2011.

References Books:

1. Madhurima Lall, Shikha Sahai, entrepreneurship, Excel Books, First Edition, New Delhi, 2006.
2. S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
3. Thomas W. Zimmerer, Norman M. Scarborough, Essentials of Entrepreneurship And Small Business Management, Fourth Edition, Pearson, New Delhi, 2006
4. Charles E. Bamford, Garry D.Bruton Entrepreneurship: a small business approach, MHE New Delhi, 2015.

III Semester Electives - Marketing

MARKETING RESEARCH

Course Objective

The course is designed to inculcate the analytical abilities and research skills among the students to facilitate decision making in solving various marketing problems.

Course Outcomes:

At the end of the course students should be able to understand

- Typical applications of Marketing Research and Research process
- Research Methods and Design and instruments of data collection
- Statistical tools and their application in analyzing and resolving marketing problems

UNIT - I

Introduction to Marketing Research- Role of Marketing research in a Marketing plan- Marketing intelligence versus Marketing Research- Typical applications of Marketing Research- Limitations of Marketing Research- Secondary and Primary research- Ethical considerations in Marketing Research- Marketing research process- Defining the Research Objective- Research Designs- Exploratory, Descriptive and casual Research- Designing the research Methodology- Survey, Observation, experimentation, Qualitative techniques- Plan for sampling, Field work, and Analysis- Presentation, Report, and Marketing action

UNIT - II

Research Methods and Design- Sources of Secondary data- Disadvantages of Secondary Data- Exploratory and Conclusive research- Major qualitative Research Techniques- Depth Interview, Focus Group, Projective techniques- Validity of research- test Marketing- Questionnaire Design for Marketing research- scales of Measurement used in Marketing research

UNIT - III

Sampling Methods - Sample size and Sampling Techniques- sampling errors- Field procedures- Planning the Data analysis- Hypothesis Testing- Simple tabulation and cross Tabulation- Chi-squared test- ANOVA and the Design of Experiments

UNIT - IV

Correlation and Regression- Explaining Association and Causation- Discriminant Analysis for Classification and prediction

UNIT - V

Factor Analysis for data Reduction- Cluster Analysis for Market segmentation- Multidimensional Scaling for Brand positioning- Conjoint analysis for product Design

TEXT BOOKS:

1. Rajendra Nargundkar: Marketing research, Text and Cases- Tata McGraw hill, 2010
2. Naresh Malhotra, Das: Marketing research: An applied Orientation- Pearson Education 2009

REFERENCE BOOKS:

1. Research for Marketing Decisions Paul E. Green, Donald S. Tull
2. Marketing Research- Text and Cases Harper W. Boyd Jr. , Ralph Westfall
3. Suja R Nair: Marketing Research, Text with cases-Himalaya Publication-2nd Revised edition 2014

SUPPLY CHAIN MANAGEMENT

Course Objective:
The objective of the course is to make the student know about the Supply Chain Mechanism, Strategies, diverse, metrics, supply chain relationships .To develop skills in managing global supply chains in the real world by correlating to the theory.

Course Objectives:

- To enable the students to gain knowledge about the concept of logistics and its importance in business environment.
- The students are able to design supply chain drivers and metrics.
- To enable the students to develop logistics and supply chain relationships.
- Hone their abilities for planning and managing inventories in supply chain.
- Able to develop skills for management of global supply chains

UNIT - I
Logistics: The logistics of Business. Objective and Importance of Supply Chain Process, Logistics and Strategies, Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, obstacles to achieving strategic fit.

UNIT - II
Supply Chain Drivers and Metrics: Drivers for Supply Chain Performance, Framework for Structuring drivers. Facilities, inventory, transportation, information, sourcing and pricing.

UNIT - III
Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operations – Mapping the supply chain processes – Supplier and distributor benchmarking – setting benchmarking priorities – identifying logistics performance indicators – e-commerce and SCM.

UNIT - IV
Planning and Managing inventories in Supply Chain: Managing Economies of Scale in Supply Chain, managing Uncertainty in a supply chain, safety inventory, determining optimal level of product inventory.

UNIT - V
Managing global logistics and global supply chains: Logistics in a global economy – global operating levels – Global supply chain business processes – Global purchasing – Global logistics – Channel in Global logistics – Issues and Challenges in Global supply chain Management.

TEXT BOOK:

1. Sunil Chopra and Peter Meindl: Supply chain management: Strategy, Planning and Operation, 3/e, Pearson Education, New Delhi 2007.

REFERENCE BOOKS:

1. Donald J. Bowersox and David J. Closs, Logistical Management: The Integrated Supply Chain Process, TMH, 2006.
2. Martin Christopher, Logistics and Supply Chain Management, Pitman, London.
3. B.S.Sahay, Supply ChainManagement for Global Competitiveness, Macmillan, New Delhi, 2003.
4. Philip B.Schary, Tage Skjott – Larsen: Managing the Global Supply Chain, Viva Mumbai, 2006.
5. Monczka: Purchasing and Supply Chain Management Thomson, 2006.

RETAILING MANGEMENT

Course Objective:
To facilitate the students about the concepts of Retailing through cases so that interested students can choose retailing as their career.

Course Outcomes: At the end of the course students should be able to understand

- Modern Retailing Concepts and will able to link it to cases to understand the present Retailing Trends.
- Shopping environment, retail formats, functions, retail operation and promotion.

UNIT - I: Introduction to Retail Management - Meaning of Retail & Retailing, History, types, functions, utilities, theories of retailing, e-tailing, structure of Indian retail industry, retailing in Asia, global retailing, retailing in Europe, service retailing, FDI retailing, Rural marketing, ethics in retailing. Case: The Classic story.(Aditya page no 283) Case: The Panwallah. (Aditya Prakash page no 287)

UNIT - II: Understanding Shoppers & Shopping - Shopping Environment, shopping in a Socio Cultural Contest, shopping process shopping behaviour, demographics of Indian shoppers, psychographic profile of Indian shoppers, lifestyle of Indian shoppers, shopping patterns in India. Case: Multinational Fast Food Chains in India. Retail Management (Suja Nair page no 474) Case: Changing Indian Consumers. (Aditya page no 258) Case: Tanishq. (Suja Nair page no 440)

UNIT - III: Delivering Value though Retail Functions - Classification of formats, ownership-based, store based, non-store based, other retail formats, Value Based Model of store format choice, attribute based model of store format choice, the competitive market place, Marketing Structure, the demand side of retailing, non price decisions, types of competition, evolution of retail competition, future changes in retail competition. Case: Nirula's. (Suja Nair Page no 448) Case: Hot Breads. (Suja Nair page no 452) Case: McDonalds India. (Suja Nair page no 459) Case: Automobile and Niche Marketing (Dr. Harjit Singh page no 417)

UNIT - IV: Pricing & Supply Chain Management - Pricing Objectives & Policies, Interactive Pricing Decisions, different Pricing Strategies, Price Adjustment Strategies. SCM- introduction, derivers of SCM, SCM & competitive advantages, types of supply chain-supply chain length, width, control of supply chain, framework of Supply Chain Management-SCM network structure, Supply Chain Business Process, SCM components, Retail Inventory Management, Retail Logistics Management, EDI in SCM. Case: Café Coffee Day. (Suja Nair page no 434) Case: Shoppers stop. (Suja Nair page no 470)

UNIT - V: Retail Buying & Managing Retail Operations-objectives of buying, organization buying, retailing buying behaviour, models of buying behaviour, buyer-responsibilities, merchandising & assortment plansmerchandise plan, merchandise plan for basic stocks retail buying groups, negotiations in retail, contract in retail, store layout & design, merchandise display-fixtures, positioning of merchandise, materials & finishes – floors, interior walls, ceilings, lightings, music, graphics-exterior signage, interior signage, layouts for e-tailers. MBA R13 55 Case: Godrej and Boyee's. (Suja Nair page no 466)

TEXT BOOK

1. Piyush Kumar Sinha, Dwarika Prasad Uniyal, Managing Retailing, 2nd Edition, Oxford, 2012.

Journals : Indian Journal of Marketing, MICA Communications Review.

REFERENCE BOOKS:

1. Lusch, Dunne, Carver, Introduction to Retailing, 7th Edition, Cengage Learning, 2013.
2. Suja Nair, Retail Management, Himalaya Publication House, 2012.
3. Aditya Prakash Tripathi, Noopur Agrawal, Fundamentals of Retailing (text and cases), Himalaya Publication House, First Edition, 2009.
4. Swapna Pradhan, Retail Management-Text & Cases, TMH, 2013.
5. Dr. Harjit Singh, Retail Management a global perspective text and cases, S.Chand, 2011.
6. Michael levy, Barton Weits, Ajay Pundit, Retailing Management, McGraw-Hill, 2011.
7. Arif sheikh, Kaneez Fatima, Retail Management, Himalaya Publication House-2012.
8. Chetan Bajaj, Rajnish tuli, Nidhi Varma ,Srivastava, Retail Management, 2nd edition, oxford, 2012.
9. David Gilbert, Retail Marketing Management, 2nd edtion, Pearson, 2013.
10. Shridhar Bhat, Supply Chain Management, HPH, 2012
11. Amit Sinha, Supply Chain Management, TMH, 2012

CONSUMER BEHAVIOUR

Course Objective:
The course is designed to inculcate the concept of consumer behavior, decision making by consumers, behavior variables and influences on consumer behavior.

Course Outcomes:
At the end of the course students should be able to understand
- Application of consumer behaviour in marketing
- Individual and group determinants of consumer behaviour
- Environmental influences on consumer behaviour
- Consumer decision making process

UNIT - I
Introduction to Consumer Behaviour (CB):
Nature and Importance of CB, Application of CB in Marketing, Consumer Research process.
UNIT - II
Individual Determinants of CB:
Perception: process, Consumer Imagery, perceived risk, Learning: principles, theories, Personality: nature, theories, self concept, psychographic and life style, Attitude: Structural model of attitude, attitude formation & change, Motivation: needs/motives & goals, dynamic nature of motivation, Arousal of motives, theories
UNIT - III
Group Determinants of CB:
Reference group influence: types of consumer relevant groups, factors affecting group influence, application of reference group concept, Family: functions of family, family decision making, family life cycle(FLC), Opinion Leadership and Personal influence, Diffusion of Innovation: Adoption process., Diffusion process
UNIT - IV
Environmental Influences on CB:
Social class, Life style Profile of Social class, application to CB, Culture: characteristics, cross cultural understanding
UNIT - V
Consumer Decision making Process:
Problem recognition, Information Search Process and Evaluation, Purchasing process, Post purchase behaviour, Models of CB- Nicosia, Howard & Sheth, Engel-Kollat Blackwell

TEXT BOOKS:
1. chiffman L.G. and Kanuk L.L., Consumer Behaviour, 9th Edition, Prentice Hall of India, New Delhi.
2. Hawkins, D I etc. Consumer Behaviour Implications for Marketing Strategy. Texas, Business, 1995.

REFERENCES BOOKS:
1. Seth, J. N. & Mittal, B. (2nd ed., 2003). Customer Behaviour-A Managerial Perspective. Thomson South-Western.
2. Hawkins, D. I. & Roger, J. B. and Kenneth, A.C. (2001). Consumer Behaviour-Building Marketing Strategy. Irwin McGraw-Hill, New York.

TOURISM MARKETING

Course Objective:
To make students familiar with the concepts and marketing of tourism

Course Outcomes:
At the end of the course student is expected to understand

- Nature of tourism marketing
- Tourist buying process
- STP of tourism marketing
- Tourism marketing management information system
- Survey and research of trends in tourism marketing

UNIT - I
Introduction to tourism marketing, Evolution, Definition, nature, process and system services & their marketing nature, characteristics of tourism products, its issues and challenges : Marketing mix

UNIT - II
Tourism Markets: Types, world tourism markets, inbound and outbound markets for India & Domestic markets: Tourist behavior. Travel purchase and tourist buying process. Tourist discussion making models

UNIT - III
Market segmentation, Targeting and positioning. Definition of market segmentation, discussions in market segmentation, Market targeting process, product positioning – purpose, process; P's of marketing.

UNIT - IV
Marking management information system and demand forecasting Introduction, structure of marketing management, information support system, demand forecasting.

UNIT - V
Market Research: Definition, research and survey methodologies, application, technology and trends in tourism marketing, role of government bodies, national, state tourism offices, local bodies, private organizations, NGO's in tourism marking.

TEXT BOOKS:
1. Kotler P. Marketing Management C. Delhi – Prentice Hall India 1986
2. Katler Philip – Marketing for non-profit organization – Prentice Hall, New Jersey 1975

REFERENCE BOOKS:
3. Jha S.M. – Tourism Marketing (Bombay – Himalaya)
4. Gavens: Marketing Management (Delhi – Himalaya)
5. Holloway I.C. and Plant R.V. (1992) Marketing for Tourism Pitman.
6. Limsden: Les (1992) Marketing for Tourism case study assignments Macmillan
7. Hoyk Darb and Jones (1995) Managing Conventions, Group Business – Educational Institute of AATM.
8. Chaudhary Manjula, 2010, Oxford University Press, New Delhi, Tourism Marketing
9. Philip Kotler, John Bowen, James Makens, Marketing for Hospitality and Tourism

III Semester Electives - Finance

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Course Objective:

This course provides a broad overview of investment management, focusing on the application of finance theory to the issue faced by portfolio managers and investors in general and To provide conceptual foundation for the purpose of undertaking Investment analysis for securities as well as portfolios.

Course Outcomes:

At the end of this course students should be able to:

- To provide a theoretical and practical background in the field of investments.
- Designing and managing the bond as well as equity portfolios in the real word.
- Valuing equity and debt instruments.
- Measuring the portfolio performances.

UNIT - I

The Investment Environment, Financial Instruments, Markets for investments and Trading.

UNIT - II

Risk and Return, organization and function of Equity and Debt Markets.Efficient markets: concepts and forms of market efficiency, Testing market efficiency. Valuation of equity shares, Economic analysis, Industry Analysis, company Analysis,Technical Analysis.

UNIT - III

Introduction to portfolio management, Markowitz portfolio theory, capital market theory, Arbitrage pricing theory, Multy factor pricing theory, Markowitz optimun portfolio selection model.

UNIT - IV

Equity portfilio management strategies, intriduction to Bond Analysis, Bond pricing and yield, Interest rate determination and structure, Bond price volatility, Bond portfolio management strategies.

UNIT - V

Introduction to derivatives, Futures and option pricing, Equity portfolio performance , portfolio performance evaluation.

TEXT BOOKS:

1. Investments by Bodie, Kane, Marcus and Mohanty,8edition(BKMM), Mcgraw Hill.
2. Investment Analysis and Portfolio Management by Prasanna Chandra, Tata McGraw Hill.

REFERENCE BOOKS:

1. Business Analysis and Valuation using financial statements by Palepu, Healy and Bernard (PHB), 3rd edition, Cengage Learning.
2. Chapters of book: Corporate Finance by Ross, Westerfield, Jaffe and Kakani, 8th Edition, Tata Mcgraw Hill
3. Security Analysis and Portfolio Management by Fisher and Jordan, Prentice Hall India.
4. Damodaran on Valuation(AD)-Security Analysis for Investment and Corporate Finance, 2nd edition, Wiley.
5. Investment Analysis and Portfolio Management by Railley and Brown, Cengage.

INTERNATIONAL FINANCIAL MANAGEMENT

Course Objectives:
The objective of the course is to provide the students with an understanding of financial markets, major institutions involved, the framework for these institutions etc. The prerequisite for the course is financial accounting and analysis and financial management.

Course Outcomes:
By end of this course it is expected that the student will be able to:

- Understand an overview of international financial management, components of BOP
- Understand the Evolution of International Monetary system.
- Know the structure of Foreign Exchange market and how to calculate spread.
- Understand the Relationship between Inflation, Interest rates and Exchange rates.
- Understand the FDI and trade finance methods.

UNIT - I
International Financial Management: An overview of IFM, International Flow of Funds -Balance of Payments (BOP), Fundamentals of BOP, Accounting components of BOP, Factors affecting International Trade flows, Agencies that facilitate International flows, Theories of International business.
UNIT - II
International Monetary System: Evolution, Gold standard, Bretton woods system, flexible exchange rate regime, the current exchange rate arrangements, EMU.
UNIT - III
Foreign Exchange Market: Function and Structure of the Forex markets, major participants, types of transactions and settlements, FE Quotations, Speculation in forward markets
UNIT - IV
Exchange Rates: Measuring exchange rate movements, Factors influencing exchange rates. Government influence on exchange rates - exchange rate systems, Relationship between inflation, interest rates and exchange rates – PPP, IFE , IRP theories.
UNIT - V
International Investments: Foreign Direct Investment, International Capital Budgeting, International Capital structure and cost of capital..Payment methods of international trade, Trade finance methods.

TEXT BOOKS:

1. Jeff Madura, International Financial Management, 6th edition, Thomson Publications.
2. P.G.Apte, International Financial Management, Tata McGraw-Hill, New Delhi, 2004

REFERENCE BOOKS:

1. Maurice D.Levi, International Finance, 3rd edition, Tata Mc Graw-Hill, New Delhi, 2003.
2. S.Eun Choel and Risnick Bruce, International Financial Management, Tata Mc Graw Hill,2001.
3. David K. Eiteman, Arthur I.Stonehill and Michael H.Moffeth, Multinational BusinessFinance, 10th edition, Pearson Education 2004.
4. P.K Jain, Josette Peyrard and Surendra S. Yadav, International Financial Management,Macmillan Publishers, 2001.

BANKING AND FINANCIAL SERVICES

Course Objective:
Providing an in-depth analysis of the banking and financial services in the liberalized Indian economy. Equipping the students with the tools used in interpreting and evaluating performance, productivity and efficiency of the banking organizations

Course Outcomes:
At the end of the course students should be able to understand
- Nature of the commercial banking and financial services.
- Ascertain the measures of bank return and risk performance and retail banking services.
- Learn the role and functions of banks and Non-banking financial companies
- Technology and CRM practices in Banks

UNIT - I
Banking and Financial Services-Indian Financial System- Indian Banking System-Banking Structure in India-Banking companies regulation-Evaluation of the Banking System and Future Trends and reforms
UNIT - II
Credit and Risk Management in Banks: Introduction-Credit lending process-Application screening process-types of risks-Credit risk assessment-Sanction and disbursement process-Monitoring repayment process
UNIT - III
Retail Banking Services-Retail banking services-retail bank lending-types of loans-home loans-personal loans-car loans-commercial loans-process of retail loans-recovery process-strategies
UNIT - IV
Non-Banking Financial Companies-Structure and role of NBFCs-Functions-lending process-recovery mechanism-Challenges and future prospectus
UNIT - V
Technology and CRM Practices in Banks- Customer relationship management-role and impact of CRM-stages in CRM process-technology for retail banking

TEXT BOOKS:

1. Management of Banking and Financial Services, 2nd Edition,by Padmalatha Suresh, Justin Paul, Publisher: Pearson Education India,
2. Koch, Timothy W. and S. MacDonald, Bank Management, 5th Edition, The Dryden Press, New York, NY, 1999.

REFERENCE BOOKS:

1. K.P.M. Sundharam, Money, Banking & International Trade -Sulltan Chand & Sons -New Delhi.
2. Srivastava, Divya Nigam, Management of Indian Financial Institutions,Himalaya Publishing House.
3. M. Y. Khan,Indian Financial System, Tata McGraw Hill.

FINANCIAL MARKETS AND INSTITUTIONS

Course Objective:
This course is intended to help you understand the role of financial institutions and markets play in the business environment. To acquire the skills necessary to manage a financial firm, to describe and apply financial concepts, theories, and tools, and to evaluate the role of technology and the legal, ethical and economic environment as it relates to financial institutions

Course Outcomes:
At the end of this course students should be able to

- To enable the students to understand the flow of funds from savers to investors, thereby promoting economic efficiency.
- To provide knowledge on Market activity and its effects on personal wealth, the behavior of business firms, and economy as a whole
- Explain domestic financial markets and institutions and how firms obtain funds in the financial markets and at what cost.

UNIT - I
Role of Financial Markets and Institutions-Overview of Financial Markets, Securities Traded in Financial Markets, Financial Market Regulation, Financial Market Globalization, Role of Financial Institutions in Financial Markets,

UNIT - II
Financial markets- Structure, Participants, Trend - Role of central bank and commercial banks- Capital market- Instruments, Players, trading - Primary and secondary market - Role of stock exchanges and stock indices.

UNIT - III
Fixed Income securities market - Structure and trends - G-sec market - Call Money Market, TB Market, Repo and CBLO, Bonds market, Trading in G-sec market-Interest rate - theories, determinants, dynamics of short term and long term rates.

UNIT - IV
Financial Institutions- Types of financial institutions-Depository institutions-Commercial banks-Intermediation-Customization of loans

UNIT - V
Financial Regulation-Banking Industry: Structure and Competition-The Mutual Fund Industry-Insurance Companies and Pension Funds-Investment Banks, Security Brokers and Dealers, and Venture Capital Firms

TEXT BOOKS:

1. Pathak, Bharati V., Indian Financial System: Markets, Institutions and Services, Pearson education (Singapore), New Delhi, Second edition, 2008.
2. Saunders, Anthonu and Cornett, Marcia Millon, Financial markets and Institutions: An Introduction to the risk management approach, McGrawHill, Irwin, New York,2007.

REFERENCE BOOKS:

1. Bhole, L.M. , Financial institutions and Markets: Structure, Growth and Innovations, McGrawHill, New Delhi, Fourth edition, 2008.
2. Fabozzi, Frank J. and Modigliani, Franco, Capital Markets: Institutions and Markets, Prentice Hall of India, New Delhi, Third edition, 2005.

PROJECT FINANCE

Course Objective:
To create an understanding about the Projects and the process, criteria and the appraisal methodology for projects.

Course Outcomes:
- To prepare and understand the concepts of project feasibility reports.
- To have a clear understanding of project financing techniques.
- Long term financing and control

UNIT - I
Introduction to Projects
Concepts of project, Importance and characteristics, Types of project, Phase of a Project & Project Life Cycle, Project identification and analysis, Ideas generation and screening.
UNIT - II
Project Appraisal
Project appraisal, techniques of project appraisal, Identifying risk, developing an appraisal process, Appraisal procedure of financial institutions in India.
UNIT - III Appraisal Measures
Appraisal measures, Meaning and use of appraisal measures, identifying the most appropriate measure for business payback, Discounted cash flow measures-NPV and IRR and other measures.
UNIT - IV Cost Benefit Analysis
Cost benefit analysis, Concept of uniform annual equivalent, Determination of economic life, Inflation and its impact on projects, Social cost benefit analysis (SCBA) different methods.
UNIT - V Financing and Control
Long term financing, Searching of finances and their appropriate mix, Loan Syndication, Consortium financing, Project monitoring and control, Control techniques, Concept of time and cost overrun.

TEXT BOOKS:
1. Prasanna Chandra: Project Planning, Analysis, Selection and Implementation.
2. Chaudhary S, Project Management.

REFERENCE BOOKS:
1. Harold Karzner, Project Management.
2. Joy P.K., Total Project Management
3. Meredith, Projects.

III Semester Electives - HR

INDUSTRIAL RELATIONS AND LABOUR LAWS

Course Objective:

The objective of the course is to enable students to have an insight into the relations between various sectors that have a bearing on management of industrial relations. The pre-requisite for this course is Human Resource Management offered in 2nd Semester.

Course Outcomes:

- Gain knowledge of the Industrial relations in the organization and its importance.
- Understand the reasons of industrial Conflicts and Disputes and the settlement procedure.
- Understand the origin and growth of Trade Unions in India and their role in the growth of the Country's economy.
- Gain knowledge of the labour legislations in India.
- Understand the different acts related to the wages and bonus of the employees.

UNIT - I

Industrial Relations: Economy and labour force in India – Approaches to IR –Employer organizations: Introduction, Origin and Growth.

Collective Bargaining: Collective Bargaining – Meaning & Definition, Levels, Process and Hindrances – Negotiating techniques and skills – Drafting of an agreement.

UNIT - II

Industrial Conflicts and Disputes: Conflicts: Introduction and Manifestation – Disputes: Introduction, Prevention and Settlement, Stages in Settlement, Effects.

UNIT – III

Trade Unions: Trade Unions: Introduction, Definition, History and evolution, Objectives, Reasons for joining Unions, Types, Structure, Growth, Theories, Problems, Recognition – Central Trade union Organizations – Trade Unions Act, 1926 – Employer Organizations.

UNIT - IV

Labour Legislation: The Factories Act, 1948 – The Industrial Disputes Act, 1948 – The Employment (Standing Orders) Act, 1946 – The Maternity Benefit Act, 1961.

UNIT - V

Wage Legislations: The Workmen's Compensation Act, 1923 – The ESI Act, 1948 – The Payment of Wages Act, 1936 – The Minimum Wages Act, 1948 – The Payment of Bonus Act, 1965 – The Payment of Gratuity Act, 1972 – The EPF Act, 1952.

TEXT BOOKS:

1. Piyali Ghosh and Shefali Nandan, "Industrial Relations and Labour Laws", I/e, McGraw Hill Education, 2015.
2. Venkataratnam C. S.: Industrial Relations, Oxford University Press, 2006

REFERENCE BOOKS:

1. Arun Monappa: Industrial Relations, TMH, New Delhi, 2003.
2. Sinha: Industrial Relations, Trade Unions and Labor Legislation, Pearson 2007.
3. P. K. Padhi: Labor and Industrial Laws, PHI, 2007.

TALENT PLANNING AND ACQUISITION

Course Objective:

The course provides an understanding of planning and acquiring organization's talent needs from a strategic perspective. The course is aimed to offer a deeper orientation of the staffing function of human resources that would enable the learner to perform the talent acquisition function confidently.

Course Outcomes:

By the end of the course the learners are expected to

- Gain conceptual knowledge and operational understanding of all the key aspects of staffing function including human resource planning, job analysis, recruitment and selection.
- Understand the role of human resource planning in creating effective organizations
- Get acquainted with techniques necessary for successful strategic human resource planning.
- Develop the skills to design and implement effective recruitment and selection processes and critically evaluate existing processes.
- Become familiarized with the latest trends and best practices in talent acquisition.

UNIT – I

Defining Strategic Staffing, Components, Goals, Integrating functional areas of HRM- Business and Staffing strategies: Resource Based View, Firm's Business Strategy, Firm's Talent Philosophy – Deriving the firms staffing strategy, The Firm's Strategic Staffing Decisions –Legal Context: Types of Employment Relationships, EEO, Affirmative Action, Bases for Employment Law Suits

UNIT - II

Job Analysis: Methods, Planning Job Analysis - Conducting Job Analysis, Developing Job Descriptions and Person Specifications – Workforce Planning Process, Forecasting the Firm's Labor Demand and Labor Supply- Qualitative and Quantitative Forecasting Methods & Techniques - Resolving the gaps between Firm's Labor supply and demand, staffing planning

UNIT - III

Recruiting: Effective recruiters, Training and Developing Recruiters- Recruiting Metrics, Developing Applicant Attraction Strategies – Measurement, Describing and Interpreting Data, Using Data Strategically – Characteristics of using successful measures, Creating and validating assessment systems – External Assessment Methods – Internal Assessment Methods.

UNIT - IV

Latest trends in Recruitment: e-recruitment, Social media recruitment, Recruitment management, mobile/video recruitment, Innovative recruitment practices – Selection tools and Techniques, Predictors of Job Performance- Testing: Types of Tests, The Selection Interview: Process, Conduct, Types, Pitfalls - Choosing Candidates, Job Offer Strategies

UNIT - V

The Employment Contract, Presenting a job offer, Negotiating, Closing the Deal – Orienting and Socializing New Employees – Managing the Flow of Workforce – Involuntary Employee Separations – Staffing Outcomes, Evaluating Staffing Systems – Technology and Staffing Evaluation

TEXT BOOKS:

1. Jean M. Phillips, Stanley M. Gully, Strategic Staffing, Pearson
2. Belcourt.M., Mc Bey K.J., Strategic Human Resource Planning, Cengage Learning.

REFERENCE BOOKS:

4. D K Bhattacharya, Human Resource Planning, Excel Books.
5. Armstrong, Taylor: Armstrong's Handbook of Human Resource Management Practice, 13/e, Kogan Page, 2014.

LEARNING AND DEVELOPMENT

Course Objective:
The course provides an understanding of planning and acquiring organization's talent needs from a strategic perspective. The course is aimed to offer a deeper orientation of the staffing function of human resources that would enable the learner to perform the talent acquisition function confidently.

Course Outcomes:
By the end of the course the learners are expected to
- Understand the Training Environment in organizations and the different models of Training
- Conduct needs assessment for training programs
- Design and execute effective training programs for employees using contemporary methods
- Evaluate the training process and measure the outcomes
- Appraise and make use of technology to enhance learning in organizational training context

UNIT - I
Introduction to Employee Training & Development: Training, Designing Effective Training – The Forces influencing working and Learning – Snapshot of Training Practices - The Strategic Training& Development Process - Organizational Characteristics that Influence Training –Training Needs in Different Strategies, Models of Organizing the Training Department – Outsourcing Training.
UNIT- II
Designing Training: Learning - Meaning, Theories – Learning Process- Training Needs Assessment: Why, Who, Methods – Needs Assessment Process –Competency Models, Scope of Needs Assessment – Considerations in Designing Effective Training Programmes.
UNIT- III
Transfer of Training: Introduction, Training Design – Work Environment Characteristics that influence transfer – Organizational Environments that Encourage Transfer – Traditional Training Methods: Presentation methods - Hands-on Methods - Group-building Methods – Choosing a Training Method.
UNIT- IV
Training Evaluation: Evaluation - Introduction, Reasons – Overview of Evaluation process– Outcomes used in Evaluation, determining whether outcomes are good – Evaluation Practices, Designs - Determining Return on Investment - Measuring Human Capital and Training Activity
UNIT – V
Employee Development: Employee Development, Approaches – Development Planning Process-Company Strategies, E-Learning and Development- E-Learning Technologies: Technology and Multimedia, Computer Based Training – Developing Online Learning, Blended Learning, Simulations, Mobile Technologies –Technologies for Training Support and Administration – Learning Management Systems – Special Issues in Training and Development

TEXT BOOKS:
1. Noe Raymond, Employee Training & Development,6e, Tata McGraw-Hill Education.
2. Pandu Naik.G., Training & Development, Excel Books India, 2009, ISBN - 8174465650, 9788174465658.

REFERENCE BOOKS:
1. Blanchard & Thacker, Effective Training, 5e, Prentice Hall
2. Harward, Taylor & Hall, What Makes a Great Training Organization?: A Handbook of Best Practices, 1/E, Pearson
3. Anjali Ghanekar, Essentials of Training & Development, 1E, Everest Publishing House, Pune, 2009, ISBN 8176601594

TALENT MANAGEMENT & SUCCESSION PLANNING

Course Objective:
To enable the students realize the challenges of acquisition and retention of talents for the competitive advantage of the organization and to make them ready to develop a diagnostic and practical perspective of management of talent in organizations.

Course Outcomes:
- To identify what drives the need for talent management in organizations today.
- To strategically manage the talent and performance in organizations.
- To implement proven strategies, tools, and processes to help manage talent and performance.
- To discover how to focus people more effectively on their performance by examining each phase of the performance management process.

UNIT - I
Talent Management: Introduction Talent Management - Meaning and significance of talent management - Aligning HRM goals to business, attracting talent, retaining talent - becoming the best employer by employer branding activities - inculcating performance culture, right sizing the workforce - work life balance initiatives - providing HR leadership to business.

UNIT - II
Competency Mapping: Competency Mapping - Features of competency methods, historical development, definitions - approaches to mapping and case studies in competency mapping - Competency mapping procedures and steps- tools for data collection, data analysis - validating the competency models,
Methods of Data Collection for Mapping: Observation, repertory grid, critical incidence technique - expert panels, surveys, automated expert system - job task analysis, behavioural event interview. - Developing competency models from raw data - data recording, analyzing the data.

UNIT - III
Employee Engagement: Employee engagement - meaning and significance - constituents of engagement, conceptual framework of engagement - behaviors associated with engaged employees, engaged, not engaged, actively disengaged - parameters to measure employee engagement - Q 12 model of Gallup, employee satisfaction survey.

UNIT - IV
Succession planning: Introduction, objectives, significance, process. Identifying managerial positions which are critical for the business. - Identifying second line of leaders and developing their capabilities to occupy the critical positions in the event of the exit of current incumbents - Taking up lateral hiring when there is discontinuity in the succession plans.

UNIT - V
Career Planning:
Career planning: Introduction, objectives, steps involved in career planning, Creating career growth opportunity. Mentoring employees for growth - Providing developmental job assignments, providing resources of learning and development opportunities - vertical promotions and horizontal postings to promote career progression - psychological contract and career anchors. *{T:1,2}*

TEXT BOOKS:

1. Lance Berger, Dorothy Berger, Talent Management Handbook, McGraw Hill Professional, 2003, ISBN - 007143612X, 9780071436120.
2. Lyle M. Spencer, Phd Signe M. Spencer, Competence At Work Models For Superior Performance, John Wiley & Sons, 2008, ISBN - 812651633X, 9788126516339.
3. Sanghi, Seema, The Handbook of Competency Mapping, SAGE(Response Books), New Delhi, 2004, ISBN - 076199842X, 9780761998426.

REFERENCE BOOKS:

1. Chowdhary, Subir, The Talent Era, Financial Times/Prentice Hall International.
2. Chowdhary, Subir, Organization 2IC**,** Pearson Education, New Delhi.

INDUSTRIAL AND ORGANIZATIONAL PSYCHOLOGY

Course Objective:

To enable the students to understand the psychology of people in the workplace and the following are the outcomes of the course.

Course Outcomes:

By the end of the course the learners are expected to

- Understand Historical background and future prospects of Industrial and organizational Psychology.
- Identify how to develop the process and methods of personnel selection.
- How to implement different approaches to motivation employees.
- Understand and design basic leader skills and models of leadership.

UNIT - 1

Introduction to Industrial and Organizational Psychology: Industrial and organizational Psychology: Meaning, subject matter and functions of Industrial and organizational Psychology, Development of Industrial and organizational Psychology, Industrial and organizational Psychology NOW, Future of Industrial and organizational Psychology, Industrial and organizational psychology in the Indian context

UNIT - II

Personnel Selection: Determining job requirements: Uses and types of job information, and job analysis, Recruiting job applicants: Recruitment techniques, Personal history assessment: Standard application blanks, bio data items, resume and letter of reference, Assessment of current behavior: Interviews, psychological testing and assessment centers

UNIT - III

Evaluating Job Performance: Uses of performance evaluation: Downsizing, fair employment, employment-at-will and seniority, Sources of evaluation: The evaluator and performance information, Appraisal rating systems: Graphic rating scales and rating errors, Non-rating evaluation methods: Checklists and comparison methods

UNIT - IV

Job Satisfaction: Job satisfaction as a job attitude, Components of job satisfaction: Satisfaction with work, with pay and with supervision, measuring job satisfaction: Job Descriptive Index, Minnesota Satisfaction, Questionnaire, Need Satisfaction Questionnaire, Faces Scale, Relationship of job satisfaction to productivity and withdrawal behavior.

UNIT - V

Motivation and Leadership: Motivation: Work Motivation, Need theories: McClelland, Herzberg, Cognitive theories: Goal Setting Theory, Self Efficacy Theory, Using motivation theory at work

Leadership: Meaning, nature and styles, Approaches to leadership: Human Relations, Theory X & Theory Y, Fiedler's Contingency Model, Specific leader skills - Leadership through power, Leadership through vision: Transactional and Transformational, Leadership through persuasion

TEXT BOOKS:

1. Berry, L.M. (1998), reprint 2010. Psychology at work: An introduction to Industrial and Organizational Psychology. N.Y.: McGraw-Hill International Editions.
2. Aamodt, M.G. (2007). Industrial and organizational psychology: An applied approach. US: Thomson & Wadsworth.
3. Schultz, D. and Schultz, S. E. (2006). Psychology and work today. 8th ed. N.D.: Pearson Edu.
4. Robbins, S.P.; Judge, T.A.; and Sanghi, A. (2009). Organizational behaviour. : Pearson Prentice Hall.

REFERENCE BOOKS:

1. McShane, et al. (2006). 1st reprint. Organizational behaviour. N.D.: Tata McGraw-Hill
2. Miner, J.B. (1992). Industrial-Organizational Psychology. N.Y.: McGraw-Hill
3. Pandit, R., Kulkarni, A.V. & Gore, C. (1999). Manasashastra: Audyogikaani vyavasayik upayojan. Nagpur: Pimpalapure & Co.
4. Luthans, F. (1995). Organizational behavior (7th ed). New York: McGraw- Hill, inc.
5. Robbins, S.P. & Sanghi, S. (2007). Organizational behavior (11th ed.). New Delhi: Pearson Education.

III Semester Electives - Operations & Business Analytics

SERVICE MANAGEMENT

Course Objective:

The objective of this course is to enable the students to gain knowledge about the service management. This course will develop skills of students in the area of designing the service enterprises, managing service operations, developing quantitative models and managing inventory and quality; to acquaint the students about various issues of service Operations management.

Course Outcomes:

At the end of the course the student will be able to

- Understand concepts; develop skills in the area of Operations management and Design of service enterprises
- Able to develop strategies and supply relationships for effective management of services.
- Hone their abilities for developing quantitative models for service management
- Hone their abilities to build the projecting and implement the project systematically
- Able to develop skills for management of inventory and service quality.

UNIT - I: Understanding Services: The concept of service operations, Role of Services in an Economy, States of Economic Development, Nature of the Service Sector, Sources of Services Sector Growth, Distinctive Characteristics of Service Operations, Classifying Services for Strategic Insights, An Open-Systems View of Services, The strategic Service Vision, Understanding the Competitive Environment of Service, Competitive Service Strategies, Strategic Analysis, Winning Customers in the Marketplace, The Competitive Role of Information in Services, the virtual value chain, Stages in Service Firm Competitiveness, service operations management practices and Service Benchmark.

UNIT - II: Designing the Service Enterprise: Innovation in Services, New service Development, Service Design Elements, Strategic Positioning through process structure, Service Blueprinting, Taxonomy for Service Process Design, Generic Approaches to Service System Design, Generic Approaches to Service System Design, Intellectual Property, Technology in the Service Encounter, The Emergence of Self-Service, Automation in Service, The Internet as Service Enabler, E-Commerce, E-Business Models, Economics of Scalability, Technological Innovation in Services.

UNIT - III: Managing Service Operations: Generic Strategies of Level Capacity, Strategies for Managing demand, Strategies for Managing Capacity, Managing waiting lines the Economics of Waiting, Queuing Systems, The Psychology of Waiting, Principles of Waiting Line Management, Essential Feature of Queuing Systems. Service Supply Relationships, Service Supply Relationships, Managing Service Relationships, Professional Service Firms, Outsourcing services, Globalization of Services, Domestic Growth and Expansion Strategies, Franchising, Globalization of Services, Global Service Strategies

UNIT - IV: Quantitative Models for Service Management and demand forecasting: Capacity Planning and Queuing Models, Analytical Queuing Models, Capacity Planning Criteria, Average Customer Waiting Time, Probability of Excessive Waiting, Minimizing the sum of Customers Waiting Costs and Service Costs, Probability of Sales Lost Because of Inadequate Waiting Area. **Forecasting Demand** for Services The Choice of Forecasting Method, Subjective Models, Causal Models, Time Series Models.

UNIT - V: Managing Service Inventory and Quality: Inventory Theory, Order Quantity Models, Inventory Management under Uncertainty, Inventory Control Systems, Single-Period Model for Perishable Goods, Retail Discounting Model, **Service Quality:** Concept of Service Quality, Measuring Service Quality, Quality Service by Design, Walk-Through Audit, Achieving Service Quality, Service Recovery, Stages in Quality Development.

Text Book:

1. James A. Fitzsimmons and Mona J. Fitzsimmons "Service Management" 7e, Mc Graw Hill, 2014.

REFERENCE BOOKS:

1. Metters, King-Metters, Pullman and Walton "Service Operations Management" 2e Cengage 2015
2. B.Mahadevan, "Operations Management", 2e,Pearson .

SUPPLY CHAIN MANAGEMENT

Course Objective:

The objective of the course is to make the student know about the Supply Chain Mechanism, Strategies, diverse, metrics, supply chain relationships .To develop skills in managing global supply chains in the real world by correlating to the theory.

Course Objectives:

- To enable the students to gain knowledge about the concept of logistics and its importance in business environment.
- The students are able to design supply chain drivers and metrics.
- To enable the students to develop logistics and supply chain relationships.
- Hone their abilities for planning and managing inventories in supply chain.
- Able to develop skills for management of global supply chains

UNIT - I

Logistics: The logistics of Business. Objective and Importance of Supply Chain Process, Logistics and Strategies, Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, obstacles to achieving strategic fit.

UNIT - II

Supply Chain Drivers and Metrics: Drivers for Supply Chain Performance, Framework for Structuring drivers. Facilities, inventory, transportation, information, sourcing and pricing.

UNIT - III

Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operations – Mapping the supply chain processes – Supplier and distributor benchmarking – setting benchmarking priorities – identifying logistics performance indicators – e-commerce and SCM.

UNIT - IV

Planning and Managing inventories in Supply Chain: Managing Economies of Scale in Supply Chain, managing Uncertainty in a supply chain, safety inventory, determining optimal level of product inventory.

UNIT - V

Managing global logistics and global supply chains: Logistics in a global economy – global operating levels – Global supply chain business processes – Global purchasing – Global logistics – Channel in Global logistics – Issues and Challenges in Global supply chain Management.

Text Book:

1. Sunil Chopra and Peter Meindl: Supply chain management: Strategy, Planning and Operation, 3/e, Pearson Education, New Delhi 2007.

REFERENCE BOOKS:

1. Donald J. Bowersox and David J. Closs, Logistical Management: The Integrated Supply Chain Process, TMH, 2006.
2. Martin Christopher, Logistics and Supply Chain Management, Pitman, London.
3. B.S.Sahay, Supply ChainManagement for Global Competitiveness, Macmillan, New Delhi, 2003.
4. Philip B.Schary, Tage Skjott – Larsen: Managing the Global Supply Chain, Viva Mumbai, 2006.
5. Monczka: Purchasing and Supply Chain Management Thomson, 2006.

ESSENTIALS OF BUSINESS ANALYTICS

Course Objective

This course provides students the fundamental concepts and knowledge needed to understand the emerging role of business analytics in organizations and enable students how to apply essential tools in a spreadsheet environment. Emphasis is on business applications, concept development and effective interpretation of models and results, rather than theory and calculations. Students use a computer software package for data analysis.

Course Outcomes:

At the end of the course the student is expected to

- Understand the overview of business analytics
- Understand the models for summarizing, visualizing, and understanding useful information from historical data.
- Understand an overview of decision analysis approaches for incorporating a decision maker's view about risk into decision making.

UNIT - I

Introduction: Decision making, Business analytics defined, a cauterization of analytical methods and models: Descriptive analysis, predictive analysis, prescriptive analysis, big data. Business analytics in practice: Financial analytics, Human resource analytics, marketing analytics, supply chain analytics.

UNIT - II

Descriptive statistics

Overview of using data: definitions and goals, types of data, modifying data in excel, modifying data in excel, creating distributions from data, measures of location, measures of variability, analyzing distributions, measures of association between two variables.

UNIT - III

Data visualization:

Overview of data visualization, tables, charts, advanced data visualization, data dashboards.

UNIT - IV

Linear regression: The simple liner regression model, least square method, assessing the fit of the linear regression model, the multiple regression model, inference and regression, categorical independent variables, modelling non-linear relationships.

UNIT - V

Decision analysis: Problem formulation, Decision analysis without probabilities: Optimistic approach, conservative approach, minimax regret approach. Decision analysis with probabilities: decision analysis with sample information:

Text book:

1. Essentials of Business Analytics, 1st EditionJeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, Dennis J. Sweeney, Thomas A. Williams.Cengage learning.

REFERENCE BOOKS:

1. Business Analytics data analysis and decision making Albright,Winston, edition CENGAGE Learning.
2. Statistics for Managers using Microsoft Excel, David M.Levine, David F.Stephan, KathryanA.Sizabat, 7th edition, PHI.
3. Glyn Davis and BrankoPecar (2013), "Business Statistics using Excel", Oxford University Press, New Delhi.

TECHNOLOGY MANAGEMENT

Course Objective:
To understand the technology growth, changes, forecasting techniques, Assessment and competitiveness.

Course Outcomes:
To adopt recent technological changes, Assess alternatives and Compete in Industry.

UNIT - I
Introduction to Technology Management: Concept and Meaning of Technology and Technology Management- Technology; Technology management, Evolution and Growth of Technology, Role and Significance of Technology Management, Impact of Technology on Society and Business- Technology and competition; Key issues in managing technological innovation, Forms of Technology- Process technology; Product technology

UNIT - II
Technology Acquisition: Technology Acquisition, Alternatives for Acquiring New Technologies, Reasons Compelling a Company for Obtaining a New Technology, Management of Acquired Technology, Measures of Scale and Mechanisms for Acquiring Technologies- Economy of scale or Scale economy; Levels of scale; The measurement of scale; Factors affecting the choice of scale

UNIT - III
Technology Forecasting: Concept of Technology Forecasting- Characteristics of technology forecasting ; Technology forecast method; Principles of technology forecasting, Technology Forecasting Process, Need and Role of Technology Forecasting, Forecasting Methods and Techniques, Planning and Forecasting

UNIT - IV
Technology Strategy and Competitiveness: Technology Strategy-Technology strategy and management; Elements of an accessible technology strategy, Innovation Management, Competitive Advantage- Components of competitive advantage; Creating competitive advantage using value chain, Technology Management Evaluation or Assessment

UNIT - V
Product Technology: Product Development, Role of Government in Technology Management, Technology Development and Competition, Managing Research & Development (R & D), Intellectual Property Management

TEXT BOOKS:
1. White/Bruton, The Mangagement of Technology and Innovation: A strategic approach, Cegage learning, Ist,Edition 2010
2. Tarek M. Khalil, Management of Technology, McGraw Hill, 2015

REFERENCE BOOKS:
1. Robert Szakonyl, Handbook of Technology Management, Viva Books Private Limited, 2015
2. Gerard H. Gaynor, Handbook of Technology Management, McGraw Hill, 2015.
3. Betz, Frederic, Strategic Technology Management, New Delhi, McGraw Hill, 2015
4. Neelakantam Tatikonda, Management of Technology, Excel Publishers, New Delhi,2010

OPERATIONS STRATEGY

Course Objective:

The objective of this course is to enable the students to gain knowledge about the Operations Strategies. This course will develop skills of students in the area of designing the operations management, capacity and process technology strategies, developing purchasing and supply strategies, strategies for improvement of operations. To acquaint the students about the process of operations strategies.

Course Outcomes:

At the end of the course the student will be able to

- Understand concepts; develop skills in the area of Operations strategy design and process.
- Able to develop strategies for substitutes and capacity.
- Hone their abilities for developing purchasing, supply and process technology strategies.
- Hone their abilities to build the skills for product and service improvement strategies.
- Able to develop skills for designing the process for operations strategies.

UNIT - I

Operation strategy:

Concept of operation strategy, operation strategy Vs management, operation strategy matrix, operation strategy process, Generic performance of objectives, targeting and operations focus,

UNIT - II

Substitutes for strategy and capacity

TQM, lean operations, business process reengineering (BPR), six sigma, capacity strategy, overall level of operations capacity, capacity change

UNIT - III

Purchasing, supply and process technology strategies

Strategies of purchasing and supplies, vertical integration decisions, contracting and relationship, supply network dynamics, managing supplier overtime, purchasing and supply chain risk, process technology strategies, product and process matrix, evolution of process technology

UNIT - IV

Improvement strategies, process and service development

Operations improvement, setting the direction, performance mapping importance, developing operations capabilities, deploying capabilities in the market.

Product and service development process, market requirement perspective, operations resources perspective.

UNIT - V

Process of operation strategies

Formulation and implementation: formulating operation strategy and role alignment, analysis needed for formulation, challenges and implementation of operation strategies.

Monitoring and control process, strategic monitoring vs control, strategic objectives tracking process, control of risk, learning contribution to strategic control.

Text Book:

1. Nigel Slack and Michael Lewis "Operations Strategy", 4e, Pearson.

REFERENCE BOOKS:

1. Jan A. Van Mieghem and Gad Allon "Operation Strategy Principles and Practices", 2e Printice Hall 2015.
2. Robert Hayes and Gary Pisona "Operation Strategy and Technology", Wiley India, New Delhi 2001.

II MBA II Semester

INTERNATIONAL BUSINESS

Course Objective:

The purpose of this paper is to enable the students learn nature, scope and structure of International Business, and understand the influence of various environmental factors on international business operations and acquainting the students with the structure and policy framework of India's foreign trade.

Course Outcomes:

At the end of the course students should be able to understand

- Nature and scope of International business and environmental factors influencing international business
- Global trading environment and institutions aid global trading
- Role of Technology in global business and International logistics
- Indian foreign trade policy in conjunction with global trade and legal framework
- Export and import procedures, promotions and policies

UNIT - I

Introduction to International Business: Importance nature and scope of International business; modes of entry and Theories of International Business; Framework for analyzing international business environment – Political, Economical, Social, Technological, Environmental and Legal environments and their impact on international business decisions.

UNIT - II

Global Trading Environment: World trade in goods and services – Major trends and developments; World trade and protectionism – Tariff and non-tariff barriers; International Economic Institutions and Agreements – WTO, IMF, World Bank, and other International agreements; Regional Economic Groupings in Practice- Global economic forum- BRICS - Regionalism vs. multilateralism, Structure and functioning of EC and NAFTA; Other Regional economic cooperation's

UNIT - III

Global Technology & International Operations: Global Technological Management – Technology and Business; Issues in international technology transfers; Management of International Operations – Location of production; Management of Inventory; Sourcing of Inputs ; International Logistics.

UNIT - IV

Indian Foreign Trade Policy: India's Foreign Trade – Trends and developments; Commodity composition and direction, India's foreign trade in global context. Recent Foreign Trade Policy – Legal frame work; Special Focus Initiatives.

UNIT - V

Export and Import Procedures & Promotions: Export and Import Procedures; Import Substitution and Export Promotion Policies – Export Incentives –duty exemption schemes, EPCG, duty draw backs; Role of commercial banks in foreign trade; EXIM Banks; Export credit insurance and ECGC. Infrastructure Support for Export Promotion – EPC; STO; EPZ/SEZ; EOUs; Foreign Investment Policy – Indians Joint ventures abroad, Multilateralism and Bilateralism in India's foreign trade.

TEXT BOOKS:

1. Aswathappa, 5e, International Business, TMH
2. P.Subba Rao, 3e, International Business, HPH

REFERENCE BOOKS:

1. John Daniels • Lee Radebaugh • Daniel Sullivan, International Business
2. Economic Survey, Govt. of India.
3. Export-import Policy and Other Documents, Govt. Of India.

IV Semester Electives - Marketing

INNOVATION AND PRODUCT DEVELOPMENT

Course Objective:

The objective of this course is to enable the students to gain knowledge about the Innovation and New Product Development. This course will develop skills of the students in the area of Innovation Management and Design of Innovation Process, Strategic alliances, New product and package development. To acquaint the students about various issues of new service innovation, market research and its influence on new product development.

Course Outcomes:

At the end of the course the student will be able to

- Understand concepts; develop skills in the area of innovation management.
- Able to develop strategic alliances and networks for innovation.
- Hone their abilities for development of new products.
- Hone their abilities for the development of new packaging for the products.
- Able to develop skills for new service innovation and market research for new products.

UNIT - I

Innovation Management: Introduction, importance and need of innovation, popular view of innovation, models of innovation, innovation as a management process, the role of state in innovation and the market, innovation diffusion theories.

Managing innovation with in firms: Managing uncertainty, organizational characteristics that facilitate the innovation process, role of individual in the innovation process, IT systems and their impact on innovation.

UNIT - II

Innovation and Operations Management: Design of innovation, innovation in the management of operations process, technology trajectories knowledge base of an organization, learning organization, degree of innovativeness, technology strategy.

Strategic alliances and networks: forms of strategic alliances, open innovation, technology transfer and models of technology transfer.

UNIT - III

New product development.

Product Strategy: New product plan, product strategy, differentials and positioning, competing with other products, new products and property, considerations when developing a new product development (NPD) strategy. NPD strategy for growth, over of NPD theories. Models of new product development.

UNIT - IV

Packaging and Product Development: Basic principles of packaging, characteristic of package, product rejuvenation, new product opportunities through packaging, product and packing size variation, packaging system and retailer acceptance.

UNIT - V

New Service Innovation and Market Research: New service innovation and market research and its influence on a new product development, different types of services, characteristics of a services, classification of service innovations, new service development models, service innovation and the consumer.

Market Research and New Product Development: Testing new products, techniques of testing new products, technology intensive products, new products as projects, NPD across different industries.

Text Book:

1. Paul Trout "Innovation and New Product Development", Pearson Pub.

REFERENCE BOOKS:

1. Karl Ulrich, Steven and Anitha Goel "Product Design and Development", MHE.
2. CK Prahalad and MS Kisan "The New Age of Innovation", MHE.
3. Dariun Rafinejod "Innovation, Product Development and Commercialization", Cengage.

ADVERTISING AND BRAND MANAGEMENT

Course Objective:
To enlighten the students with the Concepts and Practical applications of advertising and brand management in promoting goods and services

Course Outcomes
At the end of the course the student is expected to understand

- Importance of advertising in promoting goods and services.
- Developing media strategy.
- Advertising Budget and evaluating advertising effectiveness.
- Brand Building and Positioning, measuring Brand Performance.

UNIT - I
Role of Advertising in Promotional Mix – Introduction to Advertising – Advertising and Communication – Integrated Marketing (IMC) – Challenges and Opportunities in Advertising – Economic, Social and Ethical Aspects of Advertising.

UNIT - II
Audience Analysis in Advertising – Media Planning – Media Mix Decisions – Developing Media Strategy – Creative Strategy and Copy Writing – Different Types of Appeals – Layout Design.

UNIT - III
Advertising Budgets – Methods of Formulating Advertising Budgets – Evaluating of Advertising Effectiveness – Advertising Agencies.

UNIT - IV
Direct Response Advertising – Home Shopping – Direct Mail – Catalogs – Telemarketing – Internet Advertising – International Advertising – Impact of Culture – Customs – Law and Regulations.

UNIT - V
Brand Management: Brand Building and Positioning – Measuring Brand Performance – Designing Brand Marketing Programmes – Evaluating Brand Performance – Branding in Retail Business – Role of Own Label – Emerging trends in Brand Management.

Text Books

1. William Wills, John Burnett and Sandra Mriarty – Advertising Principles and Practice – Pearson, ND.
2. YLR Murthy, Brand Management: Indian Cases . Vikas, ND.

REFERENCE BOOKS

1. John. S. Wright Wills. L.Winter, Jr. and Sherliyer K.Leigler, Advertising – Tata McGraw Hill.
2. Manendra Mohan – Advertising Management Concepts and Cases – Tata McGraw Hill.
3. Percy & Elliot – Strategic Advertising Management, Oxford University Press.
4. Chunnawala, S.A., Compendium of Brand Management, Himalaya Publications House, 2004.
5. Mathur, U.G. Brand Management – Text and Cases, Macmillan India Ltd. 2006.

SERVICES MARKETING

Course Objective:
To facilitate the students about the concepts of Services Marketing through cases.

Course Outcomes:
At the end of the course students should be able to understand

- Marketing Management of companies offering Services as product.
- Characteristics of services,
- Consumer behaviour in services, align service design and standards
- Delivering service, managing services promises.

UNIT - I: Foundations of Service Marketing: What are Services? Why Services Marketing? Role of Services in Modern Economy, Service and Technology, characteristics of services compared to goods, Services Marketing Mix, staying focusing on customer, Gaps model of Service Quality-Customer Gap, Provider Gap and Closing Gap. Case 1: The United Indian Bank (Govind Apte Page no 55-56) Case 2: Online air travel: Expedia, Orbitz and Travelocity lead the pack (John E.G.Bateson Page no 82- 83)

UNIT - II: Focus on the Consumer: Consumer behaviour in services, Consumer expectations in service, consumer perceptions of service, Understanding Consumer Requirements-listening to customers through research, building customer relationships, service recovery. Case1: The Crestwood Inn, (John E.G.Bateson Page no 320-321) Case 2: Population growth and the urban poor (Vinnie Jauhari, Kirti Dutta Page no 106-108)

UNIT - III: Aligning Service Design and Standards: Service innovation and design-challenges, types of service innovations, stages in service innovation and development, service blueprinting, high performance service innovations, new Service Development Processes, Customer defined service standards-factors, types, and development, Physical Evidence and the Services cape. Case 1: Physical evidence a case of KF. (Vinnie Jauhari Page 236-238). Case 2: IT Trainers Limited. (Govind Apte Page no 186).

UNIT - IV: Delivering and Performing Service: Employee's roles in service delivery, customer's roles in service delivery, delivering service through intermediaries and electronic channels, managing demand and capacity. Case 1: Relationship between Employee satisfaction, Customer satisfaction and market share: The case of Hewlett-Packard, (Vinnie Jauhari Page 336). Case 2: Total Assurance Ltd. (Govind Apte Page 207-208).

UNIT - V: Managing Service Promises: Integrated services marketing communications-need for coordination, five categories of strategies to match service promises with delivery, Pricing of Services-three key ways that service prices are different for customers, approaches to pricing services, pricing strategies that link to the four value definitions. Case 1: Why Differential Pricing helps the poor? (Vinnie Jauhari et al Page 336).

Text book

1. Valarie A.Zeithaml & Mary Jo-Bitner: Services Marketing – Integrating customer focus across the firm, TMH, Fifth edition, 2011.

Journals: Indian Journal of Marketing, MICA Communications Review.

References

1. John E.G.Bateson, K.Douglas Hoffman: Services Marketing, Cengage Learning, Fourth Edition, 2012.
2. R. Srinivasan, Services Marketing the Indian context, 3rd edition, PHI,2012.
3. Christoper lovelock,Jochen wirtz, Jayanta Chatterjee, Services Marketing, 7th edition Pearson 2013.
4. K.Rama Mohan Rao, Services Marketing, 2nd edition Pearson, 2011.
5. Dr. S. Shajahan, Services Marketing, 2nd edition, HPH, 2012.
6. Ramneek Kapoor, Justin Paul, Biplab Halder, Services Marketing Concepts and Practices, TMH, 2011.
7. Rajendra Nargundkar, Services Marketing, , 3rd edition, TMH,2012.
8. Gupta, Services Marketing, Everest, 2007

SALES AND DISTRIBUTION MANAGEMENT

Course Objective:
The aim of this course is to enable MBA students to understand Sales Management, Sales Process, role of distribution channels and manage channel partners. They can also emerge as good sales executives and support the organization's efforts towards business development.

Course Outcomes:
At the end of the course students should be able to understand

- Importance of Sales Management
- Sales Planning and Budgeting and characteristics of distribution channels
- Sales force management
- Managing channels

UNIT - I: Introduction to Sales Management: Evolution of Sales Management, importance of Sales Management, types of Selling, difference between Selling and Marketing, Modern Day Sales Activities, Selling Skills, Selling Strategies, Selling Process. Case: Plastic Industries, Inc., The role of Personal Selling in creating Market. (Richard R.Still page no 104,105) Case: United air flow manufacturer of household appliances sales persons job. (Richard R.Still page no 115 to 118)
UNIT - II: Sales Planning and Budgeting: Sales planning process, sales forecasting methods, sales budgeting process, methods used for deciding sales budget, types of quotas and quota setting procedure, reasons for establishing or revising sales territories, routing and scheduling sales persons, market cost analysis. Case: Augsberg Wiesel Ltd, manufacturer of table ware, establishment of sales territories (Richard R Still, Page no 603 to 605) Case: Midland office engineering, establishment of sales budgeting program, (Richard R Still, page no 588 to 589)
UNIT - III: Sales Force Management: Recruitment and selection of the sales force, training the sales force, sales force motivation, sales force compensation, sales force control and evaluation. Case: 1 Adjusting Compensation Plan to Motivate Sales Representatives (K.Sridhara Batt, page no 576 to 577) Case: 2 Sales Force Strategy at Life Insurance Corporation (K.Sridhara Batt, page no 579)
UNIT - IV: Introduction to Distribution Management Definition of Distribution Management, need for Distribution Channels, Distribution Channels for Rural Markets, designing the Marketing Channels, Motivating and Evaluating Channel Members, Capturing the Customer requirements Case: 1 Fed Ex's Value Chain Solutions, (K.Sridhara Batt page no 618 to 620) Case: 2 The National Handloom Development Corporation. (Tapan K. Panda, Sunil Sahadev page no. 504)
UNIT - V: Managing Channel Institutions Managing Channel Information Systems, Managing Retailers, Wholesalers, Franchisers, Designing Channel Systems, reasons for Channel Conflicts, Managing Conflict, Managing International Channel of Distribution, Ethical issues in Sales and Distribution Management Case: 1 Kinetic Engineering Company, Handling Channel Conflict, (Krishna K Havaldar, Vasant page no 461) Case: 2 Indian Ayurveda Pharmacy Limited, (Tapan K. Panda,Sunil Sahad page no 719) MBA R13 51

Text Book

1. Krishna K Havaldar, Vasnt M Cavale, Sales and Distribution Management, 2nd edition, TMH, 2011.

Journals: Indian Journal of Marketing, MICA Communications Review.

References

1. Tapan K. Panda, Sunil Sahadev Sales and Distribution Management ,2nd edition Oxford.
2. S.L. Gupta, M.K.Rampal , Cases in Sales and Distribution Management, HPH, 2009.
3. Dinesh kumar, Marketing Channels ,Oxford ,2012
4. Richard R Still, Edward W Cundiff, Norman A P Govoni, Sales and Distribution Management, 5 th edition, Pearson, 2011.
5. Anne T Coughlan, Erin Anderson, Louis W Stern, Adel I Ei Ansary, R.C.Natarajan, Marketing Channels, 7th edition, Pearson, 2011.
6. Mark W Johnston, Greg W Marshall, Sales Force Management, 9th edition, TMH, 2009.
7. Dr.S.L.Guptha, Sales and Distribution Management, 2nd edition, Excel books, 2010.

INTEGRATED MARKETING COMMUCATION

Course Objective:
The aim of this course is to enable MBA students to understand management of marketing communication, communication mix and ethical aspects of marketing communication.

Course Outcomes:
At the end of the course students should be able to understand

- Integrated marketing communication mix and its impact on consumer behavior
- Budgeting, evaluation of IMC and measuring effectiveness of communication
- Sales promotion, media planning and ethical aspects.

UNIT - I: Understanding Integrated Marketing Communication: Understanding Marketing Communication, Integrated Marketing Communication, Integrated Marketing Communication as an Integral part of Marketing, Understanding Consumer Behaviour, Understanding the Communication process, Communication Mix. Case: Cadbury Manages a Crisis with Integrated Marketing Communications (Kruti Shah page no 59)

UNIT - II: Budgeting, Objectives and Evaluation of IMC: Setting Communication Objectives, DAGMAR Approach to setting objectives and measuring advertising effectiveness, allocating the Marketing Communication Budget, Conducting research to measure communication effectiveness, Post- Testing tools and techniques, Evaluating other promotional tools and IMC. Case : The Premium Milk Food Private Ltd. (Kruti Shah page no 820) Case : Archias, Advertizing (Jaishri Jethwaney, Shruthi Jain, Oxford, page no 195)

UNIT - III: Marketing Communication Mix I: Creative Execution in Advertising, Decision in Print, Execution on Radio, Execution on online and television, getting that 'Big Idea' of creativity. Case : Tata Salt (Part I,II,III) (Kruti Shah page no 282,284,310-311,367-372)

UNIT - IV: Marketing Communication Mix II: Sales Promotion, Direct Marketing, Personal Public Relations, Publicity and Corporate Advertising, Unconventional Promotional Media: Sponsorships, Mobile Advertising, Word Of Mouth, Village Farmers, Out of Home Media, World Wide Web Communications. Case : Amul taste of India (Kruti Shah page no 793) Case : Rasha Prankees promotion (Kruti Shah page no 600)

UNIT - V: Regulation, Social and Ethical Aspects of Advertising and Promotion:- Federal Regulation of Advertising, regulations of Advertising and Promotion in India, regulation of other Promotional Areas, Social and Ethical Criticisms of Advertising, ethical aspects of Advertising – Truth in Advertising, Advertising to children, Advertising controversial products, Social Aspects of Advertising. Case : Surrogate advertising(Jai shri Jethwaney page no 475-480) Case : The Unilever experience (Jai shri Jethwaney page no 606)

Text Book:
1. Krutishah, Alan D'Souza, Advertising and promotions on IMC Perspective, TMH, 2012.

- Journals: Indian Journal of Marketing, MICA Communications Review

References:

1. Jaishri Jethwaney, Shruthi Jain, Advertising Management, Oxford, Second edition, 2012.
2. George E Belch, Michael A Belch , Keyoor puravi , Advertising and Promotions – An Integrated Marketing Communications perspective , TMH, 2013.
3. Semenile , Allen, O Guinn , Kaufmann, Advetising and Promotions, An Integrated brand approach, Cengage, 6th edition , 2012.
4. SHH Kazmi, Satish K.Batra, Advertising & Sales Promotions, 3rd edition, Excel Books, 2011.
5. Terence A. Shimp, Integrated Marketing communication Advertising and Promotion, 8th edition Cengage Learning , 2012.
6. S.A.Chunawalla, Advertising Sales and Promotion Management, 4th edition, HPH,2012.
7. Ruche Gupta, Advertising Principles and Practice, 1st edition, S. Chand, 2012.
8. Semenik, Allen, O Guinn, kanfmann, Advertising and Promotions an Intergrated Brand Approach,6 th edition, Cengage Learning, 2012.
9. Dr. Niraj kumar, Integrated Marketing Communication, HPH, 2011.
10. Dinesh Kumar, Marketing Channel, Oxford, 2012.
11. PROF. Ritwik haldar, Advertising and Sales Promotion Management, HPH, 2011.

IV Semester Electives - Finance

FINANCIAL DERIVATIVES

Objective of the Course:
This course is aimed at enabling the student understand the issues involved in planning finances and investments at a personal level, and to be in a position to provide advice on the issues.

Course Outcomes
- Understand the meaning, nature, risk & derivatives and history of derivative market.
- To understand the concept of binomial and black-scholes option models.
- Understand the future and spot prices of future concept.
- Understand the relationship in delta, theta and gamma.
- Understand the concept of trading and analysis of commodities market.

UNIT - I
Introduction to derivatives: Meaning and Types of Derivatives& Traders, History of derivatives, Derivative Markets, Derivatives Trading in India, Forwards and Future Markets, Types of financial risks.

UNIT - II
Option: Types of Options, Valuation of Options-Binomial model and Black and Scholes Model, Strategies involving single option and stocks, Combinations, Spreads.

UNIT - III
Futures: Hedgers and speculators; Future contracts; Future contracts-clearing house, margins, trading; Future prices and spot prices.

UNIT - IV
Managing market risk: Hedging schemes – delta hedging, theta, gamma; relationship in delta, theta and gamma; Vega and rho; portfolio insurance.

UNIT - V
Commodity Markets: Role of MCX in commodities markets; commodities trading; Fundamental and Technical analysis of the commodities markets.

TEXT BOOKS:
1. Hull, J.: Options: Futures and other Derivatives, Prentice Hall, New Delhi.
2. Kolb, Robert W: Understanding Future Markets, Prentice Hall Inc., New Delhi.
3. Vijaya Bhaskar P: Derivatives Simplified, Response Books, New Delhi.

REFERENCE BOOKS:
1. Hull, John C., Futures Options and Other Derivatives, Pearson Education (2008).
2. Head, Red, Financial Derivatives: an Introduction to Forwards, Futures and Options, Prentice hall of India (2005).
3. Vohra, N.D. and Baghi, B. R., Futures and Options, Tat McGraw Hill (2002).
4. Rajiv Srivatsava., Derivatives and Risk management, Oxford University Press (2010).

FIXED INCOME SECURITIES

Course Objectives:

In the recent past, there has been a dramatic changes and introduction of new instruments in the fixed income markets. These developments in the market have led to tremendous growth and eventually landed at subprime crisis involving mortgage backed bonds, collateralized debt obligations and credit derivatives. This course helps the students to the world of fixed income securities, discusses the risk associated with these assets class. Besides, this course makes the students to pricing, term structure and valuation techniques used by the market.

Course Outcomes:

At the end of the course students should be able to understand

- Various features of fixed income market
- Appreciate the price fixing mechanism for G-bonds
- Assess the valuation of bonds from pricing models and yield curves
- Evaluate credit risk exposures for bonds
- Understand construction of mortgage-backed security and its valuation
- Value derivative instruments to speculate or hedge risk

UNIT - I

Overview of Markets & Debt securities; Price-yield conventions and repo markets; Central banks, Repo Markets and Funding securities; Auction of Treasury Debt securities;

UNIT - II

Corporate Bond Market In India; Bond Mathematics; Convertible Securities; Yield curve and term structure; Bond Indexing, methodology for construction on Bond Index

UNIT - III

Modelling Credit Risk and Corporate debt securities; Mortgages, Federal Agencies and Agency Debt; Mortgage-Backed Securities; Inflation-linked debt

UNIT - IV

Eurodollar futures contracts; Interest Rate Swap; Treasury Futures contracts; Credit default swaps; Collateralized Debt Obligations

UNIT - V

Interest rate derivatives: The Standard market models and Models of short rate

Text Book:

1. Suresh Sundaresan, 2009.Fixed Income Markets and Their Derivatives, Third edition.

REFERENCE BOOKS:

1. Frank J. Fabozzi, 2012 The Handbook of Fixed Income Securities, Eighth edition
2. Pietro Veronesi, 2010. Fixed Income Securities: Valuation, Risk, and Risk Management.
3. Ross, Westerfield, Jaffe and Kakani, 2009. Corporate Finance. Eighth edition.
4. John C. Hull, 2005. Options, futures, and other derivative securities. Sixth edition

CORPORATE RESTRUCTURING FINANCE

Course Objective
To acquire knowledge of the procedural and practical aspects of Corporate Restructuring in detail.

Course Outcomes
At the end of the course students should be able to understand

- How to analyze capital allocation options
- Evaluate pros & cons of M& A Deals
- Evaluate financing options

UNIT - 1
Introduction and Concepts: Meaning, Need, Scope and Modes of Restructuring; Emerging Trends, Planning, Formulation and Execution of Various Corporate Restructuring Strategies - Mergers, Acquisitions, Takeovers, Disinvestments and Strategic Alliances, Demerger and Hiving off; Expanding Role of Professionals

UNIT - II
Merger and Amalgamation: Legal, Procedural, Economic, Accounting, Taxation and Financial Aspects of Mergers andAmalgamations including Stamp Duty and Allied Matters; Interest of Small Investors; Merger Aspects under Competition Law; Amalgamation of Banking Companies and Government Companies; Cross Border Acquisition and Merger

UNIT - III
Corporate Demerger and Reverse Merger: Concept of Demerger; Modes of Demerger - by Agreement, under Scheme of Arrangement; Demerger and Voluntary Winding Up; Legal and Procedural Aspects; Tax Aspects and Reliefs; Reverse Mergers – Procedural Aspects and Tax Implications

UNIT - IV
Takeover: Meaning and Concept; Types of Takeovers; Legal Aspects – SEBI Takeover RegulationsDisclosure and Open Offer Requirements; Bail Out Takeovers and Takeover of Sick UNIT - s; Takeover Defenses; Cross Border Takeovers

UNIT - V
Financial Restructuring: Financial Alternatives; Funding through various Types of Financial Instruments including Equity and Preference Shares, Debentures, Securities with Differential Rights, Swaps, Stock Options; ECBs, Funding through Financial Institutions and Banks; Management Buyouts/Leveraged Buyouts; Reduction of Capital; Reorganization of Share Capital; Buy-Back of Shares;

TEXT BOOKS:

1. K. R. Sampath, Mergers/Amalgamations, Takeovers, Joint Ventures, LLPs and Corporate Restructure, Snow White Publications
2. Ray, Mergers and Acquisitions Strategy, Valuation and Integration, PHI

REFERENCE BOOKS:

1. S. Ramanujam, Mergers et al, LexisNexis ButterworthsWadhwa, Nagpur
2. ICSI : Handbook on Mergers Amalgamations and takeovers
3. Strategic Financial Management by Prasanna Chandra (PC), Mcgraw Hill
4. Financial Markets and Corporate Strategy by Sheridan Titman, 2nd Edition (Irwin/McGraw-Hill, 2002).

COMMODITIES MARKET

Course Objective

The principal aim of this course is to provide students with both theoretical and applied knowledge related to commodities trading. The specific objective include

- To differentiate commodity from financial derivatives.
- To know application of commodity futures.
- To understand the price mechanism of commodity futures.
- To learn about NCDEX and regulatory frame work and taxation aspects of the commodities market.

Course Outcomes:

- The principal underlying commodity markets and how they operate
- Principal determinants of price in commodity markets
- Main players, their trading characteristics and objectives
- Commodity derivatives exchanges
- How contract settlement and delivery is achieved
- Trading, hedging and investment strategies

UNIT - I
Introduction to commodity derivatives

Introduction to derivatives, products, participants and functions, derivatives markets, difference between commodity and financial derivatives, NCDEX – Structure, clearing and settlement system and commodities traded on the NCDEX.

UNIT - II
Application of commodity futures and options

Instruments available for trading – forward contract, introduction to futures and option, pay off for futures and options, price commodity derivatives, cost of carry model, hedging, speculation and arbitrage.

UNIT - III
Trading, clearing and settlement

Trading – futures trading system, entities in the trading system, commodity futures trading cycle, order types and trading margins for trading in futures, charges, hedge limits.

UNIT - IV
Regulatory frame work of commodity derivatives

Rules governing commodity derivatives exchanges, participants, investor grievance and arbitration.

UNIT - V
Tax aspects

Implications of sales tax, value added tax (VAT) and obligations, Electronic sport exchange – NCDEX spot exchange Ltd (NSPOT).

TEXT BOOK:

1. Indian Institute of Banking & Finance. Commodity Derivaties, 2007, Macmillan India Ltd.

REFERENCE BOOK:

1. "Guide to Indian Commodity Market" by Ankit Galax JItendra Gala – Publishing by – Buzzing Stock publishing house – 2007.

STRATEGIC COST MANAGEMENT

Course Objectives:
The objective of the program is to provide necessary skills to participants which can be easily adapted to their work environment. Understanding costs, using it for planning (budgeting), pricing, cross functional decision making as also for cost management is a key requirement.
Course Outcomes:
By end of this course it is expected that the student will be able to:

- Understand the basic use of cost management information in each of the four functions of management and in different types of organizations and the cost driver concepts at the activity, volume, structural, and executional levels.
- Apply CVP analysis for breakeven planning.
- Understand the role of budgets in the overall management process and importance of strategy and its role in the master budgeting process.

UNIT - I
Cost Management and strategy: Management Accounting and role of cost management – Four functions of management – Contemporary business environment – Strategic focus of cost management.
Basic Cost Management concepts: Cost, Cost driver, cost objects and cost assignments – cost concepts for product and service costing.
UNIT - II
Product costing: Departments, Joint products and by products – Strategic role of cost allocation – Cost allocation to service and production departments – cost allocation in service industries – Joint product costing.
UNIT - III
Process costing: Characteristics of Process Costing Systems -Equivalent UNIT - s,Flow of Costs in Process Costing, Steps in Process Costing-,Process Costing Methods- Weighted-Average Method -First-In, First-Out (FIFO) Method- Comparison of Weighted-Average and FIFO Methods ,Process Costing with Multiple Departments Transferred-In Costs ,Weighted-Average Method ,The FIFO Method.
UNIT - IV
Profit Planning: CVP Analysis: Cost-Volume-Profit Analysis -Contribution Margin and Contribution Income Statement –Strategic Role of CVP Analysis-CVP Analysis for Breakeven Planning - CVP Analysis for Profit Planning- Revenue Planning -CVP Analysis for Activity-Based Costing- Sensitivity Analysis of CVP Results Assumptions and Limitations of CVP Analysis.
UNIT - V
Strategy and Master budget: Role of Budgets -Strategy, the Long-Term Plan, and the Master Budget -Importance of Strategy in Budgeting -Formulation of Strategy-Strategic Goals and Long-Term Objectives -Short-Term Objectives and the Master Budget.
The Budgeting Process -Budget Committee -Budget Period -Budget Guidelines Initial Budget Proposal -Negotiation, Review, and Approval- budgeting in service industries-Alternative Budgeting Approaches- Behavioral issues in Budgeting.

TEXT BOOKS:

1. 1.Cost Management A strategic Emphasis , 5th Edition, Edward J. Blocher University of North Carolina at Chapel HillKenan-Flagler Business School
2. Cost Management: Measuring, Monitoring, and Motivating Performance, 2nd Edition Leslie G. Eldenburg, Susan K. Wolcott.

REFERENCE BOOKS:

1. Hand Book of Cost Management, 2nd Edition ,Roman L Well , Michael W. Maher.
2. Cost Management: Measuring, Monitoring, and Motivating Performance 2nd Edition by Leslie G. Eldenburg Susan K. Wolcott .

IV Semester Electives - HR

PERFORMANCE AND COMPENSATION MANAGEMENT

Course Objective:

To provide an outline of Managing Employee Performance and thus enabling those to establish and manage appropriate Compensation for the Employees and Executives.

Course outcomes:

By the end of the course the learners are expected to

- Be able to show awareness of the process and principles of Performance Management.
- Understand the governing body in the performance review process.
- Identify the negative aspects of appraisal system and consider how these can be overcome.
- Apply the compensation/reward system with regard to performance.
- Understand the designing and fixation of pay in relation to job.

UNIT - I

Performance Management: Introduction of Performance Management – Meaning and Definition, Concept & Perspectives, Pre-requisites, Principles, Elements, Imperatives and Challenges – Job Performance: Determinants and Five-Factor Model – Performance Management System: Elements, Objectives and Functions.

UNIT- II

Performance Management Process – I: Introduction of PMP – Performance Planning: Meaning & Definition, Objectives, Importance, Methodologies, Process – Competency Mapping: Meaning & Definition, Methods, Linkage to Performance Planning – Performance Managing – Meaning & Definition, Characteristics, Objectives, Process.

UNIT- III

Performance Management Process – II: Performance Appraisal: Meaning & Definition, Characteristics, Objectives, Principles, Process, Methods and Common Rating Errors, Elements of Good Performance Appraisal – Performance Monitoring: Meaning & Definition, Objectives, DSMC/ATI Model and Process – Role of HR: Role, Seven sins of HR Professionals, Seven rules of Excellence for HR Professional.

UNIT - IV

Compensation Management: Compensation: Perspectives and Types , Common terms, Theories – Job Analysis – Job Evaluation – Performance Related Pay: Introduction, Objectives, Individual Performance Related Pay, Advantages and Disadvantages – Team Performance Related Pay: Team Incentive Plans, Advantages and Disadvantages - Person-Based Compensation: Skill-based pay, Competency-based pay

UNIT – V

Pay Design and Structure: Types of Wage Differentials – Wage Fixation: Collective Bargaining, Process, Statutory Wage Fixation – Introduction, Designing Pay structure, Components – Executive Compensation: Introduction, Principal-Agent Theory, Components of Executive Compensation, Suggestions –Compensation Strategy: Components and Significance, Developing Compensation strategy, Policies that are strategically relevant – Global Compensation: Emerging Issues – Compensation Practices of Different Countries.

TEXT BOOKS:

1. A. S. Kohli and T. Deb, “Performance management”, 1/e, Oxford University Press, New Delhi, 2008.
2. Mousumi S. Bhattacharya and Nilanjan Sen Gupta, “Compensation Managemnt”,1/e, Excel Books, New Delhi, 2009

REFERENCE BOOKS:

1. Michael Armstrong & Angela Baron, “Performance management: The New realities”, Jaico Publishing House, New Delhi 2002.
2. Dewakar Goel: “Performance Appraisal and Compensation Management – A Modern Approach”, 2/e, PHI Learning, New Delhi, 2012.

STRATEGIC AND INTERNATIONAL HRM

Course Objective:
To enable the students to develop a strategic perspective of human resource management and understand the global HR management functions.

Course Outcomes:
At the end of the course students should be able to understand

- How to frame strategies in the organization.
- Latest Trends and Future Scenario in Strategic Human Resource Management
- Basic concepts of Domestic and International HRM with its difference
- Implementation of HR Functions in Global Context
- Latest Trends and Future Challenges in International Human Resource Management

UNIT - I
Concept of SHRM: Strategic HRM - Definition, Basis, Principles, and Aims – Concepts of SHRM, Perspectives on SHRM – HR Strategies: Overall HR Strategies, Specific HR Strategies – Strategic Role of HR - The Impact of HRM - Formulating HR Strategy.
UNIT - II
Strategic HR Systems: Staffing systems - Reward and compensation systems – Employee and career development systems - Performance management systems – HR Systems: The Link to Business Strategy and Firm Performance - Domestic and international labour market.
UNIT - III
Global Perspectives of HRM: Global Perspective - Nature, Drivers, Ripple Effects – Multiculturalism, Cultural Dimensions, Managing Across Cultures - Nature of IHRM: Defining International HRM, Differences between domestic and International HRM - Strategic IHRM: Nature of Strategic IHRM, organizational context of IHRM, Dimensions of strategic IHRM – Nature, Motives and extent of Mergers & Acquisitions – HR Interventions, Role.
UNIT - IV
International HR Functions: HR Planning, Recruitment & Selection – Recent Trends in International Staffing – Expatriate Training – Theoretical Frameworks for CCT – Performance Management: Steps in Global PMS – Issues in Managing Performance in the Global Context – Assessing Subsidiary Performance. *{T:3}*
UNIT - V
Compensation and Other Issues in IHRM: Compensation - Objectives, Philosophies, Theories & Strategy – Components of Compensation, Variables influencing Compensation – Compensation Packages – Repatriation: Benefits, Challenges, Process – International Industrial Relations: Nature, Approaches, Key Players – HR Practices in Different Countries: China, Japan, USA. *{T:3}*
NOTE: One case study be discussed – per unit – in the class

TEXT BOOKS:

1. Michael Armstrong, Strategic Human Resource Management: A Guide to Action, 4E, Kogan Page Publishers, 2008, ISBN 074945556X, 9780749455569.
2. Dreher: Human Resource Strategy 1e, 2005 TMH.
3. K. Aswathappa & SadhanaDash, International HRM, 2E, Tata McGraw-Hill Education, 2013, ISBN - 1259084795, 9781259084799.

REFERENCE BOOKS:

1. Tanuja Agarwala: Strategic HRM, Oxford, 2007.
2. Peter J. Dowling, Marion Festing, Allen D. Engle, International Human Resource Management: Managing People in a Multinational Context. 5E, Cengage Learning EMEA, 2008, ISBN - 1844805425, 9781844805426.
3. P. Subba Rao , International Human ResourceManagement, 1E, 2011, Himalaya Publishing House, ISBN - 978-93-5024-718-1.
4. Mello: Strategic HRM, Thomson, 2/e, 2007.

HR ANALYTICS AND METRICS

Course Objective:
The objective of the course is to introduce HR Analytics for the aspiring HR professionals. The course will provide the necessary conceptual framework, models and introduce the application tools.

Course Outcomes:
By the end of the course the learners are expected to
- Appreciate the use of HR Analytics for various organizational purposes.
- Apply the Metrics and Models for HR Analytics
- Determine the various indicators.
- Analyze the HR trends using predictive models.
- Be able to Report HR Analytics effectively.

UNIT - I
INRODUCTION to HR Analytics
What is HR Analytics - Origin and evolution of HR Analytics – How to Approach-Metrics- Benefits of implementing HR Analytics- Models of HR Analytics
UNIT - II
HR Analytics - Rationale
Linking HR to Business drivers - Values and Culture - Key Strategic Themes - Introduction to the Balanced Scorecard- The HR aspect
UNIT - III
QUANTIFICATION and MEASUREMENT
First generation – Cost Determinants - Second generation- Lead and lag Indicators- Lead indicators for compensation - Lead indicators for recruitment- Lead indicators for performance management- Lead Indicators for Learning and Development- Business Application: Scenario Modeling and Business Cases
UNIT - IV
ANALYSIS TOOLS
Analytical Tools: From Descriptive Analytics to Predictive Analytics -Implementing Trend Analysis- Implementing Predictive analytics- Using Regression and Correlation - Benchmarking process – (Sample Cases for different Scenarios to be discussed)
UNIT - V
REPORTING
Visualization Tools - Creating charts and graphs - Creating Pivot Table - Creating HR Dashboards

TEXT BOOKS:

1. Tracey Smith, HR Analytics: The What, Why and How, Numerical Insights LLC, 2013, ISBN 1492739162, 9781492739166.
2. Dr Martin R. Edwards, Kirsten Edwards, Predictive HR Analytics: Mastering the HR Metric, Kogan Page Publishers, 2016.

REFERENCE BOOKS:

1. Jac FITZ-ENZ, The New HR Analytics: Predicting the Economic Value of Your Company's Human Capital Investments, AMACOM Div American Mgmt Assn, 2010.
2. Jac Fitz-enz, John Mattox, II, Predictive Analytics for Human Resources, Wiley and SAS Business Series, Wiley, 2014.
3. Gene Pease, Boyce Byerly, Jac Fitz-enz, Human Capital Analytics: How to Harness the Potential of Your Organization's Greatest Asset, Wiley and SAS Business Series, John Wiley & Sons, 2012.

ORGANIZATION DEVELOPMENT AND CHANGE

Course Objective:
To enable the managers to cope up with the changes that take place constantly in business and also to make them manage the OD programmes and Change Management activities effectively.

Course Outcomes:
By the end of the course the learners are expected to

- Develop an understanding of organizational development.
- Become aware of the OD process and profession
- Apply the diagnostic models to organizational scenarios
- Understand OD Interventions and apply them in organizations.
- Enable implementation of change management programmes in organizations.

UNIT - I
Organization Development: Introduction
Organization Development: Definition, Growth, Relevance – History and Evolution of OD – Theories of Planned Change – General Models of Planned Change- Types of Planned Change- OD Practitioner: Competencies, Values, Ethics.
UNIT - II
OD – Diagnosis
OD: Entering and Contracting- Diagnosing: Need, Open Systems Model – Organizational Level Diagnosis- Group Level Diagnosis – Individual Level Diagnosis – Methods for collecting and analyzing diagnostic data -Feeding Back the Diagnostic Data.
UNIT - III
OD - Implementing Interventions
Designing Effective Interventions – Overview of Human Process Interventions – Leading and Managing Change: Vision, Political Support, Transition, Sustaining – Evaluating OD interventions- Institutionalizing Organizational Change.
UNIT - IV
Different Types of Interventions
Process Consultation – Third-Party Peacemaking – Team Building – Organization confrontation meeting – Intergroup-relation interventions- Large-group interventions.
UNIT - V
Strategic Change Interventions
Transformational Change: Characteristics – Integrated Strategic Change- Organization Design, Culture Change – Continuous Change: Self-Designing organizations- Learning Organizations.

TEXT BOOKS:

1. Thomas G. Cummings, Christopher G. Worley, Organization Development & Change, 9E, Cengage Learning, 2009, ISBN- 0324421389, 9780324421385
2. Dipak Kumar Bhattacharyya, Organizational Change And Development, 2E, Oxford University Press, 2011, ISBN - 0198066465, 9780198066460.

REFERENCE BOOKS:

1. Palmer, Dunford, Akin: Managing Organizational Change - A multiple perspective Approach, 2E, McGraw-Hill Education, 2008, ISBN - 0073404993, 9780073404998.
2. Thornhill, Managing Change, Pearson, 2005.
3. Radha R Sharma: Change Management—Concepts and Applications, TMH, 2007.

LEADERSHIP & PEOPLE MANAGEMENT

Course Objective:
To empower the students with the concepts, theories and approaches to lead organizations. The knowledge gained will help the students to feel confident to add value to the organizations. To gain an overview of what it means to be an effective people manager. To have a deeper understanding of the different aspects of people management.

Course Outcomes:
The students will be able to understand in definitions, concepts and process of leadership. The will also understand the approaches and theories of leadership, leadership styles, leadership types like transactional leadership, transformational leadership, team leadership. The student will be able to appreciate the challenges faced by a first time manager.

UNIT - I
Introduction: Leadership definition and components, ways of conceptualizing leadership, Trait versus process leadership, leadership and management. Leadership Attributes – Styles – Theories of Effective Leadership – charismatic leader, transformational leader.

UNIT - II
Factors influencing Leadership Behavior I: Personality, types, theories, Perception, factors – Learning Styles – theories. Factors influencing Leadership Behavior II: Emotional Intelligence – skills for Emotional intelligence – Cultural – formation – changing culture, Organizational and Situational Factors.

UNIT - III
Description of teams in the organizations – organizational context of teams -- structure, culture, support, human resource policies – team topography – purpose of teams, types of teams, size, diversity, extent of use.

UNIT - IV
Introduction to People Management: Difference between People Management and Human Resource Management; impact of individual and organizational factors on people management. **Getting Work Done Through Others:** Challenges of getting work done; significance of prioritization and assigning work to team members.

UNIT - V
Counseling & Mentoring:
Counseling: Why counsel troublesome people, how to turnaround problem employees and employees with problems, Counseling Dilemmas: Traps & Pitfalls to avoid
Mentoring: What mentoring can do to help high achievers, Mentor as a role model, advocate, career counselor, Mentoring: traps to avoid

TEXT BOOKS:

1. Uday Kumar Haldar, Leadership and Team Building, Oxford Publications, 2011
2. Florence M. STONE , Coaching, Counseling & Mentoring: How to Choose & Use the Right Technique to Boost Employee Performance, 2007

REFERENCE BOOKS:

1. Dungy, Tony, The Mentor Leader: Secrets to Building People and Teams That Win Consistently, Tyndale Momentum publishers
2. Leadership: Theory & Practice, 6th Edition, Peter. G. Northouse

IV Semester Electives - Operations & Business Analytics

INNOVATION AND PRODUCT DEVELOPMENT

Course Objective:

The objective of this course is to enable the students to gain knowledge about the Innovation and New Product Development. This course will develop skills of the students in the area of Innovation Management and Design of Innovation Process, Strategic alliances, New product and package development. To acquaint the students about various issues of new service innovation, market research and its influence on new product development.

Course Outcomes:

At the end of the course the student will be able to

- Understand concepts; develop skills in the area of innovation management.
- Able to develop strategic alliances and networks for innovation.
- Hone their abilities for development of new products.
- Hone their abilities for the development of new packaging for the products.
- Able to develop skills for new service innovation and market research for new products.

UNIT - I

Innovation Management: Introduction, importance and need of innovation, popular view of innovation, models of innovation, innovation as a management process, the role of state in innovation and the market, innovation diffusion theories.

Managing innovation with in firms: Managing uncertainty, organizational characteristics that facilitate the innovation process, role of individual in the innovation process, IT systems and their impact on innovation.

UNIT - II

Innovation and Operations Management: Design of innovation, innovation in the management of operations process, technology trajectories knowledge base of an organization, learning organization, degree of innovativeness, technology strategy.

Strategic alliances and networks: forms of strategic alliances, open innovation, technology transfer and models of technology transfer.

UNIT - III

New product development - Product Strategy: New product plan, product strategy, differentials and positioning, competing with other products, new products and property, considerations when developing a new product development (NPD) strategy. NPD strategy for growth, over of NPD theories. Models of new product development.

UNIT - IV

Packaging and Product Development: Basic principles of packaging, characteristic of package, product rejuvenation, new product opportunities through packaging, product and packing size variation, packaging system and retailer acceptance.

UNIT - V

New Service Innovation and Market Research: New service innovation and market research and its influence on a new product development, different types of services, characteristics of a services, classification of service innovations, new service development models, service innovation and the consumer.

Market Research and New Product Development: Testing new products, techniques of testing new products, technology intensive products, new products as projects, NPD across different industries.

TEXT BOOK:

1. Paul Trout "Innovation and New Product Development", Pearson Pub.

REFERENCE BOOKS:

1. Karl Ulrich, Steven and Anitha Goel "Product Design and Development", MHE.
2. CK Prahalad and MS Kisan "The New Age of Innovation", MHE.
3. Dariun Rafinejod "Innovation, Product Development and Commercialization", Cengage.

COMPETITIVE MANUFACTURING MANAGEMENT

Course Objective:

To enable the students to learn the modern concepts of Manufacturing like JIT, TQM, Continues improvement, Waste Elimination, Improvement of quality of products and processes and lean manufacturing. By adapting the concepts, manufacturing organizations will achieve the competitive advantages over their competitors.

Course Outcomes:

- To enable the students to gain knowledge about continuous improvement waste elimination and customer focus.
- Able to apply JIT and TQM in day to day operations of the organization.
- To enable the students to adopt lean manufacturing practices for efficiency improvement of organization.
- Able to develop skills in the lean manufacturing area.

UNIT - I

Continuous Improvement, Waste Elimination, Customer Focus: Fundamentals of Continuous Improvement, Continuous Improvement Strategy, Kaizen, Improvement Threshold, Innovation Improvement , Making the Leap, Improvement as Strategy Finding and Implementing Improvements, PDCA Cycle, Five-Why Process, Value Analysis, Value Engineering, Process Reengineering, Reengineering Fundamentals, Role of Systems Analysis, Employee Involvement.

UNIT - II

Just In Time (JIT), Total Quality Management (TQM) and Production Planning: Value-Added and Waste Elimination, Value –Added Focus, Source of waste, JIT Principles, The concept of JIT, TQM: Customer-Focused Quality, Framework for Managing TQM, Employee Involvement, Benchmarking, Implementing TQM.

Simplified Production Planning and Control Systems, Scheduling for Smooth Flow, Synchronizing and Balancing Process, Synchronization.

UNIT - III

Quality Products and Quality Process: Quality of Design, Concurrent Engineering, Quality Function Deployment, Design for Manufacture, Taguchi Methods, Quality Inspection and Statistical Sampling, Role of Inspection, Acceptance Sampling, Statistical Process Control, Control Charts, Process, Capability, Statistical Process Control in Practice, Systems for Eliminating Defects, Source Inspection and Pokayoke, Jidoka.

UNIT - IV

Elements of Lean Production: Small-Lot Production, Lot-Sizing, Lot-Size Reduction, Facilitating Small Lot Sizes, Setup-Time Reduction, Improve Setups, Setup-Reduction Methodology, Techniques for Setup Reduction, Setup-Reduction Projects, Maintaining and Improvement Equipment, Equipment Maintenance, Equipment Effectiveness, Preventive Maintenance Program, Total Productive Maintenance, Implementing TPM, Pull Production Systems, Pull systems and push systems, Group Technology, Focused Factory, Workcells and cellular Manufacturing, workcell Concepts, Workcell Applications.

UNIT - V

Lean Manufacturing: Implementation of Lean Manufacturing, Toyota Production System, Inventory and Variation, Lean Manufacturing Simplified, Significance of Lead Time, Five Strategies to Becoming Lean, Sustaining the Gains, A Lean Transformation, Planning and Goals, Constraint Management, Cellular Manufacturing.

TEXT BOOK:

1. John M. Nicholas, “Competitive Manufacturing Management”, TMH, New Delhi, 2001. 12th RP.

REFERENCE BOOKS:

1. Lonnie Wilson, “How to Implementing Lean Manufacturing”, MC Graw Hill, New Delhi, 2015.

PREDICTIVE ANALYTICS FOR MANAGERS

Course Objective:

This course aimsto introduce the statistical tools from an applied perspective using business relatedexamples. Microsoft Excel software will be used throughout the course to aid in statistical analysis.

Course Outcomes:

By the end of this course students would able to understand

- Understand the concept probability and decision trees
- Understand the concept of discrete and continuous probability distributions
- Understand the concept of hypothesis testing and its applications
- Understand the concepts of forecasting in time series analysis.

UNIT- I

Introduction to probability:

Basic ideas, relative frequency, sample space, the probability laws, the general addition law, conditional probability, statistical independence, probability tree diagrams, introduction to probability distributions, expectation and variance for probability distribution.

UNIT- II

Probability distributions:

Continuous probability distributions: Introduction, The normal distribution, the standard normal distribution, checking for normality.

Discrete probability distributions:

Introduction, Binomial probability distribution and Poisson probability distribution.

UNIT- III

Sampling distributions and estimating:

Introduction to the concept of a sample: why sampling, sampling terminology, types of samples, types of errors. Sampling from a population, using excel to generate sample from a sampling distributions, population point estimates: types of estimates, criteria of good estimate, population confidence intervals, calculating sample size.

UNIT- IV

Introduction to parametric and non-parametric hypothesis testing: Hypothesis testing rationale, one sample z-test population mean, two sample z-test for the population mean, Two sample z-test for the population proportions.

Non-parametric tests: Sign test, Wilcoxon signed rank sum test for dependent samples, Mann-Whitney U test for two independent samples.

UNIT-V

Time series data and analysis:

Introduction to time series, index numbers: Stationary and non-stationary time series, seasonal time series, Univariate and multivariate methods, scaling the time series. Trend extrapolation: a trend component, fitting trend to a time series, types of trends, using atrend chart function to forecast a time series, trend parameters and calculations.

TEXT BOOKS:

1. Glyn Davis and BrankoPecar (2013), “Business Statistics using Excel”, Oxford University Press, New Delhi.

REFERENCE BOOK:

1. David M Levine, David. F. Stephan & Kathryn A. Szabat, Statistics for Managers – Using MS Excel, PHI, 2015.
2. HaladyRaoPurba (2013), “Business Analytics an Application Focus”, *PHI Learning Private Limited*, New Delhi.
3. D P Apte : Statistical Tools for Managers USING MS EXCEL, Excel, 2012.

ENTERPRISE RESOURCE PLANNING

Course Objective:
To understand about ERP systems, ERP software and modules, Implementation of ERP, and Emerging trends on ERP.

Course Outcome:
Enhanced Evaluation of ERP systems, Business Analytics, Future trends in ERP systems.

UNIT - I
INTRODUCTION - Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems

UNIT - II
ERP SOLUTIONS AND FUNCTIONAL MODULES - Overview of ERP software solutions- Small medium and large enterprise vendor solutions, BPR, Business Engineering and best Business practices - Business process Management. ERP modules -sales and Marketing, Accounting and Finance, Materials and Production management.

UNIT - III
ERP IMPLEMENTATION - Planning Evaluation and selection of ERP systems implementation life cycle - ERP implementation, Methodology and Frame work Training – Data Migration. People organization in implementation-Consultants, Vendors and Employees.

UNIT - IV
POST IMPLEMENTATION:
Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of and ERP Implementation

UNIT - V
EMERGING TRENDS ON ERP - Extended ERP systems and ERP add–ons -CRM, SCM, Business analytics etc- Future trends in ERP systems-web enabled, Wireless technologies so on.

TEXT BOOKS:
1. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2015.
2. Jyotindra Zaveri, Enterprise Resource planning(ERP), Himalaya publishing house, New Delhi,2009

REFERENCE BOOKS:
1. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2015
2. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2015.

PRODUCTIVITY IMPROVEMENT AND COST CONTROL

Course Objective:
The objective of this course is to enable the students to gain knowledge about the Productivity Improvement and Cost Control. This course will develop skills of students in the area of productivity improvement and its techniques, vital areas of productivity improvement. To acquaint the students about the various issues related to cost control and reduction.

Course Outcomes:
At the end of the course the student will be able to

- Understand concepts; develop skills in the area of productivity improvement.
- Able to conduct productivity improvement programmes (PIP).
- Hone their abilities for developing techniques for improvement of productivity.
- Hone their abilities to identify and concentrate on the vital areas of productivity improvement.
- Able to develop skills for cost control and reduction.

Unit-I
Productivity nature, role and sources:
Productivity concept, importance and role, productivity improvement factors: Internal and external, productivity analysis, approach to productivity appraisal and analysis.
Unit – II
Productivity improvement:
Managing organization effectiveness: General considerations, productivity improvement programmes (PIP), organizational approaches to PIP, major variations of PIP.
Unit-III
Productivity improvement techniques
Work study, work simplification, Pareto analysis, Just-in-Time (JIT) method, management through value analysis, cost-benefit analysis, zero based burgeting, cost product vise allocation. Behavioral techniques: Organization Development, Brain-storming, force – field analysis, nominal group technique.
Unit –IV
Vital areas of productivity improvement:
Improving the use of capital resources – waste reduction and energy conservation programme, maintenance improvement, improving productivity through quality.
Effective human resource management: The role of management, manpower, motivation, workers participation, productivity training and work organization.
Unit –V
Cost control and cost reduction
Concept of cost control and cost reduction, benefits of cost control and cost reduction, control reports, cost control vs cost reduction, tools and techniques of cost control and reduction. Impact of cost control on manufacturing industries profitability, techniques for reducing costs in service sector, methods of costing.

TEXT BOOK:
1. Joseph Prokopenko “Productivity Management”, ILO-Geneva.

REFERENCE BOOKS:
1. Carmen pages “The Age of Productivity”, Macmilan 2010.
2. IOMA “Cost Reduction and control best practices”, John wiley and sons.

SYLLABUS Year I Semester I

MC115-Computer Programming and Problem Solving

Objective: This course is intended to teach the basics of computer hardware and software. This includes the understanding of algorithms and method of problem solving. To make the student understand the logical structure of a computer program and problem solving using C language.

Learning outcomes:

The student will be able to:

- Identify and understand the working of key components of a computer system (hardware, software, firmware etc).
- Understand computing environment, how computers work and the strengths and limitations of computers.
- Identify and understand the various kinds of input-output devices and different types of storage media commonly associated with a computer
- Identify and understand the representation of numbers, alphabets and other characters in computer system
- Understand, analyze and implement software development tools like algorithm, pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in 'C' language
- Write small programs related to simple/ moderate mathematical, and logical problems in 'C'.
- Study, analyze and understand simple data structures, use of pointers, memory allocation and data handling through files in 'C'.
    - Identify and understand the working of different operating systems like windows and Linux etc.

UNIT - I

Computer and Data: Introduction - Computer Hardware, Data, Computer Software, History, Classification of computers- Workstations, Mainframe, Super computers, client and server, Data Inside the computer, Representing Data. Algorithm - Concept, Algorithm representation, Sub algorithms. Evolution of Programming languages, Building a program, Program execution, categories of languages. CPU, Main memory, Input or Output, Interconnection of subsystems Operating systems- Definition, Evolution, Components.

UNIT - II

Introduction to C and Control Statements: Desirable Program Characteristics. Data types, Constants, Variables and Arrays, Declarations, Expressions Statements, Symbolic Constants, Operators and Expressions, Data Input and Output. Preparing and Running A Complete C Program.

Branching, looping, The Switch Statement, The break Statement, The continue Statement, The comma Statement, The go to Statement.

UNIT - III

Functions, Storage classes and Arrays: A Brief Overview, Defining a Function, Accessing a Function, Function Prototypes, Passing Arguments to a Function, Recursion. Storage Classes, Automatic Variables, External (Global) Variables, Static Variables. Defining an Array, Processing an Array, Passing Arrays to Functions, Multidimensional Arrays, Arrays and Strings.

UNIT - IV

Structures, Unions and Pointers: Defining a Structure, Processing a Structure, User-defined Data Types (Typedef), Structure and Pointers, Passing Structures to Functions, Self-referential Structures, Unions.

Pointer Declarations, Passing Pointers to a Function, Pointers and One-dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers, Passing Functions to Other Functions

UNIT - V **(11 Hrs)**

Files: Why Files, Opening and Closing a Data File, Reading and Writing a Data File, Processing a Data File, Unformatted Data Files, Concept of Binary Files

Text Books:

1. Foundations of computer science, Behrouz A. Forouzan, 2nd edition.

2. Introduction to computers, 6/e, Peter Norton TMH.

3. Byron S Gottfriend, "Programming with C", Second Edition, Schaum Out Lines, TATA Mc Graw Hill (2007)

Reference Books:

1. Sinha P., "Foundation of Computing", BPB Publication, 1st Edition, 2003

2. Rajaraman V, "Fundamental of Computers" (2nd edition), Prentice Hall of India, New Delhi. 1996.

3. Behrouy A. Foreuyan & Richard F. Gilberg, "Computer Science A structured programming Approach using C", Third Edition, Cengage Learning (2008).

4. Herbert Schildt, “The Complete Reference C”, Fourth Edition, TMH (2008)

5. Ashok N. Kamthane, “Programming with ANSI and Turbo C”, Pearson Education (2008)

MC117-Internet and Web Technologies

Objective:

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

Learning Outcomes:
The student will be able to:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas.
- Build interactive web applications using AJAX.

UNIT-I

Networking Protocols and Internet: Introduction, Protocols in Computer Communications, the OSI Model, OSI Layer Functions.

Why Internet Working?, Problems in Internet Working, Dealing with Incompatibility Issues, A Virtual Network, Internet Working Devices, Repeaters, Bridges, Routers, Gateways, A Brief History of the Internet, Growth of the Internet.

UNIT-II

WWW, HTTP, TELNET:

Introduction, Brief History of WWW, the Basics of WWW and Browsing, Hyper Text Markup Language, Common Gateway Interface, Remote Login.

UNIT-III

JavaScript and AJAX:

Introduction, JavaScript, Basic Concepts, Controlling JavaScript Execution, Miscellaneous Features, JavaScript and Form Processing, Pop-up Boxes.

AJAX: Introduction, How AJAX Works? , Life without AJAX, AJAX Coding, Life with AJAX.

UNIT-IV

Introduction to XML:

What is XML?, XML versus HTML, Electronic Data Interchange, XML Terminology, Introduction to DTD,Document-Type Declaration,Element-Type Declaration,Attribute Declaration,Limitations of DTDs, Introduction to Schema, Complex Types, Extensible Stylesheet Language Transformations, Basics of Parsing, JAXP

UNIT-V

Creating Good Web Pages:

Introduction, Top Level Navigation, Creating Sample Layouts, Metaphor, Theme, and Storyboard, Screen Resolution,3-Column Layout, Using Frameworks, Using Graphics, Usability for the Handheld Devices, Creating Multilingual Web sites, XHTML and Web Browser Compatibility Issues, Designing the Basic Elements of a Home Page.

TEXT BOOKS:

1. Achyut Godbole,Atul Kahate"Web Technologies:TCP/IP,Web/Java Programming, and Cloud Computing",Third Edition,McGraw Hill Education.

Reference Books:

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
2. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

MC119-Computer Organization

Objective: This course is intended to teach the basics involved in data representation and digital logic circuits used in the computer system. This includes the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design. This course will also expose students to the basic architecture of processing, memory and i/o organization in a computer system.

Learning Outcomes:

The student will be able to:

- Identify, understand and apply different number systems and codes.
- Understand the digital representation of data in a computer system.
- Understand the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design.
- Understand computer arithmetic formulate and solve problems, understand the performance requirements of systems

UNIT - I

Data representation and Logic circuits: Number System, complements, fixed point representation, floating point representation, binary codes, error detection codes. Logic gates, Boolean algebra, maps simplification, combinational circuits, flip flops, sequential circuits.

UNIT - II

Digital components and RTL: integrated circuits, decoders, multiplexers, registers, shift registers, binary counters, memory unit. Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Mircrooperatiaons, logic micro operations, shift micro operations, Arithmetic logic shift unit.

UNIT - III

Basic Processing Unit: Instruction codes, Computer Registers, Computer instructions – Instruction cycle, Memory – Reference Instructions. Input – Output and Interrupt. STACK organization, Instruction formats, Addressing modes, DATA Transfer and manipulation, Program control, Reduced Instruction set computer.

UNIT - IV

Micro Programmed Control and Computer Arithmetic: Control memory, Address sequencing, microprogram example, design of control unit, Hard-wired control. Microprogrammed control unit

Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT -V

The Memory System and IOP: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory. Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access.

Text Books:

1. Computer System Architecture, Morris Mano, 3rd Edition.
2. Computer organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.

Reference Books:

1. Computer System Architecture, Naush Jotwani- 7MM.
2. Digital Electronics, James W Bignel, Robert Donovan, 5th Edition, Cengage Learning Publications.
3. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.
4. Taub & Schilling: Digital integrated electronics , McGraw-Hill
5. R P Jain : Digital Electronics, 4th Edition TMH.

MC121-Discrete Mathematical Structures

Objective: Discrete mathematics is the study of mathematical structures that are discrete rather than continuous. Discrete mathematics deals with discrete objects. Its objective is to extend student’s Logical and Mathematical ability to deal with abstraction. Also its goal is to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

Course Outcomes:

At the end of the course, students would have knowledge of the concepts needed to test the logic of a program.

- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Be aware of the counting principles
- Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.

UNIT I - Mathematical reasoning

Propositions; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; use in program proving; resolution principle; application to PROLOG.

UNIT II - Set theory

Paradoxes in set theory; inductive definition of sets and proof by induction; Peono postulates; Relations; representation of relations by graphs; properties of relations; equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets;

UNIT III -Graph Theory

Elements of graph theory, cut vertices and edges, covering, matching, Euler graph, Hamiltonian path, trees traversals, spanning trees Independent sets, Isomorphism, planarity.

UNIT IV - Functions

Mappings; injection and surjection; composition of functions; inverse functions; special functions; Peono postulates; pigeonhole principle; recursive function theory;

UNIT V -Group Theory& Elementary Combinatorics

Definition and elementary properties of groups, semigroups, monoids, rings, fields, vector spaces and lattices; Elementary combinatorics; counting techniques; recurrence relation; generating functions;

TEXT BOOKS:

1. K.H.Rosen, Discrete Mathematics and applications, TataMcGraw Hill, fifth edition, 2003.

2. C.L.Liu, Elements of Discrete Mathematics, McGraw-Hill Book, Second

Edition, 2006.

REFERENCE BOOKS:

1. J .L.Mott, A.Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India, second edition, 1986.

2. W.K.Grassmann and J.P.Trembnlay, Logic and Discrete Mathematics, A Computer Science Perspective, Prentice Hall, First edition, 1996.

MC123-Accounting and Financial Management

Objective: To Demonstrate an appropriate mastery of the knowledge, skills and tools of financial accounting principles, managerial accounting principles and cost accounting principles. To demonstrate competency in applying course knowledge to analyze and successfully solve course specific problems.

Learning outcome: Upon completion of this program, The student will be able to:

- Demonstrate an understanding of the functional areas of accounting and finance.
- Demonstrate an understanding of the global environment and responsibilities of business.
- Demonstrate the ability to use business tools.
- Demonstrate the ability to communicate effectively.
- Demonstrate the ability to apply knowledge of business concepts and functions in an integrated manner.
- Demonstrate knowledge in applications of marginal costing concepts.

UNIT I:

Accounting: Generally Accepted Accounting Principles (GAAP), Characteristics and limitations of single entry system, double entry system of accounting, introduction of basic books of accounts ledgers. Preparation of trial balance - Final accounts (with simple Adjustments) -. Users of Accounting Information, Role of Accountant in modern Organization

UNIT II;

Ratio Analysis - Advantages - limitations – Types of ratio's –Liquidity ratio-Solvency ratio-Profitable ratio-Turnover ratio

UNIT III:

Financial Management - Meaning , scope, Role, objectives - Time value of money - Basics of Financial decisions -Investment decisions - basic concepts in capital budgeting- working capital Management.

UNIT-IV:

Costing - Nature and importance and basic principles. Elements of cost ,Absorption costing vs. marginal costing - Financial accounting vs. cost accounting vs. management accounting. Marginal costing and Break-even Analysis: nature, scope and importance - practical applications of marginal costing, limitations and importance of cost - volume profit analysis.

UNIT V:

Standard costing and budgeting: nature, scope and computation and analysis - materials variance, labor variance and sales variance –Types of Budgets.

TEXT BOOKS:

1. Accounting for Management, T. Vijay Kumar, TMH.

2. Financial Accounting,S.N. Maheswari and S.K. Maheswari, Vikas

REFERENCE BOOKS

1. Financial Accounting, A. Mukherjee and M. Haneef, TMH
2. Basic Financial Accounting for Management, Ambaresh Gupta, Pearson

3. Accounts and Finance for Non Accounts, Chatterjee. D.K, Himalaya
4. Financial Analysis and Accounting, P. Premchand Babu and M.Madan Mohan, Himalaya.
5. Essential of Financial Accounting, Ashish. K and Ballacharya, PHI.
6. Guide to Financial Management, John Tannent, Viva.

MC125-Computer Programming and Problem Solving Lab

Course Description and Objective:

The purpose of this course is to introduce to students to the field of programming using C language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

Course Outcomes:

The student will be able to:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

1. Programs using Input, output and assignment statements

a) Write a program to print Name, Address and Birth Date.
b) Write a program to add, multiply and divide two integers and float numbers.
c) Write a program to convert meters to Feet.
d) Write a program to accept number of days and print year, month and remaining days.

2. Programs using Branching statements

a) Write a program to find the largest of three numbers.
b) Write a program to check whether the entered number is prime or not.
c) Write a program to check whether the entered number is even or odd.
d) Write a program to find the roots of an equation ax2 + bx + c = 0.

3. Programs using Looping statements
a) Write a program to print 1 2 3 4 5 …..10.

b) Write a program to print series 2, 4, 6, 8,…….n.
c) Write a program to print series 2, 4, 16,……n*n using shorthand operator and while loop
d) Write a program to generate fibonnacci series.
(A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence)

e) Write a program to print the multiplication table.
f) Write a program to find a factorial of the given number.
g) Write a program to check whether the given number is Armstrong or not.
h) Write a program to check whether the given number is Strong number or not.
i) Write a program to check whether the given number is Perfect number.
j) Write a program to print all the numbers and sum of all the integers that are greater than 100 and less than 200 and are divisible by 13.

4. Programs using Functions
a) Write a program to find Fibonacci series till given number.
b) Write a program to check whether a number is a palindrome.
c) Write a program to print upper and lower triangular matrix.
d) Write a program to calculate sum and average of numbers in an array.
e) Write a program to calculate maximum and minimum value in an array.

5. Programs using Arrays
a) Write a program to find maximum element from 1-Dimensional array.
b) Write a program to sort given array in ascending order.
c) Write a program to transpose a matrix.
d) Write a program to add, subtract and multiply two matrices.

6. Programs using Structures
a) Define a structure called book that will describe the following information:Title of the book, Subject , Cost. Write a program to read the information about the 10 books and print subject-wise list containing name of the book with its cost.
b) Declare a structure with members: name, code, age, weight and height. Read the information of 10 persons and print the list of persons details whose weight is in between 35 and 50 kgs.

7. Programs using strings

a) Write a program to find string length.
b) Write a program that will read a text and count all occurrences of a particular alphabet
c) Write a program that will read a string and rewrite it in the alphabetical order. i.e.the word HELLO should be written as EHLLO.
d) Write a program that appends the one string to another string.
e) Write a program that finds a given word in a string.
f) Write a program that checks a given string for palindrome.
g) Write a program to find the number of vowels, blank spaces and other characters in a string.

8. Programs using Pointers

a) Write a program using pointers to read an array of integers and print its elements in reverse order.

b) Write a function to calculate the roots of the quadratic equation. The function must use two pointer parameters, one to receive the coefficients a, b, and c, and the other to send the roots to the calling function.
c) Write a function using pointers to add two matrices and to return the resultant matrix to the calling function.
d) Write a function to swap two values using pointers

9. Programs using Recursion

   a) Write a recursive program to calculate the factorial of a given number
   b) Write a recursive program to print Fibonacci series using recurssion

10. Programs using Files

   a) Write a program to create a file.
   b) Write a program to copy one file into another file
   c) Write a program to merge two files

TEXT BOOK :

1. Yashwanth P. Kanethkar, "Let us C", 8th ed., BPB Publisher, 2007.

REFERENCE BOOK :

1. B.A. Forouzan and R.F. Gilberg, "Computer science, A structured programming approach using C", 3rd ed., Thomson, 2007.

MC127-Internet and Web Technologies Lab

Course Description and Objective*:*

The purpose of this course is to introduce to students to the basics of internet and web technologies like HTML, DHTML, CSS, XML, Javascript, VBScript.

Course Outcomes:

- Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, VBScript and
- protocols in the workings of the web and web applications
- Analyze a web page and identify its elements and attributes.
- Create web pages using HTML, DHTML and Cascading Styles sheets.
- Create web pages using JavaScript
- Create XML documents and XML Schema.
- Build and consume web services.

1. Create a table in HTML to the following details

Book Name	**Author**
Operating Systems	Godbole
Data Communications and Networks	Godbole
Computer Networks	Rajkumar
OOPs	R.Nageswara Rao

2. Create a form by using various attributes of the input tags.

3. Create a web page multiple types of style sheet used in a single page.

4. Write a CGI sample program to send output back to the user.

5. Write a Java Script program by using variables.

6. Write a java script program to multiply two numbers and display the result in separate text box.

7. Write a java script program on Form Validations.

8. Write a AJAX program checking the presence of XMLHttpRequest object.

9. Write a program to create sales report for our books by using AJAX.

10.Create an XML document template to describe the result of students in an examination. The description should include the student's roll number,name,three subject names and marks,total marks,percentage and results.

11. Write an XSLT code to only retrieve the book titles and their prices.

12. Design a basic elements of a home page.

MC129-Communication Skills Lab - I

Objective of the Course:

To introduce students to the specific use of language for the purposes of Communication which would be an essential prerequisite for success in the areas of writing and speech. The teaching efforts in this course will be directed towards making students develop their business and general writing abilities using the fundamental principles that apply to the correct use of the English language free of grammatical and other related errors

Expected Learning Outcome:

Students are made

- to know the various ways to communicate
- to appreciate the intelligent and innovative use of rules
- to be able to generate creative output in tune with the demands of industry.
- To improve their power of comprehension and the ability to express themselves with rigor through writing and speech.

UNIT-1: COMMUNICATION – NATURE AND SCOPE

Communication – Significance – Process – Types – Flow of Communication – Basic Communication Skills – LSRW – Verbal and Non-verbal Communication – Formal Vs Informal Communication – Oral and Written Communication – Barriers to effective communication – organizational communication – Strategic implications of modern communication.

UNIT-2: AURAL AND ORAL COMMUNICATION

Listening – Active and Passive Listening –Barriers to effective listening – Strategies for effective listening – Introduction to presentations – Conversations – Roleplay – JAM – Debate – Extempore – Individual and Group Presentations –Group Discussions – Procedure – participation – Interviews - Business presentations - Addressing large groups – Public Speaking.

UNIT-3: WRITTEN COMMUNICATION

Sentence Structure – Requisites of a good sentence – Writing paragraphs – Principles of writing a good paragraph – Development of paragraphs – Describing people, places, things and processes – Narrating events, incidents – Persuasive communication – Longer composition – Common errors in writing.

UNIT-4: BUSINESS CORRESPONDENCE

Internal Communication – External Communication – Writing a memo – Letter Vs memo – Form and Structure – Circular – Notice – Agenda – Proceedings of meetings – Minutes – Business Letters – Sales Letters – Enquiry – Quotations – Placing orders – Claims – Adjustments – Inviting – Appreciating – Thanking etc. – Writing Emails – Standard Email practices – Email etiquette – Sample Emails.

UNIT-5: REPORTS, PROPOSALS AND PRESENTATIONS

Purpose of writing Reports –Format and Style – Types of reports – Regular reports – Factual reports – Survey reports – Feasibility reports – Business presentations – Format – Key elements for winning business proposals – Business presentations – Planning – Preparing – Organizing – Rehearsing – Improving – Visual aids – Nuances of delivery.

Text Books:

- Koneru, A., “Professional Communication”, 2008, Tata McGraw Hill.
- Bill Mascull, “Business Vocabulary in Use”, 2010, Cambridge University Press.

Reference Books:

- Bovee, C. and Thill, J.V., “Business Communication Today”, 11th edition, 2011, Prentice Hall.
- Francis Soundararaj, “Speaking and Writing for Effective Business Communiation”, 2008, Macmillan.
- RK Madhukar, “Business Communication”, 2010,Vikas Publishing House Pvt. Ltd.
- MallikaNawal, “Business Communication”, 2012, Cengage Learning India.
- Meenakshi Raman & Prakash Singh, “Business Communication”, 2012, Oxford University Press.

Year II Semester I

MC116-Data Structures

DATA STRUCTURES

Course Description and Objective:

The main objective of this course is to provide an introduction to basic data structures and manipulation by using C programming language. It enables the students to understand Abstract Data Types. It also enables the students to understand the behavior of data structures (lists, stacks, queues, trees (binary trees and tree traversals, height-balanced trees), graphs, hash tables). It improves his ability to analyze a problem and determine the appropriate data structure for the problem.

Course Outcome:

Having successfully completed this course, the student will be able to:

- Apply C programming techniques such as pointers, dynamic memory allocation, structures to developing solutions for particular problems.
- Design and implement abstract data types such as linked list, stack, queue and tree in C programming language using static or dynamic implementations.
- Evaluate and choose appropriate abstract data types to solve particular problems.

UNIT – I Introduction, Arrays and Linked Lists

Concept of Data Structures, Implementation of Data Structures Arrays: One-dimensional array, multidimensional arrays, pointer Arrays, linked lists: Types of linked list, applications of linked lists.

UNIT – II Stacks and Queues

Stack:- Introduction to stack, Representation of a stack, operations on stack, applications of stacks; Queue: Representation of Queues, Operations on Queue, various Queue structures, Applications of Queues.

UNIT-III Trees

Trees:- Definition and concepts of trees, Representation of Binary tree, types of Binary trees, Tree Traversals operations of Binary search tree, Introduction to AVL trees.

UNIT-IV Graphs

Graph Terminologies, Representation of Graphs, operations on graphs, Graph traversals, Applications of Graphs, minimum spanning trees.

UNIT-V Sorting and Searching

Sorting Techniques; Insertion sort, selection sort, merge sort, heap sort, searching Techniques : linear search, binary search and hashing.

Text Books:

1. Debasis Samanta, "Classic Data Structures", PHI Learning Private Limited, 2^{nd} edition, 2011.

2. E. Horowiz & S. Sahani, "Fundamentals of Data Structures", Galgotia Book Source Pvt.

Limited, 3^{rd} edition, 2003.

Reference Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education.

2. Sartaj Sahni, Data Structures, Algorithms and Applications in C++ , Universities Press, Second Edition, 2005

3. Jean Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications,Tata Mc-Graw Hill, Second Edition, 26^{th} Reprint 2004

MC118-Database Management Systems

Course Objectives:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Learning Outcomes:

Upon successful completion of this course, students should be able to:

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Improve the database design by normalization.
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

UNIT- I

Database System- concepts and architecture: Data modelling using the Entity Relationship (ER) modelling and Enhanced Entity Relationship (EER) modelling, Specialization and Generalization.

UNIT-II

The Relational Model: Relational database design using ER to relational mapping, Relational algebra and relational calculus, Tuple Relational Calculus, Domain Relational Calculus, SQL.

UNIT-III

Database design theory and methodology: Functional dependencies and normalization of relations, Normal Forms, Properties of relational decomposition, Algorithms for relational database schema design.

UNIT-IV

Transaction processing concepts: Schedules and serializability, Concurrency control, Two Phase Locking Techniques, Optimistic Concurrency Control, Database recovery concepts and techniques.

UNIT-V

Data Storage and indexing: Single level and multi level indexing, Dynamic Multi level indexing using B Trees and B+ Trees, Query processing and Query Optimization, Introduction to database security.

TEXT BOOK:

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems (5/e), Pearson Education, 2008

REFERENCE BOOKS:

1. Silberschatz, Korth, “Data base System Concepts”, 4th ed., McGraw hill, 2006.

2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill, 2003.

3. Peter Rob and Carlos Coronel, Database Systesm- Design, Implementation and Management (7/e), Cengage Learning, 2007.

MC120-Software Engineering

Objective : This course will be helpful for the student to understand the concept of a software life cycle and the role of process maturity models and apply key elements and common methods for elicitation and analysis to produce a set of software requirements. To distinguish between the different types and levels of testing (unit,integration, systems, and acceptance)

.**Learning Outcomes:**

After completing the course attendees will be able to:

- appreciate the wider engineering issues that form the background to developing complex, evolving (software-intensive) systems;
- plan a software engineering process to account for quality issues and non-functional requirements;
- Employ a selection of concepts and techniques to complete a small-scale analysis and design project.
- Interact with a client to elicit input, and communicate progress.
- Employ group working skills - including general organization, planning and time management, inter-group negotiation, etc.
- Translate a specification into a design, and then realize that design practically, all using an appropriate software engineering methodology.
- Reflect on the appropriateness of different software engineering methodologies in different circumstances.
- Demonstrate knowledge of the wider software engineering context, software engineering processes and their applicability.

UNIT - I

Introduction to Software Engineering : Software engineering, The software process, Software myths**.** A generic process model, Process assessment and improvement, Descriptive process models.

UNIT - II

Requirement Engineering and Modelling: Requirement engineering, Building requirement models

Requirements analysis, Scenario based modeling, Data modeling concepts, Class based modeling, Flow oriented modeling, Creating a behavioral model

UNIT - III

Design concepts and Architectural design: The design process, design concepts, the design model. Software architecture, Architectural styles, architectural design.What is a component, Designing class based components, conducting component level design, Golden rules, user interface analysis and design.

UNIT - IV

Software Testing: A strategic approach to software testing, test strategies for conventional software, Validation Testing, System Testing.

White box testing, Basis Path Testing, Control Structure Testing, Black Box Testing.

UNIT - V

Product metrics and Quality : Metrics for requirement model, Metrics for design model, Metrics for source code model, Metrics for testing model, Metrics for maintenance model. Introduction to Software quality.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering – A practitioner's Approach",Seventh Edition,McGraw-Hill International Edition

2. Ian Somerville,"Software Engineering", 7th Edition, International Computer Science Series.

REFERENCES BOOKS:

1. K.K. Agarwal & Yogesh Singh," Software Engineering" ,New Age InternationalPublishers

2. Waman S Jawadekar, "Software Engineering principles and practice", The McGraw-Hill

MC122-Probability and Statistics

Course description and Objectives:

Aim of this course is to introduce statistical techniques which are useful in every walk of life. It also introduces some probability which has many applications. By the end of the course, student would have learned regression,correlation techniques, probability, distributions, test of hypothesis and their applications.

Course outcomes:

The students will understand

- the use of statistical techniques in every walk of life.
- The statistical techniques like regressions, correlation can be used for finding qualitative and quantitative relation between two or more variables
- Probability , probability distributions can be used in many places like academics ,real life problems for decision making.
- Test of hypothesis will be useful for them in taking decisions .
- All these topics are useful in academics as well as in research work.
- They find applications at work places as well as in their real life.

UNIT I - Descriptive Statistics

Basic Definitions, Frequencies, Graphical Representation, Histogram, Ogive curves, Measures of Central tendency, Arithmetic mean, Median, Mode, mean deviation, standard deviation, Symmetry and Skewness, Karl Pearson's Coefficient of skewness.

UNIT II - Curve Fitting and Correlation, Regression

Least squares method, curve fitting (straight line and parabola only) Covariance, Correlation, Types, Pearson's Coefficient of correlation, Rank correlation, Spearman's rank correlation. Regression, Regression lines, multiple regression.

UNIT III - Probability

Introduction, Definition (Classical and Axiomatic approach), Addition theorem, Conditional probability, Multiplication theorem, Total probability, Bayes theorem.

UNIT IV - Distributions

Random variables, Discrete and Continuous variables, Introduction to Distributions.

Binomial distribution : Definition, Mean and Standard deviation, Recurrence relation, Applications, Fitting of binomial distribution.

Poisson Distribution : Definition, Mean and Standard deviation, Recurrence relation, Poisson Distribution is an approximation of Binomial distribution, Applications, Fitting of Poisson distribution.

Geometric Distribution : Definition, Properties.Normal Distribution : Definition, Normal curve, Mean and Standard deviation,

Median, Mode, Normal Distribution applications, Normal Distribution is an approximation to Binomial distribution.

Exponential Distribution : Definition, Properties.

UNIT V - Sampling Methods

Population and Sampling, Parameters and Statistics, Types of sampling, Sampling Distributions, Central limit theorem, Standard Error of mean from infinite population, Standard deviation of variance.Test of hypothesis and test

of significance, confidence limits, confidence interval, Test of significance of Large samples, T-distribution, Chi square test.

TEXTBOOKS :

1. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand & Co., New Delhi, 2011.

2. Miller and Fruinds, Fundamentals of Probability and Statistics, PHI publication, 2003.

REFERENCEBOOKS :

1. S.C. Gupta and V.K .Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand & Co., New Delhi, 2005.

2. B.V. Ramana, “Higher Engineering Mathematics”, 3rd Edition, Tata McGraw-Hill Publishing Co, 2008.

MC124-Computer Based Optimization Techniques

Objectives: To well ground students in the mathematical, engineering, and modeling skills that are the basis for computer based optimization techniques, and they will be prepared to apply those skills to the efficient design, analysis, operation and control of complex systems.

Learning Outcomes:

- Proficiency with tools from optimization, probability, statistics, simulation, and engineering economic analysis, including fundamental applications of those tools in industry contexts involving uncertainty and scarce or expensive resources.
- Facility with mathematical and computational modeling of real decision-making problems, including the use of modeling tools and computational tools, as well as analytic skills to evaluate the problems.
- Facility with the design, implementation, and analysis of computational experiments.

UNIT - I (10 Hrs)

Introduction: History and Development of OR,Types of models ,General methods for solving Operations Research models, Charecteristics, Phases, scientific method .**Linear Programming And IT's Applications:** Introduction,Linear programming formulation, Graphical solution , Simplex method, Artificial variable technique and Duality principle.

Transportation Problem: Mathematical formulation, Optimal solution, Degeneracy and Un-balanced Transportation

problem. **Assignment Problem:** Mathematical formulation, Optimal solution,Un-balanced assignment problem and variations.

UNIT - II (13 Hrs)

Replacement: Introduction, replacement of items that deteriorate when money value is not constant and constant, replacement of items that fail completely.**Job Sequencing:** Introduction, Principal assumption, solution of sequencing problem, optimal solution for processing n-jobs through two, three machines.

UNIT – III (13 Hrs)

Inventory Control: Meaning of. Inventory Control, Types,Reasons for carrying Inventory, economic lot size, quantity discounts, Deterministic models.

UNIT - IV (12 Hrs)

Network Models : Definitions – CPM and PERT – Their Algorithms Integer Programming : Branch and Bound Algorithms cutting plan algorithm.

UNIT - V (12 Hrs)

Theory of Games: Introduction, Minimax (maximin) criterion and optimal strategy, solution of games with saddle points, rectangular games with out saddle points, 2 X 2 games, dominance principle, m X 2 & 2 X n games, graphical method.

Dynamic Programming: Introduction, Bellman's Principle of optimality, solution of problem with finite number of stages, shortest path problem, linear programming problem.

TEXT BOOKS :

1. S.D.SHARMA : Operations Research

2. P.K.GUPTA & D.S.HIRA : Operations Research

REFERENCE BOOKS :

1. R.D.ASRHEDKAR & R.V.KULKARNI : Operations Research.

2**.** KAPPOR V.K **:**Operations Research

MC126-Data Structures Lab

Course Description and Objectives:

The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures .

Course Outcomes:

At the end of this lab session, the student will

- Be able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Have practical knowledge on the applications of data structures

List of Experiments:

1. Design and Implement List data structure using i) array ii) singly linked list.
2. Design and Implement basic operations on doubly linked list.
3. Design and Implement stack using i) array ii) singly linked list
4. Design and Implement Queue using i) array ii) singly linked list
5. Design and Implement basic operations on Circular Queue
6. Design and Implement basic operations(insertion, deletion, search, findmin and findmax) on Binary Search trees.
7. Implementation of Breadth First Search Techniques.
8. Implementation of Depth First Search Techniques.
9. Implementation of Searching Techniques.
10. Implementation of Sorting Techniques.

References

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
4. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, Tata McGraw-Hill.
5. Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, W. H. Freeman and Company.
6. R. G. Dromey, How to Solve it by Computer, Prentice-Hall of India.

MC128-Database Management Systems Lab

Learning Outcomes:

The student will be familiarized with

- Familiarization of Oracle RDBMS
- Data Definition, Table Creation, Constraints, Insert, Select Commands, Update and Delete Commands.
- Nested Queries and Join Queries
- Views
- Design and development of database using Oracle
- High level programming language extensions (Control structures, Procedures and Functions).
- Front end Tools
- Forms
- Triggers
- Menu Design
- Reports.
- Case Study/ Database application project.

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.

2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, EXCEPT and Constraints.

3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

4. i) Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)

ii) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block

5. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, User defined Exceptions, RAISE- APPLICATION ERROR.

6. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

7. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.

8. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.

9. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

10. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

TEXT BOOKS:

1. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc-Graw Hill.

2. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

3. SQL and PL/SQL for oracle 9i, Ivan Byross.

4. Oracle certified associate Mysql beginner's guide.

5. Oracle certified associate Oracle 10g &11g SQL fundamentals.

MC130-Statistical Techniques Lab

Course Description & Objectives:

The course provides a basic knowledge of statistics and make the students familiar with the software for statistics. It enables the students learn to solve simple technique which helps them to make analysis and effective decision making.

Course Outcomes:

The student will be able

- to learn basics of statistics
- and familiar with the software for statistics.
- to interpret and analyse data

List of Experiments:

1. Tabulation of data
   a) One way Frequency
   b) Two way Frequency
2. Construction of Histogram
3. Construction of Pie Chart
4. Construction of Line Chart
5. Construction of Scatter Chart
6. Descriptive Statistics
7. Correlation Analysis
8. Simple Regression Analysis
9. Multiple Regression Analysis
10. Fitting a trend line to an observed data

11. Polynomial Trends
12. Logarithmic, power and exponential trends
13. Moving averages

REFERENCE BOOK

1. K.V.S Sharma, “Statistics Made Simple Do it yourself on PC” TMH, Second Edition (2002)

MC 217 - OBJECT ORIENTED PROGRAMMING

Course Objectives:

To make the student able to understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries. To make the student able to write computer program to solve specified problems, by using the Java SDK environment to create, debug and run simple Java programs.

Learning Outcomes:

The student is expected to have the

- Understanding of OOP concepts and basics of java programming (Console and GUI based)
- Skills to apply OOP and Java programming in problem solving
- Should have the ability to extend his knowledge of Java programming further on his/her own.

UNIT – I Introduction, Classes and Objects

Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects Class fundamentals – Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT –II Inheritance, Packages and Interfaces

Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces.

11. Polynomial Trends
12. Logarithmic, power and exponential trends
13. Moving averages

REFERENCE BOOK

1. K.V.S Sharma, "Statistics Made Simple Do it yourself on PC" TMH, Second Edition (2002)

MC 217 - OBJECT ORIENTED PROGRAMMING

Course Objectives:

To make the student able to understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries. To make the student able to write computer program to solve specified problems, by using the Java SDK environment to create, debug and run simple Java programs.

Learning Outcomes:

The student is expected to have the

- Understanding of OOP concepts and basics of java programming (Console and GUI based)
- Skills to apply OOP and Java programming in problem solving
- Should have the ability to extend his knowledge of Java programming further on his/her own.

UNIT – I Introduction, Classes and Objects

Creation of Java, Importance of Java to Internet, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Data types, Variables, Declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting, Compiling and running of simple Java program, Concepts of classes and objects Class fundamentals – Declaring objects, Assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT –II Inheritance, Packages and Interfaces

Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages, Differences between classes and interfaces, Defining an interface, Implementing interface, Applying interfaces, Variables in interface and Extending interfaces.

UNIT – III Exception Handling, Multithreading

Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating own exception Sub classes, Concepts of Multithreading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, deadlocks, Thread groups.

UNIT – IVApplets and Event Handling & AWT Controls

Applet Class, Applet Architecture, Applet Skeleton - Applet Initialization and Termination, Overriding update(), Simple Applet, Display Methods, Requesting Repainting - A simple banner Applet, Using The Status Window, The HTML APPLET Tag, Passing parameters to Applets, Applet Context and show Document.

Event sources, Event classes – ActionEvent, AdjustmentEvent, ComponentEvent, Container Event, Focus Event, InputEvent, ItemEvent, KeyEvent and MouseEvent, Delegation event model, Event Listeners, Handling mouse and Keyboard events, Adapter classes.

UNIT – VAWT&Swing

Concepts of components, Container, Panel, Window, Frame, Canvas, Font class, Color class and Graphics. AWT Controls : Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers - Flow, Border, Grid, Card and Grid bag.

JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, Text fields, Buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS

1. Herbert Schildt, “The Complete Reference Java J2SE”, 7th ed., TMH Publishing Company Ltd, New Delhi, 2008.

2. Joe Wiggles worth and Paula McMillan, “Java Programming Advanced Topics”, 3rd ed., TMH, 2009.

REFERENCE BOOKS

1. Cay Horstmann, “Big Java”, 2nd ed., John Wiley and Sons, 2006.

MC 219 - OPERATING SYSTEMS

Course Objectives:

To make the student understand how the operating system effectively manages system resources.

Course Outcomes:

The student will

· Understand the types of Operating systems and analyze the process scheduling Algorithms and Case study on processing Scheduling.

· Understand the resource sharing among the processes in the system.

· Understand how to manage the memory during the process execution (Memory Management) and File Management system.

UNIT I - Introduction

What Operating System do, Operating System structure. Process Concept:Overview, Process scheduling, Operations on process, Inter processcommunication. Process Scheduling: Scheduling Criteria, SchedulingAlgorithms, Multiple-Processor Scheduling, Case Study: Process scheduling

in Linux.

UNIT II - Process Synchronization

The Critical-Section Problem, Peterson's Solution, Synchronization Hardware,Semaphores, Monitors, Classical problems of synchronization, Case Study :Process Synchronization in Linux.

UNIT III - Deadlocks

Deadlock Characterization, Methods of Handling Deadlocks, Deadlockprevention, Deadlock avoidance, Deadlock Detection and Recovery.

UNIT IV - Memory Management

Continuous memory allocation, paging, structure of the page table,segmentation, demand paging, page replacement algorithms.

UNIT V - File System

File Concept, Access Methods, Directory Structure, File System Mounting,File Sharing, Protection, File-System Structure, File System Implementation,Directory Implementation, Allocation Methods, Free Space Management.

Secondary-Storage Structure: Overview of Mass-Storage Structure, DiskStructure, Disk Scheduling, RAID Structure.

TEXTBOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "OperatingSystem Principles", 7th edition, John Wiley & Sons Inc, 2006.

REFERENCEBOOKS:

1. William Stallings, "Operating Systems – Operating System: Internals andDesign Principles", 6th edition, , Prentice Hall, 2005.

2. Andrew S Tanenbaum ,"Modern Operating Systems", 3rd edition, , PrenticeHall, 2007.

MC 221 - Computer Networks

Course Objectives:

This course will focus on imparting knowledge about the aspects of data communication and computer network systems with the required basic principles behind them. To provide essential knowledge about the OSI model and TCP/IP model. To create a good foundation covering the physical, data link, network, transport and application layers.

Course Outcomes:

To understand the communication basics.

To have the knowledge of different networks.

To know about different protocols.

To understand how to find the routes by using different routing algorithms.

To Understand the basics of Internet.

UNIT – I Introduction

Use of computer networks, network hardware, network software, reference models, examplenetworks

UNIT – II Physical layerandMedium access control sublayer

Guided Transmission Media, The Data link layer: design issues, Error detection &correction, elementary data link protocols, sliding window protocols.

The channel allocation problem, Multiple access protocols, Data Link Layer Switching.

UNIT – III Network Layer

Design issues, routing algorithms, congestion control algorithms, quality of service, Internetworking, the network layer in the Internet.

UNIT – IVTransport layer

The transport service, elements of transport protocols, the internet transport protocols: UDP& TCP.

UNIT – VApplication Layer

DNS-Domain Name System. The World Wide Web, Multimedia.

TEXT BOOK:

1. Andrew S Tanenbaum, "Computer Networks", 4th ed., Pearson Education, 2003.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, "Data communications and Networking", 3rd ed.,TMH, 2003.
2. William Stallings, "Data and Computer Communications", 7th ed., Pearson Education, 2004.

MC 223 – Advanced Data Structures

Course Objectives:

Describe and implement a variety of advanced data structures (hash tables,priority queues, balanced search trees). Demonstrate an understanding of external memory and external search and sorting algorithms. Data structures

for querying large collections of large strings.

Emphasis on object-oriented design, writing and documenting medium-sized programs.

Course Outcomes:

At the end of the course students should be able to :

· Analyze run-time execution of sorting methods.

· Understand and implement priority based queues;

· Understand and implement binary search trees;

· Understand and analyze heap sort;

· Knowledge on basic search and sort algorithms. Adequate knowledge to choose appropriate data structure and algorithm to solve a problem.

UNIT I - Sorting

Internal sorting -Insertion sort, Selection sort ,Shell sort , Bubble sort ,Quick sort ,Merge sort, radix sort. External sorting -Multi way merge. Searching Sequential search, Binary search and ternary search.

UNIT II - Hashing

General Idea, Hash function, separate chaining, linear probing, quadratic probing, double hashing, rehashing. Priority queues- Applications, heap sort,

Huffman codes.

UNIT III - Tree

Representation –insertion, deletion , searching. Balanced Search Trees AVL Trees: Representation –insertion, deletion , searching. Binary Search trees Red black trees: Representation –insertion, deletion , searching. B-Trees – Representation – insertion, deletion , searching.

UNIT IV - Graphs

Graph Representation, Graph Traversals, Shortest Paths Problems (Dijkstras Algorithm, Floyd warshalls Algorithm) Connectivity – Directed and Undirected Graphs, Minimum spanning trees- Prims Algorithm, Kruskals Algorithm, Topological Sort

UNIT V - Text Processing

String operations, pattern matching problems, Tries, Text compression, Text similarity testing. Sub string search problems: brute force method , knuth morris pratt, Boyer moore algorithm.

TEXT BOOKS:

1. Sartaj Sahni, Data Structures, Algorithms and Applications in Java, Universities Press, Second Edition, 2005.

2. A.Drozdek Data Structures and Algorithms in Java, 3rd edition, , Cengage Learning, 2008.

REFERENCEBOOKS:

1. Michael T Goodrich Roberto Tamassia, David Mount “Data Structures &

Algorithms in C++” WSE, WILEY, 2014.

2. Jean Paul Tremblay and Paul G. Sorenson, An Introduction to Data

Structures with Applications,Tata Mc-Graw Hill, Second Edition, 26thReprint 2004.

MC 225 - Principles of Management and Organization Behavior

Course Objectives:

The course provides the basic perspectives of management theories and practices and organization behaviour. This enables the students in knowing and understanding the functions of management, culture in organization, personality.

UNIT - I

Introduction to Management: Concept of Management…, nature of management – importance of management – functions of management … evoloution of management thought – scientific management – Modern management – human relations theories – management Vs administration.

UNIT - II

Planning: Importance – advantages – disadvantages – types of plans – process of planning – steps involved in planning, Techniques of planning – decision – Decision Making – Process

Organizing: Principles of organization – types of organization structures, merits, demerits and suitability – Departmentation, Centralization and decentralization

UNIT - III

Directing and Controlling: Meaning and Nature of Directing – leadership, Communications – formal and informal communication.

Controlling: Importance – Process and Techniques of controlling

UNIT - IV

Organizational Behaviour: Organizational Behaviour – Meaning – Nature and Scope of Organizational Behaviour – Contributions of different disciplines of OB – Context of OB – Organizational and Environmental context levels of OB

UNIT - V **(10 Hrs)**

Individuals in organization – Perception – Personality – Attitudes – Group & Teams – Team Process & Development – Organizational Culture: Meaning and Components.

Text Books:

1. P. Subba Rao, "Management & OB" Himalaya Publishing House, 2008
2. Mullins, " M & OB" 5 th Edition, Pearson Education, 2007
3. Rama Swamy, :Principles of Management", Himalaya Publication,2010.
4. L.M.Prasad, 'Principles and Practices of Management", Sultan Chand.

Reference Books:

1. Jonus A.F. Stoner, "Management" Thomson
2. Heinz Weihrich, Harold Koontz: *Management A Global Perspective*, TMH, 10/e, 2002.
3. Stephen P. Robbins Mary Coulter, "Management", PHI, 8/e, 2006.
4. Luthans, Fred: OrganisationalBehaviour 10/e, THM, 2007.
5. Robbins, P Stephen, Timotny A judge: OrganisationBehaviour, 12/e, PHI, New Delhi, 2007.

MC227 - Object Oriented Programming Lab

Course Objectives:

This course is introduced to understand the basic concepts of Java,Classsyntax, data types, flow of control, classes, methods, objects, arrays, exceptionhandling, recursion, and graphical user interfaces (GUIs). Writing and testing applets for potential inclusion in web pages. Understanding how to accessenterprise data bases from the application programs.

Course outcomes:

The student is expected to have hands on experience with the following:

1. Basics of Java programming, multi-threaded programs andException handling

2. The skills to apply OOP in Java programming in problem solving

3. Use of GUI components (Console and GUI based)

List of Experiments:

1. Write a Java program that prompts the user for an integer and thenprints out all prime numbers up to that. Integer.

2. Write a Java program that checks whether a given string is a palindromeor not.

Ex: MADAM is a palindrome.

3. Write a Java program for sorting a given list of names in ascendingorder.

4. Write a Java Program that reads a line of integers, and then displayseach integer, and the sum of all the integers (use StringTokenizer class)

5. Write a Java program that reads a file and displays a file and displaysthe file on the screen, with a line number before each line.

6. Write a Java program that displays the number of characters, lines andwords in a text file.

7. Write a Java program for creating multiple threads

a) Using Thread class.

b) Using Runnable interface.

8. Write a Java program that illustrates how run time polymorphismisachieved.

9. Write a java program that illustrates the following

a) Creation of simple package.

b) Accessing a package.

c) Implementing interfaces.

10. Write a java program that illustrates the following

a) Handling predefined exceptions.

b) Handling user defined exceptions

11. APPLETS

a) Working with Frames and various controls.

b) Working with Dialogs and Menus.

c) Working with Panel and Layout.

d) Incorporating Graphics.

e) Working with colors and fonts

12. SWINGS

Jpanel- Jframe – Jtoolbar—JwindowFramework

REFERENCEBOOKS:

1. Dietel&Dietel, Java How to Program, 5th Edition, Pearson Education,2009.

2. P.J.Deitel and H.M.Deitel, Java for Programmers, Pearson education,PHI, 2008.

3. P.Radha Krishna, Object Oriented Programming through Java,Universities Press, 2010.

4. Bruce Eckel, Thinking in Java, Pearson Education, 2010.

5. S.Malhotra and S.Choudhary, Programming in Java, Oxford Univ. Press,2009.

MC229 - Advanced Data Structures Lab

Course Objectives:

The fundamental design, and implementation of data structures. Principles for good program design, especially the uses of data abstraction.

Course Outcomes:

At end of this laboratory the student will be able to

· Write well-structured object-oriented programs of medium size of

code.

· Write programs and class libraries given a specification.

· Students will collaboratively design and then individually implement

a robust set of tools to efficiently and elegantly organize data, with

optimized access methods.

List of Programs:

1. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in

a) Preorder b) Inorder c) Postorder.

2. Write a Java program to perform the following operations:

a) Construct a binary search tree with given elements.

b) Search for a key element in the above binary search tree.

c) Delete an element from the above binary search tree.

3. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:

a) Linear search b) Binary search

4. Write a Java program to implement priority queue ADT.

5. Write Java programs for implementing the following sorting methods:

a) Bubble sort b) Insertion sort c) Radix sort

6. Write Java programs for implementing the following sorting methods:

a) Quick sort b) Merge sort

7. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.

8. Write a Java program to perform the following operations:

a) Insertion into a B-tree b) Searching in a B-tree

9. Write a Java program that implements KMP algorithm for pattern matching.

REFERENCEBOOKS:

1. A.Drozdek, Data Structures and Algorithms in Java, 3rd edition, Cengage Learning, 2008

2. J.R.Hubbard, Data Structures with Java, 2nd edition, Schaum's Outlines, TMH, 2013.

3. S.Sahani Data structures, Algorithms and Applications in java, 2nd Edition, Universities Press, 2009.

MC 231 - Communication Skills Lab-2

Course Objectives:

The Soft Skills Laboratory course is aimed at training undergraduate students and enabling them to acquire employability skills. Designed to impart work related skills, the course will help trainees develop interpersonal communication, leadership and team skills. It will give them the required competence and confidence to handle professional tasks.

Training Methodology:

The training methodology is designed to bring about changes in attitudes through experience-based learning. Activities in simulated environments such as role plays, group discussions, micro-presentations, audio-video clippings, case studies, psychometric tests etc., will provide students insights into their strengths and weaknesses.

Course Outcomes:

The Soft Skills course will help students develop professional and non-personal ways of approaching people and work through the correct use of language and speech in a workplace environment along with the ability to think critically on issues demanding attention. This includes enhancing self-awareness and a sense of self-worth in the students in order to improve their productivity and performance at the workplace.

Course Contents:

UNIT-I:

a) Role of language in Personality – How language reflects, impacts personality – Using gender-neutral language in MNCs – being culturally sensitive.

Activity – Appraising each other – Worksheets related to the above

b) Career Planning- job vs. career- goal setting- SWOT analysis- planning and prioritization - four quadrant time management system - time management – self-management – stress-management.

Activity: Setting a SMART goal - SWOT analysis of the self – Writing a Statement of Purpose (SOP).

c) Effective Resume-Writing: structure and presentation - planning and defining the career objective - projecting one's strengths and skill-sets – summarizing - formats and styles - covering letter.

Activity: Resume preparation –writing a covering letter..

UNIT-II:

A) Functional English - Formal/informal context – purpose - interpersonal dynamics - ideation –content organization - initiating a conversation –responding appropriately - right body language.

Activity - Role play in different situations, - self-introduction - social background (family, home town etc.,) - role model - my future - likes/dislikes (movies, persons, places, food, music etc.,) - a mini project on functional English.

b) Vocabulary-Building: Etymology of words - word roots - prefixes & suffixes - synonyms & antonyms-collocations - one-word substitutes – analogies - idioms and phrases - contextual guessing of unfamiliar words – task-oriented learning (100 words).

Activity: Flash cards (200 words) – vocabulary exercises with hand-outs.

UNIT-III:

a) Group Discussion: Articulation and flow of oral presentation - dynamics of group discussion – intervention – summarizing - voice modulation – content generation – Key Word Approach (KWA) – Social, Political, Economic, Legal and Technical Approach (SPELT) – View Point of Affected Part (VAP) - language relevance

- fluency and coherence.

Activity: Mock sessions on four types of GD topics.

b) Facing Interviews: Interview process - understanding employer expectations - pre-interview planning - opening strategies - answering strategies – stress-based interviews - tele-interviews, video interviews- frequently asked questions (FAQs).

Activity: Writing responses to FAQs - mock interviews.

UNIT-IV:

a) Reading Comprehension: Reading as a skill- techniques for speed reading- skimming- scanning- appreciating stylistics - impediments for speed reading - eye fixation - sub-vocalisation - critical reading - reading based on purpose - reading for information - reading for inference -understanding tone.

Activity: Reading comprehension exercises with texts drawn from subject areas. (Hand-outs)

b) Listening Comprehension: Listening as skill - different types of listening - hidden data of communication - active listening - top-down approach - bottom-up approach.

Activity: Following different accents (Indian, British, American) listening comprehension exercises with audio and video excerpts.

UNIT-V:

a) Data Commentary: Deductive & inductive reasoning - data interpretation - tables & charts - bar charts - pie charts - line graphs - ratios & proportions – percentages - coding and decoding - reasoning by analogy - artificial language etc.,

b) Analytical Thinking: Statement and Conclusion - Data Sufficiency - Statement and Argument - Statement and Assumption - Logical Deduction - Logical Problems.

Activity: Exercises with handouts.

Reference Books:

1. Edward Holffman, Ace the Corporate Personality, McGraw Hill,2001
2. Adrian Furnham, Personality and Intelligence at Work, Psychology Press, 2008.
3. John Adair Kegan Page, “Leadership for Innovation” 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, “Effective Technical Communication”, 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan & NP Singh , “Speaking English Effectively” 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect
7. K.R. Lakshminarayana& T. Murugavel, “Managing Soft Skills”, Scitech Publications. 2009
8. Dr. S.P. Dhanvel, English and Soft Skills, Orient Blackswan, 2011
9. Rajiv K. Mishra, Personality Development-, Rupa& Co. 2004.
10. R.S.Agarwal, Quantitative Aptitude, S. Chand& Co. Latest edition.
11. R.S.Agarwal, Verbal & Non-verbal Reasoning, S. Chand& Co. Latest edition.

MC 226 - Object Oriented Analysis and Design

Course Objectives:

To gain enough competence in object-oriented software Engineering (OOSE) to tackle a complete Object Oriented project. Acquire UML, a common language for talking about requirements, designs, and component interfaces. Understand the main principles of good Object Oriented Design. Understand what major tasks are appropriate to developing Object Oriented models and software and the issues and options in reuse and component based development.

Course Outcomes

- To understand the fundamental principles of OO programming.
- To master key principles in OO analysis, design, and development.
- Be familiar with the application of the Unified Modeling Language (UML) towards analysis and design.
- To know common patterns in OO design and implement them.
- To be familiar with alternative development processes.
- rocesses.

UNIT –I Introduction to UML

Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT – II Basic Behavioral Modeling and Basic Structural Modeling

Use cases, Use case Diagrams, Interactions, Interaction diagrams, Activity diagrams.

Classes, Relationships, common Mechanisms, and diagrams.

UNIT – III Class & Object Diagrams

Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT – IV Advanced Structural Modeling and Behavioral Modeling

Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT – V Architectural Modeling

Component, Deployment, Component diagrams and Deployment diagrams.

TEXT BOOKS:

1. Booch G., Rumbaugh J. &Jacobsons I., “The Unified Modeling Language User Guide”, Addison Wesley, 2002.

REFERENCE BOOKS:

1. Meilir Page-Jones, “Fundamentals of Object Oriented Design in UML”, 4th ed., Pearson Education, 2008.
2. Pascal Roques, “Modeling Software Systems Using UML2”, 2nd ed., WILEY- Dreamtech India Pvt. Ltd, 2004.
3. AtulKahate, “Object Oriented Analysis & Design”, 1st ed., The McGraw-Hill Companies, 2008.
4. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, “UML 2 Toolkit”, 1st ed., WILEYDreamtech India Pvt. Ltd., 2003.

MC 228 - Middleware Technologies

Course Objectives:

The main objective of this course is to get on awareness of a the various technologies which can help in the implementation of the various live project

Course Outcomes:

Upon completion of the subject, students will be able to:

- Understand the basic structure of distributed systems;
- Understand the motivation of using middleware;
- Understand the basic concepts underlying the ASP.net and C#.net;
- Learn to make judgment in choosing a suitable middleware for application problems;
- Understand the basic concepts of Web Services and EJB.

UNIT I - Emergence of Middleware

Introduction,Objects, Web Services,Middleware Elements, Vendor Architecture, interoperability,Middleware in distributed applications, Types of Middleware,RMI, JDBC,Client/Server CORBA Style.

UNIT II - ASP.NET

Introduction, Lifecycle, Server Controls, Basic Controls, Directives, Validators, Database Access, ADO.Net, File Uploading, Data Sources, Data Binding, Custom Controls, Security, Data Caching, Multithreading, Deployment.

UNIT III - Fundamentals of C#& .NET platform

Comprehensive .NET Assemblies. OOPs with C#, Attributes, Reflection, Properties, Indexers ,Delegates ,Events, Collections, Generics, Anonymous Methods, Unsafe Codes and Multithreading

UNIT IV - Web Services

Introduction, Architecture, Components, Security, XML Web Service Standards, Creating Web Services, Extending Web Services, Messaging Protocol, describing, discovering, securing

UNIT V - EJB

Java Bean Component Model, EJB Architecture, Session Bean, Java Message Service, Message Driven Bean, Entity Bean

TEXT BOOKS:

1. Wortgang Emmerich John,"Engineering Distributed Objects", Wiley, 2000.
2. Mesbah Ahmed, Chris Garrett, Jeremy Faircloth, Chris Payne, DotThatCom.com, "ASP.net web developer guide", Wei Meng Lee (Series Editor),Jonothon Ortiz (Technical Editor),Syngress Publications, 2001.

REFERENCE BOOKS:

1. Andrew Troelsen, "C# and the .NET Platform",Apress Wiley-dreamtech, India Pvt.Ltd, 2011.
2. ".NET Web Services-Architecture and Implementation", Keith Ballinger, Pearson Education, 2002.

MC 230 - Formal Languages and Automata Theory

Course Objectives:

The purpose of this course is to acquaint the student with an overview of the theoretical foundations of computer science from the perspective of formal languages. Classify machines by their power to recognize languages. Employ finite state machines to solve problems in computing. Explain deterministic and nondeterministic machines.

Course Outcomes:

As a result of the content and structure of this course, students should be able to:

- Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

- Create Automata to accept strings from various simple languages.
- Understand Formal Grammars.
- Beware of the Regular, Context-Free and Context-Sensitive languages.

UNIT I - Introduction & Notations

Alphabets, Strings and Languages; Automata and Grammars, Regular Languages. Deterministic finite Automata (DFA)-Formal Definition. State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem. FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT II - Regular expressions

Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages. (Proofs not required)

UNIT III - Grammar Formalism

Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, Context Free Grammar, Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs. (Proofs not required)

UNIT IV - Push Down Automata

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT V - Turing Machines

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Computable functions, Types of Turing machines, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP.

TEXT BOOK :

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", 2nd ed., Pearson Education, 2007.

REFERENCE BOOKS:

1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", 2nd ed., PHI, 2004.
2. Martin J. C., "Introduction to Languages and Theory of Computations", 2nd ed., TMH, 2005.
3. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", 2nd ed., PHI, 2009.

Electives - I

MC 232 - Embedded Systems

Course Objectives:

Emphasis on Comprehensive treatment of Embedded Hardware and Real Time Operating systems along with case studies in tune with the requirements of Industry. The example-driven approach will put students on a fast track to understanding embedded-system programming and applying what they learn to their projects.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Understand what is a embedded system and microcontroller.
- Understand different components of a microcontroller and their interactions.
- Become familiar with programming environment used to develop embedded systems
- Understand key concepts of embedded systems like I/O, timers, interrupts, interaction with peripheral devices

UNIT I - Introduction to Embedded Systems

Definition, Applications of ES, Examples of Embedded Systems, Embedded Hardware Units and Devices, Embedded Software, Design Metrics in ES, Challenges in ES Design.

UNIT II - Architecture of 8051

8051 Micro Controller Hardware, Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT III - Programming Model of 8051

Data Transfer and Logical Instructions , Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, Further Details on Interrupts.

UNIT IV - Real Time Operating Systems

Introduction**,** Tasks and Task States, Tasks and Data, Reentrancy, Semaphores and Shared Data, Basic Design Principles, Inter Process Communication: Message Queues, Mailboxes and Pipes.

UNIT V - Embedded Software Development

Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment, Host and Target Machines, Linker/Locator for Embedded Software, getting Embedded Software into the Target System.

TEXT BOOKS:

1. Raj Kamal, “Embedded Systems”, 2nd ed., TMH, 2009.

2. Kenneth J. Ayala, Thomson, “The 8051 Microcontroller”, 3rd ed., 2008.

REFERENCE BOOKS :

1. David E. Simon, “An Embedded Software Primer”, 1st ed., Pearson Education, 2008
2. Wayne Wolf, “Computers as Components-principles of Embedded

   Computer system Design”, 1st ed.,Elseveir, 2009.

1. Labrosse “Embedding system building blocks”, 2nd ed., CMP Publishers, 2007.
2. Ajay V Deshmukhi,” Micro Controllers”, 1st ed., TMH, 2008.
3. Frank Vahid, Tony Givargis, John Wiley, “Embedded System Design”, Microcontrollers, 3rd ed.,Pearson Education, 2008.

MC 234 - Human Computer Interaction

Course Objectives:

The student will learn how interaction with computers takes place at user interface, which comprises both hardware and software. To facilitate communication between students of psychology, design, and computer science on user interface development projects. To facilitate communication between students of psychology, design, and computer science on user interface development projects.

Course Outcomes:

- The student will learn, The importance of User Interface and interaction with computers using a Graphical User Interface and Keyboard and function keys along with video drivers
- To provide the future user interface designer with concepts and strategies for making design decisions.
- To expose the future user interface designer to tools, techniques, and ideas for interface design.
- To introduce the student to the literature of human-computer interaction.

UNIT I - Introduction

Importance of user Interface - definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface - popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user - Interface popularity, characteristics- Principles of user interface.

UNIT II - Design process

Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business functions.

UNIT III - Screen Designing

Screen Designing:- Design goals - Screen planning and purpose, organizing screen elements, ordering of screen data and content - screen navigation and flow - Visually pleasing composition - amount of information - focus and emphasis - presentation information simply and meaningfully - information retrieval on web - statistical graphics - Technological consideration in interface design.

UNIT IV - Windows

New and Navigation schemes selection of window, selection of devices based and screen based controls. Components - text and messages, Icons and increases - Multimedia, colors, uses problems, choosing colors.

UNIT V - Software tools

Specification methods, interface - Building Tools. Interaction Devices - Keyboard and function keys - pointing devices - speech recognition digitization and generation - image and video displays - drivers.

TEXT BOOKS:

1. Wilbert O Galitz “The essential guide to user interface design”, Wiley Computer publishing 2nd edition.
2. Ben Shneidermann,CatherinaPlaisant “Designing the user interface”, Pearson Education Asia. 3rd Edition 2007,

REFERENCE BOOKS:

1. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg “Human - Computer Interaction” Pearson Education
2. Rogers, Sharps “Interaction Design Prece”, Wiley Dreamtech,

MC236 - Open Systems For Web Technologies

Course Objectives:

It makes familiar of Open Source technologies like LINUX, MySQL, CGI, PHP, Webserver and various tools which are used to develop web programming.

Course Outcomes:

- Students can develop web pages using HTML
- Can write dynamic web pages
- Can write server programs handling database connection
- Can generate responses accordingly

UNIT I - Introduction

Nature of Open sources –Maturity Model- Design Strategy-Support Models-Advantages – Application of Open Sources.

General Overview - Case Study: Linux - Files and Directories - Intermediate File Management - Process Management-Memory Addressing - Process Scheduling - Signals – Virtual File System- Page Cache- Program Execution.

UNIT II - Open source Database

General Overview- Case Study: MySQL -Introduction – MySQL Basic- Directory Structure-Creating Users and Super Users- Designing a Relational Database-Managing Databases, Tables and Indexes-Operators-functions-Transaction Management

UNIT III - Open source programming languages

General Overview - Case Study: PHP -Introduction – Basics of PHP- functions-Error Handling- Interaction between PHP and MySQL Database using Forms-Using PHP to manipulate and Retrieve Data in MySQL.

UNIT IV - Open source web server

General Overview of Web Server - Case Study: Apache Web server – Working with Web Server – Configuring and using Apache Web services-Case Study Apache Tomcat.

UNIT V - Open source tools and technologies

Open Source IDE-Modeling Tools- Mozilla Firefox- Wikipedia- Eclipse

TEXT BOOKS:

1. Dan Woods and GautamGuliani,"Open Source for the Enterprise: Managing Risks, Reaping Rewards", O'Reilly, Shroff Publishers and Distributors, 2005.

2. Daniel.P.Bovet and Marco Cesati," Understanding the Linux Kernel ", O, Reilly, 2007.

REFERENCE BOOKS:

1. Ivan Bayross and SharanamShah,"MySQL 5 for Professionals", Shroff Publishers and Distributors, 2007
2. Ivan Bayross and Sharanam Shah," PHP 5.1 for Beginners", Shroff Publishers and Distributors, 2006
3. Vivek Chopra, Sing Li, Jeff genender, "Professional Apache Tomcat 6", Wiley India, 2007

Electives-2
MC 238 - Enterprise Resource Planning

Course Objectives:

This subject provides students with the basic concepts of ERP systems for manufacturing or service companies, and the differences among MRP, MRP II, and ERP systems and in-depth knowledge of major ERP components, including material requirements planning, master production scheduling, and capacity requirements planning.

Course Outcomes:

Upon completion of the subject, students will be able to

- Examine systematically the planning mechanisms in an enterprise, and identify all components in an ERP system and the relationships among the components;
- Understand production planning in an ERP system, and systematically develop plans for an enterprise;
- Use methods to determine the correct purchasing quantity and right time to buy an item, and apply these methods to material management;
- Understand the difficulties of a manufacturing execution system, select a suitable performance measure for different objectives, and apply priority rules to shop floor control.

UNIT I - Introduction to ERP

ERP Introduction, Benefits, Origin, Evolution and Structure**:** Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT II - ERP Technologies

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain management.

UNIT III - ERP Modules

ERP Marketplace and Marketplace Dynamics**:** Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT IV - ERP Implementation

Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.

UNIT V - ERP & E-Commerce

Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study

TEXT BOOKS:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw H**ill**

REFERENCE BOOKS:

4. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI
5. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology
6. Mary Summer, "Enterprise Resource Planning"- Pearson Education

MC 240 - Software Project Management

Course Objectives:

Students will be introduced to the following aspects of project management related to managing small software development and To describe activities of SPM highlights and train in the planning and implementation of project management. It brings a specific project to complete on time and on budget.

Course Outcomes:

- identify and describe the impact different project contexts will have upon all aspects of a software development project, including an understanding of the role professional ethics plays in the conduct of successful software development
- identify and describe the key phases of project management and the key skills associated with each
- determine an appropriate project management approach through an evaluation of the business context and project scope and knowledge of agile and traditional project management approaches
- demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule; governance including progress reporting, risk and quality management
- as part of a small team research and produce a concise piece of writing suitable for presentation to senior management demonstrate an ability to present their ideas both formally and informally to a group of their peers.

UNIT I - Software Management & Software Economics

The waterfall model, conventional software Management performance. Evolution of Software Economics : Software Economics, pragmatic software cost estimation.

Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II - The old way and the new & Life cycle phases

The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT III - Artifacts of the process

The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures : A Management perspective and technical perspective.

UNIT IV - Project Organization and planning

Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. Line-of-Business Organizations, Project Organizations, evolution of Organizations. Process Automation : Automation Building blocks, The Project Environment.

UNIT V - Project Control and Process instrumentation

The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. Modern Project Profiles, Next generation Software economics, modern process transitions.

TEXT BOOK :

1. Walker Royce ,"Software Project Management", 1st ed., Pearson Education, 2005.

REFERENCES BOOKS :

1. Bob Hughes and Mike Cotterell, "Software Project Management", 3rd ed.,Tata McGraw - Hill Edition, 2005.
2. Joel Henry, "Software Project Management", 1st ed., Pearson Education, 2006.
3. Pankaj Jalote, "Software Project Management in practice", 1st ed., Pearson Education, 2005.

MC 242 - e-Commerce

Course Objectives:

Students will be introduced to the e-commerce environment, various approaches to safe e-commerce, various payment schemes.

Course Outcomes:

- Know about various environments and opportunities in e-commerce.
- Understand various protocols used fir safe e-commerce
- Know how internet is used in performing e-commerce.

UNIT – I Electronic Commerce Environment and Opportunities

Background, The Electronic Commerce Environment, Electronic Marketplace Technologies. Modes of Electronic Commerce: Electronic Data Interchange, Migration to Open EDI, Electronic Commerce with www/Internet, Commerce Net Advocacy, web Commerce Going Forward.

UNIT – II Approaches to Safe Electronic Commerce

Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers and Enterprise Networks.Electronic Cash and Electronic Payment Schemes: Internet Monetary Payment & Security Requirements. Payment and Purchase Order Process, On-line Electronic cash.

UNIT – III Internet/Intranet Security Issues and Solutions

The need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption, Enterprise Networking and Access to the Internet, Antivirus Programs, Security Teams.

UNIT – IV Master Card/Visa Secure Electronic Transaction

Introduction, Business Requirements, Concepts,payment Processing. E-Mail and Secure E-mail Technologies for Electronic Commerce: Introduction,The Means of Distribution, A model for Message Handling, E-mail working, Multipurpose Internet Mail Extensions, Message Object Security Services, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet.

UNIT – V Internet Resources for Commerce

Introduction, Technologies for web Servers, Internet ToolsRelevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access andArchitecture, Searching the Internet. Advertising on Internet: Issues and Technologies. Introduction,Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches andTechnologies: EP and web based EP.

Text Books:

1. WebCommerceTechnologyHandbook, byDanielMinoli, EmmaMinoli, McGraw-Hill
2. Frontiers of electronicommerece by Galgotia.

Reference Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
4. Electronic Commerce – Gary P.Schneider – Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol

GuyericoTraver.

MC 244 - Seminar

MC 246 - Object Oriented Analysis and Design Lab

Course Objectives:

This course explains how a software design may be represented as a set of interacting objects that manage their own state and operations. It describes the activities in the object - oriented design process using UML.

Course Outcomes:

· To understand the fundamental principles of Object Oriented programming.

· To implement key principles in Object Oriented analysis, design, and development.

· Be familiar with the application of the Unified Modelling Language (UML) towards analysis and design.

Prepare the following documents for two or three of the experiments listed below and develop the software engineering methodology.

1. Program Analysis and Project Planning.

   Thorough study of the problem – Identify project scope – Objectives – Infrastructure.

2. Software requirement Analysis

1. Data Modeling

   Use work products – Data dictionary – Use diagrams and activity diagrams, build and test lass diagrams – Sequence diagrams and add interface to class diagrams.

2. Software Developments and Debugging

3. Software Testing

   Prepare test plan – perform validation testing – Coverage analysis – memory leaks – develop test case hierarchy – Site check and Site monitor.

Mini-Project - I: A Point-of-Sale (POS) System

A POS system is a computerized application used to record sales and handle payments; it is typically used in a retail store, it includes hardware components such as a computer and bar code scanner, and software to run the system. It interfaces to various service applications, such as a third-party tax calculator and inventory control. These systems must be relatively fault tolerant; that is, even if remote services are temporarily unavailable they must still be of capturing sales and handling at least cash payments. A POS system must support multiple and varied client-side terminals and interfaces such as browser, PDAs, touch-screens.

Mini-Project - II: Online Bookshop Example

Following the model of amazon.com or bn.com, design and implement an online bookstore.

Mini-Project - III: A Simulated Company

Simulate a small manufacturing company. The resulting application will enable the user to take out a loan, purchase a machine, and over a series of monthly production runs, follow the performance of their company.

Mini-Project - IV: A Multi-Threaded Airport Simulation

Simulate the operations in an airport. Your application should support multiple aircrafts using several runways and gates avoiding collisions/conflicts. Landing: an aircraft uses the runway, lands, and then taxis over to the terminal. Take-Off: an aircraft taxies to the runway and then takes off

Mini-Project -VIII: A Notes and File Management System

In the course of one's student years and professional career one produces a 1 lot of personal notes and documents. All these documents are usually kept 1 on papers or individual files on the computer. Either way the bulk of the I information is often erased corrupted and eventually lost. The goal of this 1 project is to build a distributed software application that addresses this "| problem. The system will provide an interface to create, organize and manage I personal notes through the Internet for multiple users. The system will also allow users to collaborate by assigning permissions for multiple users to view and edit notes.

Mini-Project - IX: A Customizable Program Editor

A programmer's editor will focus on an individual programmer's particular needs and style. The editor will act according to the specific language the current source file is in, and will perform numerous features, such as auto-completion or file summarization, on the file. These features will be turned on or off by the programmer, and the programming style of the user will be used to create *as* efficient an editing environment as possible.

Mini-Project - X: A Graphics Editor

Design and implement a Java class collection that supports the construction of graph editing applications, i.e., applications that include the ability to draw structured and unstructured diagrams.

E.g.,

1. The goal of the GEF project is to build a graph editing library that can be used to construct many, high-quality graph editing applications. Some of GEF's features are:

2. A simple, concrete design that makes the framework easy to understand and extend.

3. Node-Port-Edge graph model that is powerful enough for the vast majority of connected graph applications.

4. Model-View-Controller design based on the Swing Java Ul library makes GEF able to act as aUl to existing data structures, and also minimizing learning time for developers familiar with Swing.

5. High-quality user interactions for moving, resizing, reshaping, etc. GEF also supports several novel interactions such as the broom alignment tool and selection-action-buttons. Generic properties sheet based on JavaBeans introspection. XML-based file formats based on the PGML standard

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.

2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.

2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.

3. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.

MC 248 - Middleware Technologies Lab

Course Objectives:

The main objective of this course is to get on awareness of a the various technologies which can help in the implementation of the various live project

Course Outcome:

Upon completion of the Lab subject, students will be able to:

- Understand the RMI concept of distributed systems;
- Understand the basic concepts underlying the ASP.net and C#.net;
- Learn to make judgment in choosing a suitable middleware for application problems;
- Understand the basic concepts of Web Services and EJB.

LIST OF EXPERIMENTS

1. Create a distributed application to download various files from various servers using RMI
2. State management techniques in ASP.NET
3. Using Validation controls in ASP.NET
4. ADO.NET code to show records in Grid view control
5. ADO.NET code to insert, update and delete records from database
6. Creating a simple console application which displays HELLO WORLD using C#
7. Creating asimple console calculator in C#
8. Creating windows application in C#
9. Web Services Demo

10. Create a java bean to draw various graphical shapes and display it using or without using BDK

11. Develop an Enterprise Java Bean for banking operations

12. Develop an Enterprise Java Bean for Library operations

TEXT BOOKS:

1. Wortgang EmmerichJohn,."Engineering Distributed Objects", Wiley, 2000
2. Mesbah Ahmed, Chris Garrett, Jeremy Faircloth, Chris Payne, DotThatCom.com, "ASP.net web developer guide",WeiMeng Lee (Series Editor),Jonothon Ortiz (Technical Editor),Syngress Publications.

REFERENCE BOOKS:

1. Andrew Troelsen,"C# and the .NET Platform",Apress Wiley-dreamtech, India Pvt.Ltd.
2. Keith Ballinger,".NET Web Services-Architecture and Implementation", Pearson Education

MC 250 - Mini Project - I

MC 325 - Data Warehousing and Data Mining

Course Objectives:

- To understand the issues relating to the feasibility, usefulness,effectiveness, and scalability of techniques used for the discovery of patterns hiddenin large data sets.
- To know the basic concepts of the data warehouse and other data repositories.
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering

Course Outcomes:

Students are able to

- Learn the basic concepts of Database Technology Evaluation steps and also understood the need of data

10. Create a java bean to draw various graphical shapes and display it using or without using BDK

11. Develop an Enterprise Java Bean for banking operations

12. Develop an Enterprise Java Bean for Library operations

TEXT BOOKS:

1. Wortgang EmmerichJohn,."Engineering Distributed Objects", Wiley, 2000
2. Mesbah Ahmed, Chris Garrett, Jeremy Faircloth, Chris Payne, DotThatCom.com, "ASP.net web developer guide",WeiMeng Lee (Series Editor),Jonothon Ortiz (Technical Editor),Syngress Publications.

REFERENCE BOOKS:

1. Andrew Troelsen,"C# and the .NET Platform",Apress Wiley-dreamtech, India Pvt.Ltd.
2. Keith Ballinger,".NET Web Services-Architecture and Implementation", Pearson Education

MC 250 - Mini Project - I

MC 325 - Data Warehousing and Data Mining

Course Objectives:

- To understand the issues relating to the feasibility, usefulness,effectiveness, and scalability of techniques used for the discovery of patterns hiddenin large data sets.
- To know the basic concepts of the data warehouse and other data repositories.
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering

Course Outcomes:

Students are able to

- Learn the basic concepts of Database Technology Evaluation steps and also understood the need of data mining and its functionalities

- Explore the efficient and effective maintenance of Data Warehouses.
- Apply the data mining functionalities like Clustering, Classification, AssociationAnalysis to real world data.
- Discover interesting patterns and association rules from huge volume of data used to do classifications and predictions.
- Gain knowledge on developing areas like Web Mining, Text Mining, and Spatial Mining.

UNIT- I Introduction toData Warehousing and Mining

Why Data Mining, What is Data Mining, Kinds of Data, Kinds of Patterns, and Technologies used, Kinds of applications adopted, Major issues in Data Mining.

Basic Concepts, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction

UNIT– II About Data and DataPreprocessing

Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT- III Mining Concept

Preliminary Concepts, Data Cube Computation Methods, Processing Advanced Kinds of Queries by Exploring Cube Technology, Multidimensional Data Analysis in Cube Space

Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods

Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining

UNIT- IV Classification

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy

Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Classification Using Frequent Patterns, Lazy Learners, Other Classification Methods

UNIT- V ClusterAnalysis

Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering, Probabilistic Model-Based Clustering, Clustering High-Dimensional Data

TEXTBOOKS:

Jiawei Han MichelineKamber–“DataMiningConcepts&Techniques”,Thirddition, MorganKaufmann Publishers, 2012.

REFERENCE BOOKS:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, First Edition,2012.

2.RalphKimball,MargyRoss, “TheDataWarehouseToolkit”,first editionJohnWileyandSonsInc., 2002.

3.AlexBerson,StephenSmith,KurtThearling,“BuildingDataMiningApplicationsforCRM”,first edition, TataMcGrawHill, 2000.

4.Margaret Dunham, “DataMining: IntroductoryandAdvancedTopics”,first edition, Prentice Hall,2002.

5.PaulrajPonnaiah, “DataWarehousingFundamentals”,first edition,WileyPublishers,2001.

Course Objectives:

The main objectives of this course is to enable the students with basic data analytic skills like regression analysis, classification techniques, clustering techniques, association rule mining. Further, this course also enables the students how to scale the above algorithms with different data environments like massive amount of data, streaming data, distributed data and provides hands on experience on real world problems using above theoretical background.

Course Outcomes

- Necessary theory background for processing analytics.
- Processing analytics on small scale data.
- Mining from massive datasets.
- Mining from distributed datasets.

UNIT I - INTRODUCTION TO BIG DATA

Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

UNIT II - MINING DATA STREAMS

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III - HADOOP

History of Hadoop- The Hadoop Distributed File System – Components of HadoopAnalyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFSBasics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT IV - HADOOP ENVIRONMENT

Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - MonitoringMaintenance-Hadoop benchmarks- Hadoop in the cloud

UNIT V - FRAMEWORKS

Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphereBigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

TEXT BOOKS:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.

2. Tom White “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.

REFERENCES:

3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012

4. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

MC 329- Cryptography And Network Security

Course Objectives:

This Course focuses towards the introduction of network security using various cryptographic algorithms and understanding network security applications. It also focuses on the practical applications that have been implemented and are in use to provide email and web security.

Course Outcomes:

On successful completion of this course, the students

- Will have knowledge and understanding of: Classical encryption techniques, Block ciphers and the Data Encryption Standard, Basics of finite fields, Advanced Encryption Standard, Contemporary symmetric ciphers, Confidentiality using symmetric encryption, Basics of number theory, Key management, Public key cryptosystems, Message authentication, Hash functions and algorithms, Digital signatures and authentication protocols, Network security practice, Applications, E-Mail, IP and web security, System security, Intruders, Malicious software, Firewalls.

- Will develop their skills in: the programming of symmetric and/or asymmetric ciphers and their use in the networks.
- Will learn protocols used in Web Security and Transport layer Security

UNIT I - Network Security Introduction

Security attacks – Security services – Security Mechanisms – A Model for Network Security Model Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography

UNIT II - Block Ciphers And Data Encryption Standard

Block Cipher Principles – Data Encryption Standard – Strength of DES – Differential and Linear Cryptanalysis - Block Cipher Design Principles.-Advanced Encryption Standard – Evaluation Criteria of AES – AES Cipher – More on Symmetric Ciphers – Multiple encryption and Triple DES – Block Cipher Modes of Operation – RC4.

UNIT III - Public-key Encryption And Hash Funcitons

Principles of Public –Key Cryptosystems – RSA Algorithm – Key Management – Message Authentication and Hash Functions – Authentication Requirements – Authentication Functions – Message Authentication – Hash Functions – Security of Hash Functions and MACs- Digital Signatures - Authentication Protocols – Digital Signature Standard.

UNIT IV - Network Security Applications

Kerberos – X.509 Authentication Service – Public Key Infrastructure – Pretty Good Privacy – S/MIME- IP Security Overview – IP Security architecture-Authentication Header – Encapsulating Security Payload – Combining Security associations – Key Management

UNIT V - Web Security

Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction. SYSTEM SECURITY Intruders – Intrusion Detection – Password Management – Malicious Software - Firewalls – Trusted Systems.

TEXT BOOKS :

1. William Stallings, “Cryptography and Network security”, 4th ed., Pearson Education, 2010.
2. William Stallings “Network Security Essentials Applications and Standards”, 2nd ed.,Pearson Education, 2009.

REFERENCE BOOKS :

1. Eric Malwald, “Fundamentals of Network Security “, 4th ed., Pearson Education, 2010.
2. Charlie Kaufman, “Radis Perlman and Mike Speciner ,Network Security

   – Private Communication in a Public W orld”, 1st ed., Pearson Education,2009 .

3. Buchmann, Springer ,”Introduction to Cryptography”, 2nd ed., Pearson Education, 2009.
4. William Stallings,”Cryptography and Network security”, 1st ed., Pearson Education, 2008.

Elective-III

MC 331- Software Testing Methodologies

Course Objectives:

Software testing is a subject where the student will learn and apply basic skills needed to create and automate the test plan of a software project.It aims to describe principles and strategies for generating system test cases and to understand the essential characteristics of tools used for test automation.

Course Outcomes:

Students who have completed this course would have learned

· Various test processes and continuous quality improvement

· Types of errors and fault models

· Methods of test generation from requirements

· Behavior modeling using UML: Finite state machines (FSM)

· Test adequacy assessment using: control flow, data flow, and program mutations

UNIT I - Introduction

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT II - Transaction Flow & Domain Testing

Transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

Domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT III - Path products and expressions

Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

UNIT IV - Logic Based Testing & State, State Graphs and Transition testing

Overview, decision tables, path expressions, kv charts, specifications. State graphs, good & bad state graphs, state testing, Testability tips.

UNIT V - Graph Matrices and Application

Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Winrunner tools for functional / Regression testing (Ref Text book2).

TEXT BOOKS:

1. Boris Beizer, “Software Testing Techniques”, 2nd ed., Dreamtech, 2006.

2. Dr.K.V.K.K.Prasad, “Software Testing Tools”, 1st ed., Dreamtech. 2008.

REFERENCE BOOKS:

1. Brian Marick, “The craft of software testing”, 2nd ed., Pearson Education,

2007.

2. Edward Kit, “Software Testing in the Real World “, 2nd ed., Pearson Education, 2008.

MC333 – Distributed Systems

Course Objectives:

To list the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions. Course Objective Should be in single paragraph

To build distributed system software using basic OS mechanisms as well as higher-level Middleware and languages.

Course Outcomes:

To be able to:

- Distinguish the theoretical and conceptual foundations of distributed computing.
- Recognize the inherent difficulties that arise due to distributed-ness

  of computing resources.

- Recognize the feasibilities and the impossibilities in managing resources.
- Identify the problems in developing distributed applications.

UNIT I - Basic Distributed System Concepts

Introduction, Distributed Computing Models, Software Concepts, Issues in Designing Distributed Systems, Client–Server Model.

UNIT II - Network & Inter Process Communication

LAN and WAN Technologies, Protocols for Network Systems, Protocols for Distributed Systems, Message Passing, Group Communication, API for Internet Protocol, RPC Communication

UNIT III - Synchronization

Clock Synchronization, Logical Clocks, Global State, Mutual Exclusion, Election Algorithms, Deadlocks in Distributed Systems

UNIT IV - Distributed System Management

Load-balancing Approach, Load-sharing Approach, Threads, Fault Tolerance, Basic Concepts of DSM, File Models in DFS

UNIT V - Emerging Trends in Distributed Computing

Grid Computing, SOA, Cloud Computing, The Future of Emerging Trends.

TEXT BOOKS:

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani&MukeshSinghal, Cambrigde, rp 2010

REFERENCE BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.

MC335 – Script Programming

Course Objectives:

The course introduces students to algorithmic programming using two scripting languages widely used for web applications: PHP and JavaScript. Because web applications typically draw parts of their content from online databases, the course will introduce students to PHP's facilities for interacting with database systems.

Course Outcomes:

Students who complete this course successfully will be able to:

4.5 Explain the structure of the HTTP protocol and exchanging messages over the Internet

4.6 Identify the features of web servers and support of PHP on local database

4.7 Usage of PHP and JavaScript language constructs: variables, functions, objects, control structures, and data types.

4.8 Use PHP to query and update a database using SQL. Implement event-driven algorithms in JavaScript

UNIT I - Script and Perl

Introduction to Script programming in Linux and MS-windows, Perl programming

UNIT II - Python programming

Running Your Python Scripts from a Command Prompt Making Your Scripts Behave Like Normal Programs A Simple CGI Script Writing the Editor Script Writing the Save Script Running the Editor. Writing the Main Script Writing the View Script Writing the Edit Script Writing the Save Script Trying It Out

UNIT III - Php programming

Writing php first script, a script to acquire user input, file upload forms and scripts, Calling an External CGI Script with the virtual function getting information about php and your script

UNIT IV - Windows Power shell programming

Using power shell scripts, debugging power shell script.

UNIT V - Application Development

Applications development with Client/server architecture, graphs, GUI and graphics programming using script languages searching and search engine development using script languages

TEXT BOOKS:

1. Programming Perl, 3rd Edition By Larry Wall, Tom Christiansen, Jon Orwant O'Reilly
2. Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress, 2003

REFERENCE BOOKS:

1. Windows Power Shell™ 3.0 Step by Step Ed willson Microsoft publisher.
2. PHP A Beginner s Guide Vikram Vaswani McGrawhill

Elective - IV
MC337 – Cloud Computing

Course Objectives:

Cloud computing has evolved as a very important computing model, which enables information, software, and shared resources to be provisioned over the network as services in an on-demand manner. This course provides an insight into what is cloud computing and the various services cloud is capable.

Course Outcomes:

Compare the operation, implementation and performance of cloud computing systems, and the relative merits and suitability of each for complex data-intensive applications

- Explain and characterize different cloud computing models, namely, infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS)
- Identify security implications in cloud computing
- Write comprehensive case studies analysing and contrasting different cloud computing solutions

UNIT – I

Introduction: Definition, Historical developments, Computing platforms and technologies. Principles of Parallel and Distributed Computing: Parallel versus distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing.

UNIT – II

Virtualization: Characteristics, Virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples.

Cloud Computing Architecture: Cloud reference model, Types of clouds, Economics of clouds, Open challenges.

Aneka: Cloud Application Platform: Framework overview, Anatomy of the Aneka container, Building Aneka clouds, Cloud programming and management.

UNIT – III

Concurrent Computing- Thread Programming: Programming applications with threads, Multithreading with Aneka, Programming applications with Aneka threads.

High Throughput Computing- Task Programming: Task computing, Task-based application models, Aneka task-based programming.

UNIT – IV

Data Intensive Computing – Map-Reduce Programming: Introduction, Technologies for data-intensive computing, Aneka MapReduce programming. Cloud Platforms in Industry: Amazon web services, Google AppEngine, Microsoft Azure.

UNIT – V

Cloud Applications: Scientific applications in – Healthcare, Biology, Geo-science; Business applications in – CRM and ERP, Productivity, Social networking, Media applications, Multiplayer online gaming.

Advanced Topics in Cloud Computing: Energy efficiency in clouds, Market based management of clouds, Federated clouds / InterCloud, Third party cloud services.

TEXT BOOKS:

1. Buyya R, Vecchiola C, Selvi S T, Mastering Cloud Computing, McGraw Hill Education (India), 2013.

REFERENCE BOOKS:

1. Buyya R, Broberg J, Goscinski A, Cloud Computing - Principles and Paradigms, Wiley, 2011.

2. Rittinghouse J W, Ransome J F, Cloud Computing - Implementation, Management, and Security, CRC Press, 2010.

3. Velte A T, Velte T J, Cloud Computing - A Practical Approach, McGraw Hill, 2011.

4. Shroff G, Enterprise Cloud Computing - Technology, Architecture, Applications, Cambridge University Press, 2010.

5. Antonopoulos N, Gillam L, Cloud Computing - Principles, Systems and Applications, Springer, 2010.

6. Furht B, Escalante A, Handbook of Cloud Computing, Springer, 2010.

7. Sosinsky B, Cloud Computing Bible, Wiley, 2011. 8. Joseph J, Fellenstein C F, Grid Computing, Pearson, 2004.

MC339 – Soft Computing

Course Objectives:

To know about the components and building block hypothesis of Genetic algorithm. To understand the features of neural network and its applications and to study the fuzzy logic components

Course Outcomes:

- Implement machine learning through neural networks.
- Gain Knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.
- Understand fuzzy concepts and develop a Fuzzy expert system to derive decisions.

- Able to Model Neuro Fuzzy system for data clustering and classification.

UNIT I - Neural Networks

History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta.

UNIT II - Fuzzy Logic

Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks. Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation.

UNIT III- Fuzzy Sets & Fuzzy Arithmetic

Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

UNIT IV - Fuzzy Logic

Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Uncertainty based Information : Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

UNIT V - Fuzzy Logic & Genetic Algorithm

Introduction of Neuro - Fuzzy Systems, Architecture of Neuro Fuzzy Networks. Medicine, Economics etc. An Overview, GA in problem solving, Implementation of GA

TEXT BOOKS:

1. AI & Expert system, JankiRaman ,MacMillen,2003.
2. Artificial Intelligence, Knight ,TMH,1991.

REFERENCE BOOKS:

1. Artificial Intelligence, G.F luger,Pearson education,2003.

2. Artificial Intelligence, Patrickshenry ,Winston,Pearson education,2001.

3. Artificial Intelligence, Nilsson ,Morgon, Kufmann 1998.

4. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1995.

MC341 – Mobile Computing

Course Objectives:

To provide basics for various techniques in Mobile Communications and Mobile Content services.

Course Outcomes

• Learn the basics of Wireless voice and data communications technologies.
• Have working knowledge on various telephone and satellite networks.
• Know the working principles of wireless LAN and its standards.
• Have knowledge on various Mobile Computing algorithms.
• To build skills in working with Wireless application Protocols to develop mobile content applications.

UNIT I -WIRELESS COMMUNICATION FUNDAMENTALS

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks.

UNIT II - TELECOMMUNICATION NETWORKS

Telecommunication systems – GSM – GPRS – DECT – UMTS – IMT-2000 – Satellite Networks - Basics – Parameters and Configurations – Capacity Allocation – FAMA and DAMA – Broadcast systems – DAB - DVB.

UNIT III - WIRLESS LAN

Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - 802.11b standards – HIPERLAN – Blue Tooth.

UNIT IV - MOBILE NETWORK LAYER

Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR – Alternative Metrics.

UNIT V -TRANSPORT AND APPLICATION LAYERS

Traditional TCP – Classical TCP improvements – WAP, WAP 2.0.

TEXT BOOKS

1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003. (Unit I Chap 1,2&3- Unit II chap 4,5 &6-Unit III Chap 7.Unit IV Chap 8- Unit V Chap 9&10.)
2. William Stallings, “Wireless Communications and Networks”, PHI/Pearson Education, 2002. (Unit I Chapter – 7&10-Unit II Chap 9)

REFERENCES

1. KavehPahlavan, PrasanthKrishnamoorthy, “Principles of Wireless Networks”, PHI/Pearson Education, 2003.
2. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York, 2003.
3. HazysztofWesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2002.

MC343 – Seminar

MC345 – Datawarehousing and Data Mining Lab

Course Objectives:

The main objective of this lab is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. At the end to compare and contrast different conceptions of data mining.

Course Outcomes:

Students can able

• To evaluate the different models of OLAP and data preprocessing.

• To enlist various algorithms used in information analysis of Data Mining Techniques.

• To demonstrate the knowledge retrieved through solving problems

List of Experiments

1. Explore various commands given in PL/SQL in Oracle 8.0

2. Execute multi-dimensional data model using SQL queries.

3. Implement various OLAP operations such as slice, dice, roll up, drill up,

pivot etc.

4. Implementation of Text Mining on the data warehouse

5. Explore the correlation-ship analysis between the data set

6. Evaluate attribute relevance analysis on a weather data warehouse

7. Evaluate Information Gain of an attribute in the student database

8. Experiment to predict the class using the Bayesian classification

9. Find out a weight & bias updating using the Back Propagation Neural

Network

10. To perform various data mining algorithms on the give data base using

WEKA

REFERENCEBOOKS:

1. Jiawei Han, Micheline Kamber " Data Mining: Concepts and Techniques" 3rd edition, Morgan Kaufmann, 2012

2. Ramesh Sharda, Dursun Delen, David King Business Intelligence, 2/E; Efraim Publisher Turban,pearson Education, 2011

3. Berry, Gordon S. Linoff, "Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management", John Wiley & Sons Inc publishers, 3rd Edition, 2011.

MC347 –Cryptography and Network Security Lab

Course Objectives:

After the success full completion of this course the student is enable towards learning and overcome security attacks in future.

Course Outcomes:

· Understand computer security principles and discuss ethical issues for theft of information. Identify threatmodels and common computer network security goals

· Explain various encryption algorithms, hashing functions, one-way authentication and public key cryptology

List of Experiments

1. Write program for Ceaser cipher encryption and decryption

2. Write program for Mono alphabetic cipher encryption and decryption

3. Implementation of Play Fair cipher

4. Implementation of Vigenere cipher (Polyalphabetic substitution)

5. Implementation of Hill cipher

6. Implementation of Rail Fence cipher

7. Implementation of S-DES algorithm for data encryption

8. Implement RSA asymmetric (public key and private key)-Encryption

9. Implement Euclidean and Extended Euclidean algorithm for calculating

the GCD

10. Working with PGP

REFERENCEBOOKS:

1. Cryptography and Network security by William Stallings, Pearson Education, Fourth Edition

2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education, Second Edition

3. Fundamentals of Network Security by Eric Malwald (Dreamtech press)

4. Network Security – Private Communication in a Public World by Charlie Kaufman, Radis Perlman and Mike Speciner,Pearson Education

5. Introduction to Cryptography Buchmann, Springer

MC349 – Miniprojects-II

PR004- Project Work

AGRICULTURE ENGINEERING

Course	Code	L	T	P	Cr
APPLIED INSTRUMENTATION	PH298	4	-	-	4
ADVANCES IN ERGONOMICS	PH299	4	-	-	4

BIOTECHNOLOGY

Course	Code	L	T	P	Cr
MICROBIAL TECHNOLOGY	PH026	4	-	-	4
INFLAMMATION	PH243	4	-	-	4
CHEMOINFORMATICS	PH265	4	-	-	4
PLANT NUTRACEUTICALS	PH267	4	-	-	4

ELECTRONICS & COMMUNICATION ENGINEERING

Course	Code	L	T	P	Cr
BIOMEDICAL SIGNAL PROCESSING	PH201	4	-	-	4
FUNDAMENTALS OF MASSIVE MIMO	PH202	4	-	-	4
COMPRESSIVE SENSING	PH203	4	-	-	4
SPEECH PROCESSING	PH204	4	-	-	4
CONVEX OPTIMIZATION	PH206	4	-	-	4
PHYSICALLY UNCLONABLE FUNCTIONS CONSTRUCTIONS, PROPERTIES & APPLICATIONS	PH211	4	-	-	4
ANTENNA THEORY	PH214	4	-	-	4
MICROWAVE & MILLIMETER WAVE CIRCUITS	PH215	4	-	-	4
ADVANCED DIGITAL COMMUNICATIONS	PH220	4	-	-	4

BROADBAND WIRELESS TECHNOLOGIES	PH221	4	-	-	4
BIOMECHANICS	PH234	4	-	-	4
CHANNEL CODING	PH238	4	-	-	4
WIRELESS & CELLULAR COMMUNICATIONS	PH239	4	-	-	4
MICRO STRIP ANTENNA	PH240	4	-	-	4
MICROWAVE MEASUREMENTS	PH241	4	-	-	4
META MATERIALS	PH242	4	-	-	4

MECHANICAL ENGINEERING

Course	Code	L	T	P	Cr
COMPUTATIONAL FLUID DYNAMICS	PH034	4	-	-	4
FUELS & COMBUSTION	PH035	4	-	-	4
CONVENTIONAL MACHINING PROCESSES	PH049	4	-	-	4
ADVANCED HEAT TRANSFER	PH231	4	-	-	4
RENEWABLE ENERGY TECHNOLOGIES	PH232	4	-	-	4
NANO MATERIALS & FLUIDS FOR ENERGY & ENVIRONMENT	PH233	4	-	-	4
MECHATRONICS & MANUFACTURING AUTOMATION	PH235	4	-	-	4
ADVANCED SURFACE ENGINEERING TECHNIQUES	PH236	4	-	-	4
ADDITIVE MANUFACTURING TECHNOLOGIES & APPLICATIONS	PH237	4	-	-	4

MANAGEMENT SCIENCES

Course	Code	L	T	P	Cr

DECISION SUPPORT SYSTEMS & BUSINESS INTELLIGENCE	PH210	4	-	-	4

CHEMISTRY

Course	Code	L	T	P	Cr
CHROMATOGRAPHIC TECHNIQUES FOR API	PH219	4	-	-	4
APPLICATIONS OF NANOMATERIALS AND CATALYSTS	PH253	4	-	-	4
POLYMERS AND ELASTOMERS	PH254	4	-	-	4
ANALYTICAL CHEMISTRY	PH255	4	-	-	4
ELECTROCHEMISTRY AND BATTERIES	PH256	4	-	-	4
ENVIRONMENTAL AND SUITABLE CHEMISTRY	PH257	4	-	-	4
FOOD, AGRO AND PHARMACEUTICAL CHEMISTRY	PH258	4	-	-	4
MEDICINAL CHEMISTRY	PH259	4	-	-	4
STEREO-SELECTIVE ORGANIC SYNTHESIS	PH260	4	-	-	4
SURFACE AND INTERFACIAL CHEMISTRY	PH261	4	-	-	4
SYMMETRY AND MATHEMATICS	PH262	4	-	-	4

CHEMICAL ENGINEERING

Course	Code	L	T	P	Cr
STRUCTURE MECHANICS OF FIBERS, YARNS AND FABRICS	PH216	4	-	-	4
PHYSICAL PROPERTIES OF TEXTILE FIBERS	PH217	4	-	-	4
NON WOVEN TECHNOLOGY	PH218	4	-	-	4

MATHEMATICS

Course	Code	L	T	P	Cr
MATHEMATICS	PH132	4	-	-	4
GRAPH THEORY	PH230	4	-	-	4

PHYSICS

Course	Code	L	T	P	Cr
POLYMER COMPOSITES	PH042	4	-	-	4
MATERIAL SCIENCE & ENGINEERING	PH053	4	-	-	4

ENGLISH

Course	Code	L	T	P	Cr
LITERARY THEORY	PH212	4	-	-	4
ENGLISH LANGUAGE TEACHING	PH213	4	-	-	4
NAYANTARA SAHGAL IN THE CONTEXT OF INDIAN WRITING IN ENGLISH	PH222	4	-	-	4
KAMALA MARKANDAYA IN THE CONTEXT OF INDIAN WRITING IN ENGLISH	PH223	4	-	-	4
DYNAMICS OF POWER AND OPPRESSION:AN INTERDISCIPLINARY STUDY OF TOTALITARIANISM	PH224	4	-	-	4
NARRATIVE TECHNIQUES AND PSYCHOLOGICAL REALIAM IN THE WORKS OF KHAZUO ISHIGURO	PH225	4	-	-	4
REFLECTIVE TEACHING FOR LANGUAGE TEACHERS	PH226	4	-	-	4
TEACHING AND TESTING OF VOCABULARY IN SECOND LANGUAGE	PH227	4	-	-	4
INDIAN WRITING IN ENGLISH	PH245	4	-	-	4

CURRENT RESEARCH & PRACTICE IN TEACHING & LEARNING VOCABULARY	PH247	4	-	-	4
LANGUAGE ACROSS CURRICULUM IN ESL PEDAGOGY	PH248	4	-	-	4
SPEAKING SKILLS	PH249	4	-	-	4
ENHANCING COMMUNICATION SKILLS THROUGH DRAMATIZATION	PH251	4	-	-	4
CRIMINAL RECORD DOCUMENTATION : A LINGUISTIC STUDY	PH252	4	-	-	4

AGRICULTURE ENGINEERING
PH085 - SPECIAL MANUFACTURING PROCESS

UNIT- I : Surface Treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapor deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT- II : Processing of Ceramics: Applications, characteristics, classification .Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Area of application, finishing of ceramics. Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

UNIT- III : Fabrication of Microelectronic Devices: Crystal growth and wafe preparation , Film deposition oxidation, Lithography, bonding and packing, reliability and yield. Printed circuit boards, computer aided design in microelectronics , surface mount technology,Integrated circuit.

UNIT – IV : Micro and Nano Manufacturing Techniques;Methods of micromachining; Abrasive jet, Ultrasonic, Abrasive water jet micromachining, Micro turning, Microdrilling; Abrasive based, Nano finishing processes; Abrasive flow finishing, Chemomechanical polishing.

UNIT -V : Rapid Prototyping:Working Principles, Methods, Stereo Lithography, Laser Sintering, Fused Deposition Method, Applications and Limitations, Rapid tooling, Techniques of rapid manufacturing.

REFERENCES:

- Manufacturing Engineering and Technology I Kalpakijian / Adisson Wesley, 1995.
- Process and Materials of Manufacturing / R. A. Lindburg / 1th edition, PHI 1990.
- Microelectronic packaging handbook / Rao. R. Thummala and Eugene, J. Rymaszewski / Van Nostrand Renihold,
- MEMS & Micro Systems Design and manufacture / Tai — Run Hsu / TMGH
- Advanced Machining Processes / V.K .Jain / Allied Publications.
- Introduction to Manufacturing Processes / John A ScheyI McGraw Hill.

PH086 - UNCONVENTIONAL MACHINING PROCESS

Unit II
Thermal and Electrical Energy Based Processes
Electric Discharge Machining (EDM) – Wire cut EDM – Working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear - Dielectric – Flushing –– Applications. Laser Beam machining and drilling, (LBM), plasma, Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment -Types – Beam control techniques – Applications.
Unit III
Chemical and Electro-Chemical Energy Based Processes
Chemical machining and Electro-Chemical machining (CHM and ECM)- Etchants – Maskant - techniques of applying maskants – Process Parameters – Surface finish and MRR-Applications. Principles of ECM- equipments-Surface Roughness and MRR Electrical circuit-Process Parameters-ECG and ECH – Applications.
Unit IV

Unit V
Recent Trends in Non-Traditional Machining Processes
Recent developments in non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Comparison of non-traditional machining processes.

Course Outcome:
Upon the completion of this course the students will be able to

- CO1 Explain the need for unconventional machining processes and its classification
- CO2 Compare various thermal energy and electrical energy based unconventional machining processes.
- CO3 Summarize various chemical and electro-chemical energy based unconventional machining processes.
- CO4 Explain various nano abrasives based unconventional machining processes.
- CO5 Distinguish various recent trends based unconventional machining processes.

Text Books:

1. Vijay.K. Jain Advanced Machining Processes Allied Publishers Pvt. Ltd., New Delhi, 2007
2. Pandey P.C. and Shan H.S. Modern Machining Processes Tata McGraw-Hill, New Delhi, 2007.

References:

1. Benedict. G.F. Nontraditional Manufacturing Processes, Marcel Dekker Inc., New York, 1987.
2. Mc Geough, Advanced Methods of Machining, Chapman and Hall, London, 1998.

Paul De Garmo, J.T.Black, and Ronald. A.Kohser, Material and Processes in Manufacturing Prentice Hall of India Pvt. Ltd., 8thEdition, New Delhi , 2001.

BIOTECHNOLOGY

PH026 - MICROBIAL TECHNOLOGY

UNIT - 1 MATERIAL BALANCES: Introduction to biotechnology and biochemical engineering, bioprocess techniques, biotechnology products; Thermodynamic preliminaries, system and process, steady state and equilibrium, law of conservation of mass, types of material balance problem, material balances with recycle and bypass streams.

UNIT - 2 ENERGY BALANCES: Energy balance- basic energy concepts, intensive and extensive properties, studies of enthalpy for reactive and non-reactive processes; Heat of combustion, heat of reaction at non-standard conditions; Thermodynamics of microbial growth, energy balance equation for cell culture, unsteady state energy balance equations.

UNIT - 3 MEDIUM OPTIMIZATION: Medium optimization techniques with special emphasis on statistical techniques- Plackett-Burman design, ANOVA, central composite design, response surface methodology; Sterilization- media sterilization, kinetics of thermal death of cells and spores, design of batch and continuous thermal sterilization, coupling of Arrhenius equation and cell death kinetics, sterilization of air and filter design, radiation and chemical sterilization.

UNIT - 4 UNSTRUCTURED MODELS FOR MICROBIAL GROWTH: The development of different microbial growth kinetics- Malthus, Pearl and Read, Monod Model and Konark Model; The limitations of Monod model and development of other constitutive models- multi substrate model, inhibition models for substrate, product and toxic substances; Development of logistic equation; Maintenance and endogenous metabolism kinetics.

UNIT - 5 STRUCTURED MODELS OF MICROBIAL GROWTH: Kinetics based on molecular mechanismcompartment models, model of cellular energetics and metabolism, model of product formation, singles cell model, model of gene expression and regulation; Plasmid expression and replication; Model of plasmid stability, parameter estimation, model validation and bioprocess optimization.

TEXT BOOKS:

1. J.E. Bailey and D.F. Ollis, "Biochemical Engineering Fundamentals", McGraw Hill Inc., New York, 2010.

2. D.S. Clark and H.W. Blanch, "Biochemical engineering", CRC Press, 1997.

REFERENCE BOOKS:

1. K. Schugerl and K.H. Bellgart, "Bioreaction Engineering, Modeling and control", Springer Verlag, Berlin, 2000.

2. D.G. Rao, “Introduction to biochemical engineering”, Tata McGraw Hill Education, 2010.

PH243 – INFLAMMATION

UNIT I

IMMUNE CELLS AND IMMUNE ORGANS:
Cells of the immune system, Classification, CD Markers of leukocytes and lymphocytes,Development and maturation of B-cells and T-cells, Lymph glands: Bone Marrow, Thymic Schooling, Mucosal associated lymphoid tissue.

UNIT II

ANTIGEN AND ANTIBODY:
Structure of an antigen, Types of antigens, Immunogen, Tolerogen, Adjuvants, Structure of Immunoglobulins, Allotypes, Idiotypes, Hybridoma Technology, Phage display of antibodies.

UNIT III

HYPERSENSITIVITY:
Definition and classification, IgE mediated (Type-1) hypersensitivity (allergy), IgG and IgM mediated (Type-II) hypersensitivity, Immune complex mediated (Type-III) hypersensitivity and Delayed (Type-IV) hypersensitivity.

UNIT IV

INFLAMMATION:
Introduction to Inflammation, what is inflammation? Characteristics of inflammation, Health benefits of inflammation, Health advantages of inflammation, the role of inflammation in disease, why we need inflammation? Acute inflammation, Chronic inflammation, Cytokines in inflammation, Wound healing, Arachidonic acid pathway.

UNIT V

CHRONIC INFECTION AND INFLAMMATION:
Atherosclorosis, Human papillomavirus, Liver Cirrhosis, Diabetes, Multiple Sclerosis, Gastric ulcers, Phyto-nutrients, Immunity and Inflammtion.

Basic Text Book:

Kenneth Murphy, Paul Travers and Mark Walport (2007) Janeway's Immunobiology, 7th Ed.

PH265 – CHEMOINFORMATICS

Unit – I : Introduction to the world of chemical informatics: Overview of the class; defining chemical informatics; chemical and bioinformatics; chemical informatics and the pharmaceutical industry; example applications

Unit – II : Representing 2D structures: Kinds of 2D structure representation; atom lookup and connection tables; graph theory; SMILES; SD files; Fragment codes & Fingerprints; descriptors

Unit – III: 2D chemical database applications: Types of searching; substructure searching with SMARTS; similarity searching with fingerprints; demonstrations of searching systems

Unit – IV: QSPR & QSAR: Feature selection, Model building, QSAR biological and physicochemical parameters, QSAR applications in drug design, QSAR model selection and validation, CoMFA

Unit – IV: High-Throughput chemistry (CombiChem): Mix and split synthesis, solid-phase synthesis, solution-phase synthesis, combinatorial biosynthesis, library design, virtual high-throughput screening

TEXT BOOK:

1. Leach, Andrew R., and Valerie J. Gillet "An introduction to chemoinformatics", 1st edition Springer, 2007".

REFERENCE BOOK:

1. Thomas Engel (2006). "Basic Overview of Chemoinformatics", 1st edition J. Chem. Inf. Model. 46 (6): 2267–77.
2. Lee, Ming Ta Michael, and Teri E. Klein. "Pharmacogenetics of warfarin: challenges and opportunities." Journal of human genetics 58, no. 6 (2013): 334-338.

PH267 - PLANT NUTRACEUTICALS

UNIT 1 Phytochemicals: classification, biosynthesis and production

1.1 Secondary metabolites and phytochemicals –function of secondary products in plants, health benefits of phytochemicals

1.2 Phytochemical classes and chemical properties

1.3Biosynthetic pathways of secondary product classes –Terpenoid and shikimate pathways, isoprenoid pathway, polyketide pathway

1.4 In vitro techniques for the cultivation of nutraceutical plants, factors determining accumulation of secondary metabolites, strategies to improve metabolite production, biological elicitors of plant secondary metabolites (mode of action and use in production of nutraceutics)

1.5 Phytochemicals in plant cell bioreactors –plant bioreactors; commercial production of plant secondary metabolites

UNIT 2 Nutrigenetics and Nutrigenomics

2.1 Nutritional genetics vs nutritional genomics

2.2 Nutrients modulating genome expression –nutrient as signal molecule, mechanisms of nutrient perception

2.3 Nutrigenetic diseases and Nutrigenomic diseases –PKU, Obesity, CVD, Cancer, Inflammation, Diabetes, Osteoporosis

2.4 Variation in human populations -gene polymorphism, SNP, nutritional implications; personalized nutrition

2.5 Biomarkers –biomarkers of biological effect -enzyme function, oxidative stress, immune function, bone health, cell turnover; biomarkers for genetic susceptibility

UNIT 3 Advanced Tools in Nutrigenomics

3.1 Genetic selection- insertional inactivation and alpha complementation

3.2 Use of animal and cell models in nutrition and food research: in vitro models applicable in nutrigenomic studies, use of animal models–advantages and limitations

3.3 Transcriptomics- mRNA profiling, cDNA-AFLP, DNA microarrays, SAGE, MIAME/Nut; using transcriptomics to explain mechanism behind differences in response to diet

3.4 Proteomics-2D-DIGE, ELISA, protein microarray, MALDI-TOF, PSI (Proteomics Standard Initiative) –role of proteomics in nutrigenetics and nutrigenomics

3.5 Metabolomics-analytical tools–LC resolved and GC resolved mass spectrometry, NMR spectroscopy, global vs targeted metabolic profiling-applications to nutrition, metabolomics.

UNIT 4 Phytochemicals and Nutraceuticals in Health & Disease

4.1 Nutraceuticals **-** isoprenoid derivatives, phenolic compounds, carbohydrate derivatives, amino acid derivatives and minerals (Ca, Zn, Cu, K, Se)

4.2 Nutraceuticals and antioxidant function-oxidative stress and ROS, antioxidants (amino acids, peptides and proteins), antioxidant defense systems, phytochemicals

4.3 Phytochemicals and cancer-models of carcinogenesis, cancer risk -nutrients and phytochemicals; impact on cancer metastasis suppressor genes, phytoestrogen

4.4 Phytochemicals in immune function-carotenoids and flavonoid

4.5 Plant lipids in health and disease; plant tochopherols/tocotrienols and health

Activities:

1. To understand the importance of biofortified crops for enduring nutritional security

2. To study the importance of phytochemicals in treating various diseases.

ELECTRONICS & COMMUNICATION ENGINEERING
PH201 - BIOMEDICAL SIGNAL PROCESSING

Unit-I :Biomedical signal origin
Preliminaries; Biomedical signal origin & dynamics (ECG) ; the EEG Signal and its characteristics; Biomedical signal origin & dynamics (EEG, EMG etc.);
Filtering for Removal of artifacts Statistical Preliminaries – random noise, structured noise, stationary vs non stationary processes; Time domain filtering (Synchronized Averaging, Moving Average, Derivative-based operator to remove low frequency)

Unit-II :Frequency Domain Filtering
Removal of High-Frequency noise: butterworthlowpass filters; Removal of Low-Frequency noise: butterworthhighpass filters; Removal of periodic artifacts: Notch and Comb Filters. Optimal Filtering: The Weiner Filter, Adaptive Filters for Removal of interference : the adaptive noise canceller, the least mean squares adaptive filter, the recursive least square adaptive filter.

Unit-III :Event Detection
P, QRS and T wave in ECG, Derivative based Approaches for QRS Detection, Pan Tompkins Algorithm for QRS Detection, Detection of Dicrotic Notch, Correlation Analysis of EEG Signal.

Unit-IV :Waveform Analysis
Illustrations of problem with case studies: The QRS complex in the case of bundle-branch block, The effect of myocardial ischemia and infarction on QRS waveshape, ectopic beats, EMG interference pattern complexity, PCG intensity patterns.
Morphological Analysis of ECG: Correlation coefficient, The Minimum phase correspondent and Signal Length
Envelop Extraction & analysis: Amplitude demodulation, The Envelogram Analysis of activity Root Mean Square value, Zero-crossing, rate Turns Count, Form factor.

Unit-V :Frequency-domain Analysis
Averaged Periodogram Blackman-Tukey Spectral Estimator Daniellâ€™s Spectral Estimator, Measures derived from PSDs: moments of PSD functions, Spectral power ratios.

Text Book:
1. RANGARAJ M.RANGAYYAN, "Biomedical Signal Analysis: A case-study approach" , wiley interscience-2002.

Reference books:
1. D.C. Reddy, "Biomedical Signal Processing: principles and techniques", Tata McGraw Hill, New Delhi, 2005
2. MetinAkay, "Biomedical Signal Processing", Academic press, Inc.
3. Bruce, "Biomedical Signal Processing & signal modeling," wiley, 2001.

PH202 - FUNDAMENTALS OF MASSIVE MIMO

UNIT-I

Introduction: Point-to- point MIMO, Multi-user MIMO, Massive MIMO, Time Division verses Frequency Division Duplexing

Models and Preliminaries: Single-Antenna Transmitter and Single-Antenna Receiver, Coherence Time, Coherence Bandwidth, Coherence Interval, Interpretation of T_c and B_c in Terms of Nyquist Sampling Rate, TDD Coherence Interval Structure

UNIT-II

Single Cell Systems: Uplink Pilots and Channel Estimation: Orthogonal Pilots, De-Spreading of the Received Pilot Signal, MMSE Channel Estimation

Uplink Data Transmission: Zero-Forcing, Maximum-Ratio

Downlink Data Transmission: Linear Precoding, Zero-Forcing, Maximum-Ratio

UNIT-III

Multi Cell Systems: Uplink Pilots and Channel Estimation, Uplink Data Transmission, Zero-Forcing, Maximum-Ratio, Downlink Data Transmission, Zero-Forcing, Maximum-Ratio

UNIT- IV

Massive MIMO Propagation Channel: Favorable Propagation and Deterministic channels, Favorable Propagation and Random Channels, Finite-Dimensional Channels

UNIT- V

Capacity and Capacity Bounding Tools: Jensen's Inequality, Point-to-Point Scalar Channel Point-to-Point MIMO Channel, Multiuser MIMO Channel

Test Books

1. Thomas L. Marzetta, Erik G. Larsson, Hong Yang and HienQuoc Ngo, "Fundamentals of Massive MIMO", Cambridge University Press 2016.

2. David Tse and PramodViswanath, "Fundamentals of Wireless Communication", Cambridge University Press 2005.

Reference Books:

EzioBiglieri , Robert Calderbank et al "MIMO Wireless Communications" Cambridge University Press 2007.

Daniel W. Bliss and SiddhartanGovindasamy, "Adaptive Wireless Communications: MIMO Channels and Networks", Cambridge University Press, 2013.

PH203 - COMPRESSIVE SENSING

UNIT I: Introduction to Compressive Sensing,Sparse and Compressible Signal Models.

UNIT II: Uniqueness and Uncertainty, General Sparse Signal Representations using Dictionaries.
Dictionary Analysis.

UNIT III: Compressive Sensing and Sensing Matrices, Sensing Matrices for Exact Recovery, Recovery in the Presence of Noise,

UNIT IV: Sub-Gaussian Distributions and Sensing Matrices.

UNIT V: Recovery via l1 Minimization, Algorithms for Sparse Recovery, Applications.

Text Books: There is no required text but the following titles may prove useful

1. Probability and Random Processes by G. Grimmett and D. Stirzaker, 3rd. ed., Oxford University Press
2. Random Matrices by M. Mehta, 3rd ed., New York: Academic Press
3. Function Estimation and Gaussian Sequence Models by I. Johnstone.

Reference Books:

1. All of Statistics by L. Wasserman, Springer
2. Numerical Linear Algebra by LLoyd N. Trefethen and David Bau, III, SIAM
3. Convex Optimization by S. Boyd and L. Vandenberghe, Cambridge University Press
4. Introductory Lectures on Convex Optimization: A Basic Course by Y. Nesterov, Kluwer Academic Publisher
5. A Wavelet Tour of Signal Processing by S. Mallat, 3rd ed., Academic Press
6. Discrete Time Signal Processing by A. Oppenheim and R. Schafer, Prentice Hall.

PH204 - SPEECH PROCESSING

Unit-I Introduction to speech processing, Digitization and Recording of speech signal, Review of Digital Signal Processing Concepts

Unit-II Human Speech production, Acoustic Phonetics and Articulatory Phonetics, Different categories speech, sounds and Location of sounds in the acoustic waveform and spectrograms, Uniform Tube Modeling of Speech Production, Speech Perception

Unit-III Time Domain Methods in Speech Processing, Analysis and Synthesis of Pole-Zero Speech Models, Short-Time Fourier Transform, Analysis:- FT view and Filtering view, Synthesis:-Filter bank summation (FBS) Method and OLA Method.

Unit-IV Features Extraction, Extraction of Fundamental frequency, Speech Prosody, Speech Prosody Modeling (Fujisaki Model). Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status. Speech based Applications (TTS, ASR and spoken language acquisition).

Unit-V Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

Text Books:

1. Discrete-Time Speech Signal Processing: Principles and Practice by Thomas F. Quatieri
2. Theory and Applications of Digital Speech Processing, by L. R. Rabiner and R. W. Schafer,

PH206 - CONVEX OPTIMIZATION

UNIT 1: Introduction to optimization: Role of optimization, convexity, Examples of application (communications, signal processing). Review of linear algebra and mathematics background.

UNIT 2: Convex set and convex function, Convex set, convex functions, Operations that preserve convexity (both sets and functions), Conjugate function, conjugate sets, and separating hyper-plane theorem. Convex optimization problems. Optimization problem definition and examples, linear programming, Quadratic programming, Geometric programming, Semi-definite programming

UNIT 3: Duality: Lagrangian dual function (conjugate function), Lagrange dual problem i. Properties, weak and strong duality ii. Interpretation of dual variables, duality (geometric, saddle point, economics) Optimality conditions i. KKT, necessity and sufficiency ii. Sub-gradients for non-smooth functions

UNIT 4: Methods and algorithms: Unconstrained i. Gradient descent, steepest descent ii. Newton method with equality constraints i. Newton methods with equality constraints ii. ADMM method iii. Sub-gradient method. With inequality constraints i. Barrier interior point method ii. Primal-dual interior point methods.

UNIT 5: Advanced topics: First-order methods for large-scale optimization, i. First-order gradient descent ii. Application in machine learning, Schur convexity.

Text Book:

1. Boyd and Vandenberghe, Convex Optimization, Cambridge University Press, 2004.

Reference Books:

1. Ben-Tal and Nemirovski, Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications, MPS-SIAM Series on Optimization, 2001.
2. Nesterov, Introductory Lectures on Convex Optimization: A Basic Course, Springer, 2003.
3. David G. Luenberger, Optimization by Vector Space Methods, Wiley, 1997.
4. R. Tyrell Rockafellar, Convex Analysis, Princeton University Press., 1996.

PH211 - PHYSICALLY UNCLONABLE FUNCTIONS CONSTRUCTIONS, PROPERTIES AND APPLICATIONS

UNIT-1: Introduction to Physical Unclonable Functions (PUFs): Introduction, Trust and Security in a Modern World, Information Security and Cryptology, Physical Security and Roots of Trust, The PUF Concept, On PUFs and Fingerprints, PUF Class, PUF Instance, PUF Evaluation, Shorthand Notation, Details of a PUF Experiment, PUF Response Intra-distance, Inter-distance Statistics.

UNIT-2: Classification Non-electronic, Electronic and Silicon PUFs, Intrinsic and Non-intrinsic PUFs, Weak and Strong PUFs, Intrinsic PUF Constructions: SRAM PUF, Latch, Flip-Flop, Butterfly, Buskeeper PUFs, Bistable Ring PUF.

UNIT-3: Physically Unclonable Functions: Properties Introduction, Constructability and Evaluability, Reproducibility, Uniqueness and Identifiability, Unpredictability, Mathematics and True Unclonability, One-Wayness, Tamper Evidence, Unpredictability of a Physical Function System.

UNIT-4: Implementation and Experimental Analysis of Intrinsic PUFs Introduction, Test Chip Design, Top-Level Architecture, PUF Block: Arbiter PUF, Power Domains, Implementation Details, Experimental

UNIT-5: Modeling Attacks and Applications Modeling Attacks on Arbiter PUFs, Modeling with Machine Learning Techniques, Modeling Entropy Bound, Assessing Entropy Adversary Models and Basic Entropy Bounds, Completely Ignorant Adversary, Adversary Knows Global Bias, Adversary Knows Inter-Bit Dependencies

Text book:

1. Physically Unclonable Functions Construction, Properties and Applications: Role Maes, springer, DOI 10.1007/978-3-642-41395-7

Reference Books:

1. O. Kommerling and M. G. Kuhn, ―Design principles for tamper-resistant smartcard processors,‖ in Proc. USENIX Workshop Smartcard Technology,1999, pp. 9–20.
2. R. Anderson and M. Kuhn, ―Tamper resistance—A cautionary note,‖in Proc. 2nd USENIX Workshop Electronic Commerce, Nov. 1996, pp. 1–11.
3. O. Goldreich, S. Goldwasser, and S. Micali, ―On the cryptographic applications of random functions,‖ Proc. Crypto Advanceds in Cryptology, pp. 276–288, 1985.
4. P. S. Ravikanth, ―Physical one-way functions,‖ Ph.D. dissertation, Dept.

PH214 - ANTENNA THEORY

UNIT I - FUNDAMENTAL CONCEPTS
Physical concept of radiation- Radiation pattern-near-and far-field regions,-antenna theoremformulation of fundamental antenna properties -Friis transmission equation-radiation integrals and auxiliary potential functions

UNIT II – RADIATION FROM WIREANTENNAS
Infinitesimal dipole-finite-length dipole-linear elements near, conductors- dipoles for mobile communication-small circular loop.

UNIT III - APERTURE AND REFLECTOR ANTENNAS
Huygens' principle- radiation from rectangular and circular apertures- design considerations -Babinet's principle -Radiation from sectoral and pyramidal horns-design concepts prime-focus parabolic reflector and cassegrain antennas.

UNIT IV - BROADBAND AND MICROSTRIP ANTENNAS
Log-periodic and Yagi antennas- frequency independent antennas- helical antennas -Basic characteristics of microstrip antennas -feeding methods- methods of analysis -design of rectangular and circular patch antennas-microstrip arrays.

UNIT V – ANTENNAARRAYS AND BASIC CONCEPTS OF SMART ANTENNAS
Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays. Concept and benefits of smart antennas- Fixed weight beam forming basics- Adaptive beam forming.

Text Books:

1. C. A. Balanis, *"Antenna Theory Analysis and Design"*, 3rd Ed., John Wiley & Sons, 2008.
2. W. L. Stutzman, and G. A. Thiele, *"Antenna Theory and Design"*, 2nd Ed., John Wiley & Sons, 2010.

Reference Books:

1. R. S. Elliot, *"Antenna Theory and Design"*, Revised edition, Wiley-IEEE Press, 2005.
2. R. E. Collin, *"Antennas and Radio Wave Propagation"*, McGraw-Hill., 1985.
3. F. B. Gross, *"Smart Antennas for Wireless Communications"*, McGraw-Hill, 2005.
4. John.D.Kraus and R.J.Marhetka*,"Antennas for all Applications"*3rd edition.Tata McGraw Hill, 2008.

PH234 - BIOMECHANICS

UNIT-1 Introduction to biomechanics: what is biomechanics, Fundamentals of biomechanics and qualitative analysis, Anatomical description and its limitations.

UNIT-2 Multiaxial deformations and stress analyses: Poisson's ratio, biaxial and triaxial stresses, stress transformation, principal stresses, Mohr's circle, failure theories, allowable stress and factor of safety, factors affecting strength of materials, fatigue and endurance, stress concentrations, torsion , bending and combined loading-problems.

UNIT-3 Applications of statics to biomechanics: skeletal joints and muscles, basics considerations, basic assumptions and limitations, mechanics of the elbow, shoulder, spinal column, hip, knee and ankle.

UNIT-4 Mechanical properties of biological tissues: viscoelasticity, analogies based on springs and dashpots, empirical models of viscoelasticity, time-dependent material response, comparison of elasticity and viscoelasticity, common characteristics of biological tissues, biomechanics of bone, tendons and ligaments, skeletal muscles and articular cartilage.

UNIT-5 Biomechanics of human movement: linear and angular kinematics of human movement, linear kinetics of human movement, equilibrium and human movement, and angular kinetics of human movement

Text books:

1. Duane Knudson, "*Fundamentals of Biomechanics*", 2ndedition Springer Science and Business Media, 2007.
2. Nihatozkaya and Margareta Nordin, " *Fundamentals of biomechanics-equilibrium, motion and deformation*" Springer, Second edition
3. Susan .J. Hall, "*Basic biomechanics"*, Tata McGraw Hill, Sixth edition, 2011

Reference Books:

1. Y.C. Fung, "*Bio-Mechanics- Mechanical Properties of Tissues*", Springer-Verlag, 1998.
2. D. J. Schneck and J. D. Bronzino, "*Biomechanics- Principles and Applications"*, CRC Press, Second Edition, 2000.
3. *Jay D. Humphrey and Sherry De Lange, "An Introduction to Biomechanics: Solids and Fluids, Analysis and Design", Springer Science and Business Media, 2004.*

PH215 - MICROWAVE AND MILLIMETER WAVE CIRCUITS

UNIT-1 Analysis of Microwave Circuits:Introduction, Microwave Components – E-plane Tee, H-planeTee, Magic Tee, Directional Coupler, Isolator, Circulator & their Scattering.

UNIT-2 Transformers &Resonators:Parameters, Impedance Transformers – Quarter wave Transformers, Microwave Resonators – Rectangular and Cylindrical Resonators.

UNIT- 3 Filters And Periodic Structures:Design of Narrow Band Low Pass, Band Pass and High Pass Filters, Maximally flat and Chebyshev Designs, Introduction to Periodic Structures, Floquet's Theorem, Circuit Theory Analysis of Infinite and Terminated Structures,

UNIT-4 Obstacles in Wave Guides:Introduction, Posts in Waveguides, Diaphragms in Waveguides, Waveguide Junctions, Waveguide Feeds, Excitation of Apertures

UNIT-5 Millimeter Wave Circuits:Wave Propagation in microstriplines, Discontinues in Microstrips, Parallel Coupled lines, Power Dividers and Directional Couplers, Microwave and Millimeter Wave Integrated Circuits.

Text Books:

1. Roger F. Harrington, "Time-Harmonic Electromagnetic Fields", Mcgraw-hill.
2. Robert E Collin, "Foundation For Microwave Engineering", McGraw-Hill.

Reference Book:

1. Analysis Methods for RF, Microwave, and Millimeter-Wave Planar Transmission LineStructures by Cam Nguyun

PH221 - BROADBAND WIRELESS TECHNOLOGIES

UNIT 1 Introduction to Wireless Communication. The Cellular concept, System design, Capacity improvement in cellular systems, Co channel interference reduction. Intelligent cell concept and applications.TechnicalChallenges.

UNIT2 Mobile radio propagation: Reflection, Diffraction. Fading. Multipath Propagation. Channel modeling, Diversity Schemes and Combining Techniques.

UNIT 3 Design parameters at the base station, Practical link budget design using path loss models. Smart antenna systems, Beamforming.MIMO Systems. RAKE receiver.

UNIT 4 Multiuser Systems: CDMA- Principle, Network design, Link capacity, Power control, WCDMA-Network planning, MC-CDMA, OFDM, Cellular mobile communication beyond 3G.

UNIT 5GSM, IS-95, GPRS, UMTS, WLAN, WPAN, WMAN, Ultra Wideband communications, 4G and beyond 4G.

Text Books:

1. *A.F.Molisch, Wireless Communications, Wiley, 2005.*
2. *A.Goldsmith, Wireless Communications, Cambridge University Press, 2005.*

Reference Books:

1. *P.MuthuChidambara Nathan, "Wireless Communication"s, PHI, 2008.*
2. *Ke-Lin Du, M.N.S.Swamy, "Wireless Communication Systems", Cambridge University Press, 2010.*
3. *K.Fazel& S. Kaiser," Multi-carrier and Spread Spectrum Systems", Wiley, 2003*
4. *S.G. Glisic, "Advanced Wireless Communications", 4G Technologies, Wiley, 2004.*
5. *W.C.Y.Lee, "Mobile Communication Engineering", (2/e), McGraw- Hill, 1998.*
6. *S.G. Glisic, "Adaptive CDMA", Wiley, 2003*

PH240 - MICRO STRIP ANTENNA

UNIT-1 BASICS OF MICROSTRIP ANTENNAS Origin of Microstrip radiators, microstrip antenna analysis methods, microstrip antenna advantages, disadvantages and applications; materials used for microstrip antennas, feed, ground and substrates and their properties, Common Feed methods, Characteristics of Resonance Frequency, Bandwidth, % BW, Return loss, VSWR, 50 Ohms Characteristic impedance, Axial ratio, Efficiency, Gain, Directivity, Rectangular & Polar Radiation Patterns, Experiment on the design of simple feeds.

UNIT-2RECANGULAR, CIRCULAR MICROSTRIP ANTENNA MODELS AND CHARACTERISTICS Rectangular microstrip antennas- common feed methods, TM10 and TM01 modes, return loss, radiation pattern, quarterwave rectangular microstrip antenna, single feed and dual fed circular polarized rectangular microwave antenna design, impedance and axial ratio bandwidth, efficiency. Circular micro strip antenna properties, directivity, input impedance bandwidth, gain, radiation pattern and efficiency, radiation modesTM11 bipolar mode, TM21 Quadra polar mode, TM02 unipolar mode, cross polarization.

UNIT-3DESIGN GUIDELINES OF MICROSTRIP Design guidelines for a linearly polarized rectangular microstrip antenna, Design guidelines for a circularly polarized rectangular microstrip antenna, electromagnetically coupled rectangular microstrip antenna, ultra-wideband rectangular microstrip antenna, design of SMSA, RMSA, UWB.

UNIT-4 Broadbandmicrostrip antennas, broadbanding, microstrip antenna matching with capacitive slot, microstrip arrays- planar array theory, array feeding methods – corporate fed and series fed; overview of printed antennas –omnidirectional microstrip antenna, stripline fed tapered slot antenna.

UNIT-5 DESIGN STRUCTURES AND APPLICATIONS OF DIFFERENT ANTENNAS Basic concepts of CPW-Coplanar Waveguide antennas, metamaterials, DRA-Dielectric Resonator Antennas, Micro strip antenna with DGS, MIMO antennas, reconfigurable antennas, Design structures of different antennasand applications of different antennas.

Text Books:

1. Randy Bancraft, "Microstrip and Printed Antenna Design",2nd Edition, Prentice-Hall of India, 2009
2. Ramesh Garg, PrakashBhartia, InderBaul and ApisakIttipiboon, "Microstrip Antenna Design Handbook", Artech House, 2001
3. Time Domain Finite Element Methods for Maxwell's equations in Metamaterials by Jichun Li, Yunqinghuang, 2013

Reference Books:

1. MIMO System Techonology for Wireless Communications by George tsoulos, 1st Edition
2. A CPW fed monopole antenna with uni planar EBG & Rhombic SRR by Madhav B.T.P &MeenaKumari
3. Rectangular Dielectric Resonator Antennas by Rajveer S. Yadhuvanshi& Harish ParthasarathyReconfigurable antennas by Jennifer T. Bernhard, 2007

4. Broadband microstrip antenna by Girish Kumar & KP Ray, 2003
5. Microstrip patch antennas by RedneyB.Waterhouse, 2003
6. Microstrip antennas by David M.Pozar& Daniel by H.Schaubert,1995
7. Electromagnetic band gap structure antenna by Fan Yang, YahyaRahmat-sail

PH241 - MICROWAVE MEASUREMENTS

UNIT I Introduction to Microwaves and Mathematical model of Microwave Transmission History of Microwaves, Microwave Frequency bands, General Applications of Microwaves, Advantages of Microwaves. Concept of Mode, Characteristics of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission, S-Parameters.

UNIT II Analysis of Microwave Transmission Lines and Waveguides Analysis of Microwave Transmission Lines and Waveguides Transmission line equations & solutions, reflection and transmission coefficient, standing wave and standing wave ratio, line impedance and admittance, impedance matching, using stub line, application of Smith Chart in solving transmission line, transients in transmission lines.

UNIT III Microwave Measurements Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal.

UNIT IV Antenna Pattern Measurements Basic Considerations, Pattern Formats, Fresnel Region Measurements, Modeling Techniques, Antenna Range Design and Evaluation: Introduction, Electromagnetic Design Consideration, Antenna Range Evaluation. Antenna Testing: Introduction, Types of of Ranges: Elevated Ranges, Ground Ranges, Near Field Ranges, Radar Cross Section Ranges.

UNIT VModern Trends in Microwaves Engineering Effect of Microwaves on human body, Medical and Civil applications of microwaves, Wireless Communications system, Radar Systems, Radiometer Systems, Satellite Communication, Remote sensing,

Text Books:

1. Samuel Liao - Microwave devices and circuits, PHI , Third Edition
2. Dennis Roddy - Microwave Technology, PHI
3. G. Kennedy - Electronic Communication systems, McGraw-Hill Book Company , Fourth Edition

Reference Books:

1. Annapurna Das, SisirK.Das- Microwave engineering, (TMG), Second Edition
2. Siteshkumar Roy &ManojitMitra - Microwave semiconductor devices, PHI , Third Printing
3. A. K. Gautam - Microwave engineering, (S. K. Kataria pub) , 2nd Edition
4. Sanjeev Gupta, Microwave Engineering, Khanna Pub., Third Edition
5. Evans, Gray E," Antenna measurements techniques", Artech House, Inc
6. J S Hollis, T J Lyon, L Clayton," Microwave Antenna Measurements” , Scientific Atlants, Inc Third Edition
7. David M. Pozar, "Microwave Engineering", Third Edition, Wiley India.

PH220 - ADVANCED DIGITAL COMMUNICATION

UNIT 1 Digital modulation techniques: Digital modulation formats, Coherent binary modulation techniques, Coherent quadrature - modulation techniques, No-coherent binary modulation techniques, Comparison of binary and quaternary modulation techniques, M-ray modulation techniques, Power spectra, Bandwidth efficiency, M-array modulation formats viewed in the light of the channel capacity theorem, Effect of inter symbol interference, Bit verses symbol error probabilities, Synchronization, Applications.

UNIT 2 Coding techniques: Convolutional encoding, Convolutional encoder representation, Formulation of the convolutional decoding problem, Properties of convolutional codes: Distance property of convolutional codes, Systematic and nonsystematic convolutional codes, Performance Bounds for Convolutional codes, Coding gain, Other convolutional decoding algorithms, Sequential decoding, Feedback decoding, Turbo codes. Communication through band limited linear filter channels: Optimum receiver for channel with ISI and AWGN, Linear equalization, Decision - feedback equalization, reduced complexity ML detectors, Iterative equalization and decoding - Turbo equalization.

UNIT 3 Adaptive equalization: Adaptive linear equalizer, adaptive decision feedback equalizer, Adaptive equalization of Trellis - coded signals, Recursive least square algorithms for adaptive equalization, Self recovering (blind) equalization.

UNIT 4 Spread spectrum signals for digital communication: Model of spread spectrum digital communication system, Direct sequence spread spectrum signals, Frequency hopped spread spectrum signals, CDMA, Time hopping SS, Synchronization of SS systems.

UNIT 5 Digital communication through fading multipath channels: Characterization of fading multipath channels, The effect of signal characteristics on the choice of a channel model, Frequency nonselective, Slowly fading channel, Diversity techniques for fading multipath channels, Digital signals over a frequency selective, Slowly fading channel, Coded wave forms for fading channels, Multiple antenna systems.

Text books:

1. John G. Proakis, **"Digital Communication"**, McGraw Hill, 4th edition, 2001.
2. Bernard Sklar, **"Digital Communication - Fundamental and applications",** Pearson education (Asia), Pvt. Ltd., 2nd edition, 2001.
3. Simon Haykin, **"Digital communications",** John Wiley and Sons.
4. Andrew J. Viterbi, **"CDMA: Principles of spread spectrum communications",** Prentice Hall, USA, 1995.

PH242 - METAMATERIALS

UNIT-I: Introduction to Metamaterials (MTMs): The concept of Metamaterials: Basic Electromagnetic and Optical properties, Basic structures, potential applications, Governing equations for Metamaterials, Brief overview of computational electromagnetics. Definition of Metamaterials and Left-Handed(LH) MTMs.

UNIT-II: Fundamentals of LH MTMs: Conventional Backward waves and Novelty of LH MTMs, Terminology, Transmission line approach, Composite Left/Right Handed MTMs, MTMs and photonic Band-Gap structures. Left-Handedness from Maxwell's equations, Entropy conditions in Dispersive media, Boundary conditions, Reversal of Doppler effect, Reversal of Snell's law, Focusing by a "Flat LH Lens".

UNIT-III: Simulations of Wave propagation in Metamaterials I: Interesting phenomena of wave propagation in MTMs: Demonstration of a PML model, Multiscale phenomena for Metamaterials, Demonstration of Backward Wave Propagation, Metamaterial electro magnetic cloak: Form Invariant property of Maxwell's equations, Design of Cylindrical and square cloaks, cloak simulation in Frequency domain.

UNIT-IV: Simulations of Wave propagation in Metamaterials II:

Solar cell design with Metamaterials: Brief Introduction, Mathematical formulation, Numerical Simulations, Problems needing special attention: Unit cell design and Homogenization, A posteriori error estimator.

UNIT-V: Future of MTMs:"Real-Artificial" Materials: the challenge of Homogenization, Three-Dimensional isotropic LH MTMs, "Magnet less" Magnetic MTMs, Terahertz Magnetic MTMs, Antenna Radomes and Frequency selective surfaces, Nonlinear MTMs, Active MTMs.

Textbooks:

1. "Time Domain Finite Element Methods for Maxwell's equations in Metamaterials" by Jichun Li, Yunqinghuang.
2. "Electromagnetic Metamaterials: Transmission Line Theory and Microwave Applications" The Engineering Approach by Christophe Caloz, Tatsuo Itoh

PH238 - CHANNEL CODING

UNIT – IINTRODUCTION TO ERROR CONTROL CODING: Introduction to error control coding, Introduction to block codes, linear block codes, Generator matrix and parity check matrix, Properties of linear block codes: Syndrome, error detection, Decoding of linear block codes.

UNIT – II LOW DENSITY PARITY CHECK CODES: Introduction to low density parity check codes,LDPC code properties, Construction of parity check matrix H, Representation using tanner graphs, Encoding of low density parity check codes, Efficient encoding of LDPC codes , Decoding of low density parity check codes.

UNIT – IIICONVOLUTIONAL CODES: Introduction to convolutional codes, Encoding of convolutional codes, Structural properties of convolutional codes - state diagram, catastrophic convolutional codes,Transfer function of convolutional encoder, Distance properties of convolutional codes, Trellis diagram, Decoding of convolutional codes- Viterbi algorithm- hard decision decoding, soft decision decoding.

UNIT – IVTURBO CODES: Introduction to turbo codes, Encoding of turbo codes, Turbo decoding – the BCJR algorithm, Performance analysis of the turbo codes.

UNIT –VSPACE-TIME CODING: Introduction to space-time coded MIMO system, Space-time block code, Decoding STBCs, Alamouti code - 2-transmit, 1-receive alamouti STBC coding, 2-transmit, 2-receive alamouti STBC coding, Higher order STBC's, Space-time trellis coding.

TEXT BOOKS:

1. K. Deergha Rao, "Channel Coding Techniques for Wireless Communications", Springer India, 2015.
2. Richardson T, "Modern Coding Theory", Cambridge University Press, 2008.

PH239 - WIRELESS AND CELLULAR COMMUNICATION

UNIT – IOVERVIEW OF CELLULAR EVOLUTION AND WIRELESS TECHNOLOGIES: Introduction, **2G/3G Cellular Systems and their features, Cellular evolution to 4G,Motivation and scope for 5G Cellular systems,Non-Cellular technologies for Internet of Things (IoT) and Smart grids,**Basic Cellular Terminology, Introduction to Antennas and Propagation Models, Link budget, Fading margin, Outage, Cellular concept, Cellular system design and analysis, Cellular Geometry and System Design, Cellular System Capacity, Trunking, Handoff and Mobility, Classification of signal variation, Shadowing, Outage, Multipath.

UNIT – IIMULTIPATH FADING ENVIRONMENT AND BER PERFORMANCE IN FADING CHANNELS: Rayleigh Fading and Statistical Characterization, Properties of Rayleigh Distribution, BER in Fading, Narrowband vs Wideband Channels, Characterization of Multipath Fading Channels, Choice of Modulation, Coherent versus Differential Detection, BER in Fading, Ricean Fading, Ricean and Nakagami Fading, Moment Generating Function.

UNIT – IIITRANSCEIVERS AND SIGNAL PROCESSING: Structure of a wireless communication link, Modulation formats, Demodulation, Diversity, Channel coding and information theory, Equalizers, BER in fading, Equal Gain Combining, Array Gain, Diversity Gain, Alamouti Scheme, Channel capacity, Capacity of fading Channels, Capacity with Outage, Channel State Information, Optimum Power Allocation.

UNIT – IVCDMA and OFDM: Optimum Power Allocation – Water filling, Introduction to Direct Sequence Spread Spectrum Communications, Properties of Spreading Sequences, Introduction to CDMA, Features of cdma2000 and WCDMA, Rake Receiver for multipath channels, Multiuser environment, CDMA system capacity, CDMA Multiuser Detectors, Orthogonal Frequency Division Multiplexing, Multiantenna systems.

UNIT – VMIMO: Multi User Introduction: Point-to- point MIMO, Multi-user MIMO, Massive MIMO, Time Division verses Frequency Division Duplexing, Models and Preliminaries: Single-Antenna Transmitter and Single-Antenna Receiver, Coherence Time, Coherence Bandwidth, Coherence Interval, Interpretation of Tc and Bc in Terms of Nyquist Sampling Rate,TDD Coherence Interval StructureDetection, MIMO, Space time codes.

TEXT BOOKS:

1. T. S. Rappaport, “Wireless Communications – Principles and Practice” (2nd edition) Pearson, 2010, ISBN 9788131731864.
2. A. Molisch, "Wireless Communications," Wiley, 2005Haykin & Moher, "Modern Wireless Communications" Pearson 2011 (Indian Edition).

3. J. G. Proakis, "Digital Communications," McGraw Hill.

4. A. Goldsmith, "Wireless Communications," Cambridge Univ Press, 2005.

5. D. Tse and P. Viswanath, "Fundamentals of Wireless Communications," Cambridge Univ Press, 2005.

MECHANICAL ENGINEERING

PH034 - COMPUTATIONAL FLUID DYNAMICS

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS Basics of computational fluid dynamics - Governing equations of fluid dynamics - Continuity, Momentum and Energy equations - Chemical species transport - Physical boundary conditions Time-averaged equations for Turbulent Flow - Turbulent-Kinetic Energy Equations Mathematical behaviour of PDEs on CFD - Elliptic, Parabolic and Herbolic etuations –

UNIT II FINITE DIFFERENCE METHOD 9 Derivation of finite difference equations - Simple Methods - General Methods for first and second order accuracy - solution methods for finite difference equations - Elliptic equations - Iterative solution Methods - Parabolic equations - Explicit and Implicit schemes - Example problems on elliptic and parabolic equations.

UNIT III FINITE VOLUME METHOD (PM) FOR DIFFUSION 9 Finite volume formulation for steady state One and Two dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank - Nicol son and fully Implicit schemes

UNIT IV FINITE VOLUME METHOD FOR CONVECTION DIFFUSION 1 10 Steady one-dimensional convection and diffusion - Central, upwind differencing schemes-properties of discretization schemes - Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICK Schemes

UNIT V CALCULATION FLOW FIELD BY FVM Representation of the pressure gradient term and continuity equation - Staggered grid -Momentum equations - Pressure and Velocity corrections - Pressure Correction equation, SIMPLE algorithm and its variants. Turbulence models, mixing length model, two equation (k-C) models - High and low Reynolds number models LECTURE 45 TUTORIAL 15 TOTAL 60 TEXT

BOOKS: 1 T.J. Chung, Computational Fluid Dynamics, Cambridge University, Press, 2002 Versteeg, H.K., and Malalasekera, W., An Introduction to Computational Fluid Dynamics: The finite volume Method, Longman, 1998 REFERENCES; 1 Petarkar, S. J. Numerical Heat Transfer and Fluid Flo wr, HerrFsphere Publishing Corporation, 2004 2 Mura l idha r, 1 ., and Su n da ra rajan, T_, cam p utationel Fluid Flow and Feat Transfer. Morose Fublistrin; House, NewDelhi, 1995. :: hoshdastidar' , P.S., computer Simulati n floes end heat transfer, Tate McGraw Hill Publishing Company Ltd.. '1998 Pearson Education, 2005. 5 Anil W. Date ,Introduction to Computational Fluid Dynamics Cambridge University Press, 2005.

PH035 – FUELS AND COMBUSTION

UNIT-I Fuels- detailed classification - Conventional and Unconventional Sorid, Liquid, gaseous fuels and nuclear fuels - Origin of Coal - Analysis of coal. Coal - Carborisation, asification and liquification - Lignite: petroleum based fuels - problems. associated with very low calorific value gases: Coal Gas - Blast Furnace Gas Alcohols and eiogas_

UNIT II Prhciples of combustion - Chemical composition - Flue gas anlaysis. - dew point of products - Combustion stoichiOmetry. Chemical kinetics - Rate of reaction - R.eaction order - Molecularity Zeroth, first, second and third order reactions - complex reactions - chain reactions. Theories of reaction Kinetics - General oxidation behavior of HC's,

UNIT III Thermodynamics of combustion - Enthalpy of formation - Heating value of fuel - Adiabatic flame Temperature - Equilibrium composition of gaseous mixtures..

UNIT IV Laminar and turbulent flames propagation and structure - Flame stability - Burning velocity o fuels — Measurement of burning velocity - factors affecting the burning velocity. Combustion of fuel, droplets and sprays - Combustion systems - Pulverised fuel furnaces - fixed, Entrained and Fluidised Bed Systems.

UNIT V Environmental considerations - Air pollution - Effects on Environment, Human Health etc. Principal pollutants - Legislative Measures - Methods of Emission control_

REFERENCES

1_ Combustion Fundamentals by Roger A strehlow - Mc Draw Hill 2. Fuels and combustion by Sharma and Chancier Mohan - Tata Mc Graw Hill Combustion Engineering and Fuel Technology by Shaha A.K. Oxford and 1BH. 4. Principles of Combustion by Kanneth K_Kuo, Wiley and Sons_ 5. Combustion by Barker - Mo. Graw Hill. 6. An Introduction to Combustion - Stephen 171. Turns, Mc. Craw Hill International Edition, 7. Combustion Engineering - Gary L. Berman & Kenneth W_ Raglandr Mc_ Graw Hill International Edition_ S. Combustion- I, Glassman

PH049 – CONVENTIONAL MACHINE PROCESSING

UNIT - I Principles and Elements of machining - Types of cutting tools – Geometry of single point cutting tool – chip formation and types of chips, chip breakers. Orthogonal and Oblique cutting – Machinability - Merchant's force diagram – velocity relationship – cutting speed, feed, depth of cut. Tool life and wear – Tool materials, thermal aspects, surface finish, cutting fluids, empirical and analytical determination of cutting forces.

UNIT - II Work Holding Devices of Lathe: Three jaw chuck – Four jaw chuck – combination chuck and other work holding devices. Tool holders. Lathe Operations : Turning, facing – taper turning – thread cutting, special attachments, machining time and power estimation. Capstan & Turret Lathe: Differences, collet chuck, tool holders, tool layout, automatic lathes.

UNIT - III Shaper : Line diagram and parts, specifications, quick return mechanism for shapers – work holding devices and shaper operations. Planer : Types of planers, specifications, quick return mechanism of a planer – work holding devices. Slotting Machine : Line diagram and parts of a slotter – specifications – Ram drive mechanism, determination of vcm in accordance with the machine mechanism.

UNIT - IV Drilling Machine : Classification and Specifications – Drill bits – twist drill – nomenclature – Tool Holding devices – Drilling operations. Special purpose machines. Boring Machine: Boring operations and Jig Boring machines. Milling Machine : Classification of Milling Machines – Parts and Specifications – types of milling cutters – Milling Operations – Indexing heads – plain and universal dividing heads, milling mechanics, milling time and power estimation, special setups.

UNIT - V Grinding : Cylindrical - external and internal, surface and centerless grinding machines, grinding process, grinding process parameters. Grinding Wheel : Specifications - Abrasives, bonds, grit, grade and structure of grinding wheel. Fine Finishing Processes : Lapping, Honing and superfinishing operations.

TEXT BOOKS : 1. P.N.Rao, " Manufacturing Technology," Vol-2 , 2nd edition, Tata Mc Graw hill education (P) ltd,2012. 2. B.S. Raghu Vamsi, "A Course in Workshop Technology", Vol-II, 2nd ed., Dhanapathi Rai & Sons, 2013.

REFERENCE BOOKS : 1. Helmi A.Youssef, Hassan El-Hofy, "Machining Technology," CRC Press Micro print (P) Ltd, Chennai, 2012. 2. Hindustan Machin Tools, "Production Technology", 3rd ed., Tata McGrawHill, 2014. 3. R.K. Jain and S.C. Gupta, "Production Technology", 17th ed., Kanna Publishers, 2011.

PH231 – ADVANCED HEAT TRANSFER

1. **Conduction:** Introduction – Modes of heat transfer – Combined modes – Steady one-dimensional – Steady heat source system – Steady porous system – Steady two-dimensional system – Unsteady Conduction - Lumped heat capacity system - infinite solid flat plate - cylinder (Hcsillery charts).

2. **Fins:** Types of fins – Analysis of fins (Longitudinal & annular) of uniform cross section, effectiveness - Efficiency of fin.

3. **Convection:** Boundary layer flow with heat transfer - Equations of momentum and energy – Forced convection over a flat plate (similarity solution) – Empirical relations for forced and free convection - Mechanism of free convection in enclosed spaces – Mixed convection.

4. **Two Phase Heat Transfer:** Regimes of pool boiling – Flow boiling – Correlations – Types of condensation – Film condensation on horizontal and vertical surfaces.

5. **Radiation:** Overview of Mechanism – laws of radiation- Radiant heat exchange in gray - non-gray bodies - with transmitting - reflecting and absorbing media - specular surfaces - gas radiation

Heat Exchanger: Definition and classification - concept of LMTD and overall heat transfer coefficient - fouling factor- Derivation of LMTD and effectiveness for parallel and counter flow heat exchangers - NTU approach and design procedure – compact heat exchangers.

Reference Books:

a. Holman.J.P., Heat Transfer, Tata Mc Graw Hill, 2002.
b. Engineering heat and mass transfer by Mahesh M Rathore, Laxmi Publications
c. Heat Transfer - A basic approach / Necati Ozisik/ Mc Graw Hill
d. Heat transfer by Cengel and Ghajar, TMH
e. Fundamentals of Heat and Mass transfer by Incropera and Dewit, Wiley
f. Heat Transfer / Ghoshdastidar / Oxford University Press
g. Convective Heat Transfer Analysis /Patrick H.Oosthuizen/David Naylor/ Mc Graw Hill
h. Convective Heat and Mass Transfer / W.M.Kays & Craford/ TMH
i. Mass Transfer Operations / Robert E. Treybal / Mc Graw Hill

PH232 - RENEWABLE ENERGY TECHNOLOGIES

1. **Global and National Energy Scenario:** Over view of conventional & renewable energy sources - Need & development of renewable energy sources - Types of renewable energy systems - Future of Energy Use - Global and Indian Energy scenario - Renewable and Non-renewable Energy sources, Energy for sustainable development - Potential of renewable energy sources - Renewable electricity and key elements – Global climate change - CO2 reduction potential of renewable energy- Concept of Hybrid systems.

2. **Solar Energy:** Solar energy system - Solar Radiation – Availability - Measurement and Estimation - Solar Thermal Conversion Devices and Storage - Applications Solar Photovoltaic Conversion - solar thermal - Applications of solar energy systems.

3. **Wind Energy:** Wind Energy Conversion – Potential - Wind energy potential measurement - Site selection - Types of wind turbines - Wind farms - Wind Generation and Control - Nature of the wind - Power in the wind - Factors influencing wind – Wind data and energy estimation - Wind speed monitoring - Classification of wind – Characteristics - Applications of wind turbines - Offshore wind energy – Hybrid systems - Wind resource assessment - Betz limit - Site selection - Wind energy conversion devices - Wind mill component design - Economics and demand side management – Energy wheeling - Energy banking concepts - Safety and environmental aspects - Wind energy potential and installation in India.

4. **Biogas:** Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features – Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

5. **Ocean Energy:** Ocean wave energy conversion - Principle of Ocean Thermal Energy Conversion (OTEC) - Ocean thermal power plants - Tidal energy conversion - Tidal and wave energy its scope and development - Scheme of development of tidal energy.

a. **Small Hydro Power Plant:** Importance of small hydro power plants and their Elements - Types of turbines for small hydro - Estimation of primary and secondary power.

b. **Geothermal Energy**: Geothermal power plants - Various types - Hot springs and steam ejection.

Reference Books:

a. Power plant technology, J Wakhil
b. Non-Conventional Energy Sources G.D Rai
c. Solar Energy - Principles of thermal collection and storage S. P. Sukhatme
d. Solar Engineering of Thermal Processes J. A. Duffie and W. A. Beckman
e. Biomass Regenerable Energy D. D. Hall and R. P. Grover.
f. Renewable Energy Sources, Twidell, J.W. and Weir, A., EFN Spon Ltd., 1986.
g. Renewable Energy Engineering and Technology, Kishore VVN, Teri Press, New Delhi,2012
h. Sustainable Energy Systems Engineering, Peter Gevorkian, McGraw Hill,2007
i. Principles of Solar Engineering, Kreith, F and Kreider, J. F., McGraw-Hill, 1978.
j. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K, 1996.
k. Alternative Energy Sources, Veziroglu, T.N., Vol 5 and 6, McGraw-Hill, 1990
l. Biochemical and Photosynthetic aspects of Energy Production, Anthony San Pietro, Academic Press, 1980.
m. Thermochemical processing of Biomass, Bridgurater, A.V., Academic Press, 1981.
n. Renewable Energy, Bent Sorensen , Elsevier, Academic Press, 2011

PH233 - NANO MATERIALS AND FLUIDS FOR ENERGY AND ENVIRONMENT

Unit-I: Energy overview

Types of energy and utilization – energy characteristics, energy measures, fundamentals of environment, environmental aspects of energy utilization, public health issue related to environment pollution, public standards, environmental impact assement

Unit- II: Nanomaterial's used in energy and environmental application

Evaluation of properties and performance of practical power systems that benefit from optimization of materials processing approaches

Unit-III Device applications

Sensors, power semiconductors chips, fuel cells, superconductors, solar cells, energy storages and alternative power sources. Solar cells, thin film Si solar cells, chemical semiconductor solar cells, dye sensitized solar cells, polymer solar cells, nano quantum dot solar cells, hybrid nano-polymer solar cells

Unit-IV Introduction to fuel cells

Fuel cells, principle of working, basic thermodynamics and electrochemical principle, fuel cell classification, fuel cell electrodes and carbon nano tubes, application of power and transportation.

Unit V:Nano fluids: Preparation, Stability Mechanisms, and Applications

Introduction to Nanofluids.Preparation Methods for Nanofluids - Two-Step Method, One-Step Method, Other Novel Methods.The Stability of Nanofluid-The Stability Evaluation Methods for Nanofluids- Sedimentation and Centrifugation Methods- Zeta Potential Analysis- Spectral Absorbency Analysis-The Ways to Enhance the Stability of Nanofluids- Surfactants Used in Nanofluids-Surface Modification Techniques: Surfactant-Free Method- Stability Mechanisms of Nanofluids. Application of Nanofluids- Heat Transfer Intensification-Electronic Applications-

Transportation-Industrial Cooling Applications-Nuclear Systems Cooling-Space and Defense-Mass Transfer Enhancement-Energy Storage-Solar Absorption-Mechanical Applications-Friction Reduction

Reference Books:

1. W.F. kenney, energy conservation in the process industries, academic press, 1984

2. Tetsuo soga, nanostructured materilas for solar energy conversion, Elsevier.

3. Introduction to Materials Science and Engineering, Yip-wah Chung, 2006, CRC

PH235 - MECHATRONICS AND MANUFACTURING AUTOMATION

Unit1 Introduction: Definition of mechatronics. Mechatronics in manufacturing, products and design. Review of fundamentals of electronics.

Unit 2. Mechatronics elements: Data conversion devices, sensors, micro sensors, transducers, signal processing devices, relays, contactors and timers.
Processors /controllers- Microprocessors, microcontrollers, PID controllers and PLCs.

Unit 3Drives and mechanisms of an automated system: Drives-stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems

Unit 4 Hydraulic system Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, and pumps. Design of hydraulic circuits.

Unit 5 Pneumatic system Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems.
CNC technology and Robotics CNC machines and part programming. Industrial Robotics.

Textbooks

[1] Boucher, T. O., Computer automation in manufacturing - an Introduction, Chapman and Hall, 1996.

[2] HMT Limited, “Mechatronics”, Tata McGraw-Hill Publishing Co Ltd, 2002.

[3] Mechatronics System Design, 5th Indian reprint, by Devdas shetty, Richard A. kolk, PWS Publishing Company,2009.

References:

[1] W. Bolton, Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering (2012), Pearson Education.

[2] Deb, S. R., Robotics technology and flexible automation, Tata McGraw-Hill, New Delhi, (2009).

[3] Mechatronics – N. Shanmugam / Anuradha Agencies Publishers, (2010).

[4] Mechatronics – Smaili A, Mrad F, Oxford Higher Education, Oxford University Press(2008)

[5] Mechatronics – Principles and Application Godfrey C. Onwubolu, Elsevier, Indian print (2006).

PH236 - ADVANCED SURFACE ENGINEERING TECHNIQUES

Unit 1: Introduction to materials, surface, thermodynamics of surface, surface dependent engineering properties. Common surface initiated engineering failure; mechanisms of surface degradation (wear, corrosion and high Temperature oxidation)

Role of microstructure and materials behavior in controlling the surface dependent failure of components, Importance of surface engineering, classification and scope of surface engineering of Materials. Introduction to surface modification and coating techniques.

Unit 2: Requirement of protective coatings, classification of organic, polymeric and inorganic coatings, conversion coatings, metallic coatings, electrodeposition and electroless coatings. Paint coatings for corrosion protection, role of resins, pigment, additives and solvents.

Unit 3: Application techniques: Surface preparation and its importance in coating, role of coating selection & design of coating, failure mechanism , maintenance coatings, industrial paint systems, modern paint coating systems and specific examples. coatings for underground pipelines, storage tanks, overhead pipelines, offshore structures, ship hulls, risers, reinforced bars and concrete structures. testing and evaluation.

Unit 4: Synthesis, processing and characterization of nano-structured coatings, functional coatings,advanced coating practices, characterization of nano-coatings, applications of nano-coatings,

Need of advanced methods for surface and coating testings, Size dependency in nanostructures of nanocoatings, Size effect in electrochemical properties of nanostructured coatings, Size effect in mechanical properties of nanostructured coatings, Size effect in physical and other properties of nanostructured coatings.

Unit 5: Microencapsulation: Processes, Microencapsulation: Kinetics of release, Plating of nanocomposite coatings, Advantages of microencapsulation over other conventional methods.

Current trends in surface modification of nanomaterials, Modified Nanomaterials: In-use for consumer products, Main problems in synthesis of modified nanomaterials.

Text books:

1. Surface Engineering for Wear Resistances (Introduction and classification of Wear) By: K.G. Budinski Prentice Hall, Englewood Cliffs, 1988

2. Surface Engineering & Heat Treatment (Diffusion assisted surface alloying) By: P.H Morton I.I.T, Brooke field, (1991)

3. Protective Coating of Metals By: R.M. Burns & W.W. Bradley Reinhold Publication Corporation, N. York, 1928

4. Metals HandbookNinth Edition, Vol.5, Surface Cleaning, Finishing & Coating,

5. ASM, Metals Park Ohio, 1982. Metals HandbookNinth Edition, Vol.5, Surface Cleaning, Finishing & Coating, ASM, Metals Park Ohio, 1982.

6. Handbook of thin film deposition processes and techniques Edited by Krishna Seshan, William Andrew Publishing Norwich, New York, U.S.A.

7. Nanomaterials and Surface Engineering edited by Jamal Takadoum, John Wiley & Sons, Inc., USA.

8. Nanocoatings: Size Effect in Nanostructured Films By Mahmood Aliofkhazrae, Springer-Verlag, USA.

9. Introduction to Tribology byu Bharat Bhusan, John Wiley & Sons, USA.

PH237 - ADDITIVE MANUFACTURING TECHNOLOGIES AND APPLICATIONS

UNIT – I

Introduction: Prototyping fundamentals: Need for time compression in product development, Need for Additive Manufacturing, Historical development, Fundamentals of Additive Manufacturing, AM Process Chain, Advantages and Limitations of AM, Commonly used Terms, Classification of AM process. Fundamental Automated Processes: Distinction between AM and CNC, other related technologies.

UNIT – II

Liquid-based AM Systems:Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. **Solid ground curing (SGC):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. **Polyjet:** Process, Principle, working principle, Applications, Advantages and Disadvantages, Case studies. Microfabrication.

Solid-based AM Systems:Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. **Fused Deposition Modeling (FDM):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. **Multi-Jet Modelling (MJM):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT – III

Powder Based AM Systems:Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. **Three dimensional Printing (3DP):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. **Laser Engineered Net Shaping (LENS):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.**Electron Beam Melting (EBM):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.**Wire Arc Additive Manufacturing (WAAM): W**orking principles, applications, advantages and disadvantages of WAAM. WAAM advantages over powder bed AM systems, case studies.

UNIT – IV

Rapid Tooling and Rapid Manufacturing process optimization: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification: Indirect

Rapid Tooling Methods: Arc Spray Metal Deposition, Investment Casting, Sand Casting. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process.

Rapid manufacturing process optimization- factors influencing accuracy, data preparation errors: part building errors; errors in finishing. Influences of part build orientation. Additive manufacturing software's.

UNIT –V

AM Applications: Application – Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customised Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules. Web Based Rapid Prototyping Systems

Suggested Reading:

1. Rapid prototyping: Principles and Applications - Chua C.K., Leong K.F. and LIM C.S, World Scientific publications , Third Edition, 2010.

2. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer , 2001

3. Wholers Report 2000 – Terry Wohlers, Wohlers Associates, 2000

4. Rapid Prototyping & Engineering Applications – Frank W.Liou, CRC Press, Taylor & Francis Group, 2011.

MANAGEMENT SCIENCES

PH210 - DECISION SUPPORT SYSTEM

UNIT - I

M.I.S and Its Role In Organizations Open-Systems and Closed Systems. D.S.S Its Relation to M.I.S, Characteristic Role of D.S.S as Different From M.I.S in an Organization, Expert DSS and Its Role as an Aid to Management Decision Process.

UNIT - II

Deterministic Models: Models Required to Cope With Uncertainty, Probabilistic Models and Fuzzy Sets, Fuzzy DSS and Fuzzy Expert DSS. *{Ref:2,3}*

UNIT - III

Application of DSS to Some Functional Areas of Management Like Finance, Marketing, Production Planning and Control Etc. *{Ref:2,3}*

UNIT - IV

Non-Optimizing Models of DSS, Simulation Techniques and Monte- Carlo Methods. Application of DSS Technical Feasibility and Financial Viability of DSS. Advantages and Limitations of DSS –Contemporary practices. *{Ref:1,2,3}*

UNIT - V

Introduction to Artificial Intelligence (AI): An Overview of AI– AI Technologies in Business, Domains in AI, Neural networks, Fuzzy logic systems in Business, Virtual Reality, Intelligent agents, expert system and its components, Applications of expert system, developing expert systems, value of expert systems. *{Ref:4,5}*

Reference Books:

1 Macllah: Decision Support Systems and Data Warehousing, TMH, 2003.

2 Turbon: DSS and Intelligent Systems, Pearson Education, 2001.

3 James A Obrien: Management Information systems—Managing information technology in the E-Business Enterprise, 5/e, TMH, New Delhi, 2002.

4 Janakiraman&Sarukesi: Decision Support Systems, PHI, New Delhi, 2002.

5 George M..Marakas:Decision Support Systems in the 21st Century, 2/e, Pearson Education, New Delhi, 2003.

CHEMISTRY

PH219 - CHROMATOGRAPHIC TECHNIQUES FOR API

Unit1: Basic Chromatographic Techniques
Chromatography - principle, classification and mechanism based on adsorption, partition, ion exchange, ion association, gel permeation and molecular sieving. Analytical and industrial applications of Column chromatography, Paper chromatography, Thin Layer chromatography, Ion–exchange chromatography; Advantages and Disadvantages

Unit2: Advanced Chromatographic Techniques
Gas chromatography –Principle, Instrumentation, column, mobile and stationary phase, detectors – operative principles of MS, TCD, FID and ECD; Liquid chromatography–HPLCand UPLC-Principle, Instrumentation, Columns,Detectors UV, PDA, ELSD, RI, Fluorescence; Applications, advantagesanddisadvantages of GC and HPLC.

Unit3: Method Development, validation and impurity profiling
HPLC method development for drugs –Strategiesincluding detectors; principle of validation, Methodology,Specificity,Precision,Accuracy,Linearity,Limit of Detection,Limit of Quantification,Robustness,Ruggedness; Stability testing-Protocol,Stress testing of drug products,Impurity profiling –impurity types.

Unit4: Regulatory Guidance for API
ICH Guidelines for analytical method validation; Q3A, Q3B and Q3C; US FDA guidelines;WHO guidelines for standard estimation of raw materials and finished products including herbal products;ICH guidelines for ImpuritiesandImpurity profiling study.

Unit5: STATISTICAL ANALYSIS
Types of errors, precision and accuracy, significant figures, various statistical tests on the accuracy, positive and negative deviation from accuracy, binomial, Gaussian and normal distribution of random errors; mean value, variance and standard deviation, reliability interval, deviations from the Gaussian law of error distribution, t-distribution and t-test; SPSS and Annova software

Test Books and Reference Books

1. Practical HPLC Method Development by Llyod R Snyder, joseph J.Krirkland and Joseph, L Glajch, 2nd edition, 2010, John Wiley and Sons.

2. Fundamentals of Analytical Chemistry by Douglas A Skoog, Donald M.Weast, F.James Holler, 8th Edition, 2003, Sanders College Publications.

3. Method Validation Pharmaceutical Analysis: A guide to Best Practice by Joachim Erner, John H.McB.Miller, 2005, Wiley.VCH.

4. ICH, US-FDA, USP Guidanceon Analytical Method Validation, Guidelines on Quality, Stability and Impurity.

5. Handbook of Stability in Pharmaceutical Development, Regulations, Methodologies and Best practices.

6. Instrumental Methods of Analysis – H.H.Willard, L.L.Merritt, J.a.Dean, F.A. Settle, CBS Publishers & Distributors, 1986.

PH253 - APPLICATIONS OF NANOMATERIALS AND CATALYSTS

UNIT - 1: Basics of Nanomaterials:
Definition - Classification – Difference between bulk and nanomaterials - General synthetic approaches (top-down and bottom-up) - Properties - Characterization Techniques (UV/Vis, Calculation of band-gap, relation to 1D box problem, Microscopy) – Aspect ratio - Applications with special emphasis on catalysis (Au/Ag catalysis) - Size and shape dependent activity (QDs)

UNIT – 2: Fundamentals of Heterogeneous- and Nano- Catalysis:
Introduction to catalysis - Differences between homogeneous and heterogeneous catalysis – Important steps in heterogeneous catalysis - Kinetics and Thermodynamic Concerns - Industrial significance

UNIT - 3: Metal-based Nanocatalysts for Industrial Chemical Transformations:
Introduction to metal/metal-oxide/sulfide/carbide nanoparticles - Synthesis and characterization - Selected catalytic reactions (noble-metal and non-noble-metal-based catalytic examples) - Industrial examples - Fischer–Tropsch process, strategies to control exhaust gases (zeolite, NO_x etc.)

UNIT – 4: Non-metal-based Nanocatalysts for Industrial Chemical Transformations:
Introduction to non-metal-based nanomaterials - Synthesis and characterization - Catalytic reactions involving silica and carbon (either as support for metal nanoparticles or homogeneous catalysts or as active catalysts) – Industrial examples (automobile and petrochemical industries) - Concept of carbocatalysis

UNIT – 5: Electro- and Photo-catalysis:
Electrocatalysis – Basics of electrocatalysis – Examples of electrocatalytic reactions – Recent trends in nanomaterials-based electrocatalysis (HER, OER etc.)
Photocatalysis – Basics of photocatalysis – Examples of photocatalytic reactions – Recent trends in nanomaterials-based photocatalysis (Water-splitting, artificial photosynthesis)

TEXT AND REFERENCE BOOKS:
1. Nanocatalysis Synthesis and Applications: Editor(s): Vivek Polshettiwar Tewodros Asefa
Print ISBN:9781118148860 |Online ISBN:9781118609811 |DOI:10.1002/9781118609811
Copyright © 2013 John Wiley & Sons, Inc.
2. Industrial Catalysis: A Practical Approach Author(s): Jens Hagen
Print ISBN:9783527331659 |Online ISBN:9783527684625 |DOI:10.1002/9783527684625

PH254 – POLYMERS AND ELASTOMERS

Unit I : Introduction to Polymers and Polymer Solutions
Types of Polymers, Applications, Different types of M.Wt and its significance, Polymerisation techniques, Thermodynamics of polymer solution: Flory-Huggins theory(liquid lattice theory), modified Flory-Huggins theory, entropy of mixing, enthalpy and free energy of mixing, dilute polymer solutions (Flory-Krigbaum theory), advantages and limitation of FH and FK theories.

Unit II: Polymerisation Mechanism, Kinetics and Reactivity ratio
Types**:** Radical, cationic, anionic and condensation polymerization, Kinetics and reactivity ratio of co-polymerisation, thermodynamic aspects of polymerization, Controlled Living Radical Polymerisation: nitroxide mediated polymerization (NMP), metal-catalyzed living radical polymerization (ATRP), reversible addition-Fragmentation Chain Transfer (RAFT) radical polymerization, coordination polymerization.

Unit III: Polymer Characterisation and Properties
For functional group characterisation: IR, UV, NMR. For M.Wt estimation : NMR, GPC, light Scattering. Thermal analysis: TGA, DSC, DTG, DMA. Rheology of polymers and polymer solution. Mechanical properties of polymers, Thermal properties.

Unit IV: Speciality polymers
Liquid crystalline polymers, conducting polymers, electroluminescent polymers, inorganic polymer, biomedical polymers, Poly electrolytes-water soluble charged polymers, solid polymer electrolytes (SPE), polymer colloids, polymeric gels, crosslinked polymers: synthesis, properties and applications, Elastomers- Natural and synthetic elastomers, Industrial application of Elastomers

Unit V: Polymeric composites:
Fundamental concepts, methods of fabrication, factors influencing the performance of polymer composites-aspect ratio, void content, length of the fiber, nature of the fiber. Structure property relationship between fiber and matrix, modifications of the fiber surface, degree of interaction between fiber and matrix, wetting behavior, degree of cross linking etc., Nanocomposite: Polymer/CNTs and Polymer/Nano clay based composites.

Suggested Books and References:
1. Text Book of Polymer Science, 3rd Edition (1984), F. W. Billmayer, Jr., Willey-Interscience, New York.

2. Principle of Polymer Sciences, P. Bahadur and N.V. Sastry, Narosa Publishing House, New Delhi (2002)

3. Polymer Sciences, V.R. Gowarikar, N.V. Vishwanathan, J. Shreedhar , Wiley Eastern, New

Delhi (1986)

4. Plastic Materials- J A Brydson; Newnes-Butterworths, 3rd Ed. 1979, p.73.

5. Handbook of analysis of synthetic polymers and plastics- J Urbansky and others; John Wiley, 1977.

6. Polymer Chemistry- An Introduction- M P Stevens; 2nd Ed, Oxford Univ. Press, 1990.

7. Industrial chemicals- W L Paith, D B Keyes ad R L Clark; John Wiley and Sons.

8. J.M.G Cowie. Polymers: Physics and Chemistry of Modern Materials. Blackie. London, 1992.

9. P.J. Flory. A Text Book of Polymer Science. Cornell University Press. Ithacka, 1953. 5. F. Ullrich, Industrial Polymers, Kluwer, N.Y. 1993.

10. Thermal characterization of polymeric materials, by Turi E.A., Academic press Inc.

11. Polymer science, a material science H.B. Vol I & Ii by Jenkins, A.D., North Holland publishing co., Amsterdam London

12. Odian, G. Principles of Polymerization (Wiley, 2004)

13. Sun, S. F. Physical Chemistry of Macromolecules, 2nd edn. (Wiley, 2004)

PH255 – ANALYTICAL CHEMISTRY

Unit – I: Principles of Analytical Chemistry
Elementary concepts: Sampling, Preparation of samples for analysis, Calibration standards, Significance of calibration; Evaluation of Analytical data: Errors, Accuracy and Precision, Law of distribution in case of indeterminate errors; Criteria for rejection of analytical data; Chemical equilibria.

Unit – II: Classical Methods of Analysis:
Titrimetric analysis: Acid-base, redox, complexometric, role of indicators; **Gravimetric analysis**: theory of crystal formation, co-precipitation, elementary gravimetry, precipitation reactions; **Colorimetry**: Spectrophotometric reagents, spectrophotometric titrations, turbidimetric methods.

Unit – III: Electroanalytical Techniques
Electroanalytical methods – **Electrogravimetry** with controlled potential and without potential control; **Voltammetry**, cyclic-voltammetry; **Polarography**, pulse-polarography, amperometric titrations.

Unit – IV: Chromatographic Techniques
Principle and classification of chromatographic techniques; Principle, instrumentation and applications of Gas chromatography (GC), Gas-Liquid chromatography, Gas-Solid chromatography, High-Performance Liquid chromatography (HPLC); Partition chromatography; Ion-exchange chromatography (IEC); Size-exclusion chromatography (SEC).

Unit – V: Importance of Analytical Chemistry to Industrial Research:
Importance of qualitative and quantitative analysis in R & D, industries and other branches of Sciences; Design of experiments for analytical method development and validation based on HPLC, LC-MS and GC-MS techniques

Text Books:

1. Skoog, Douglas A.; West, Donald M.; Holler, F. James; Crouch, Stanley R. Fundamentals of Analytical Chemistry. Belmont: Brooks/Cole, 2014.

2. Skoog, Douglas A.; Holler, F. James; Crouch, Stanley R. Principles of Instrumental Analysis. Belmont, CA: Brooks/Cole, 2007.

3. Christian G. D., Dasgupta P. K. and Schug K. A., “Analytical Chemistry” Wiley Publishers, 7th edition, 2014.

4. Bard, A.J., and Faulkner, L.R. Electrochemical Methods: Fundamentals and Applications. New York: John Wiley & Sons, 2nd Edition, 2000.

5. F. Scholz and Z. Stojek, Electroanalytical Methods, Springer-Verlag Berlin Heidelberg 2010.

6. Day and Underwood, Quantitative Analysis, 6th Edition, PHI, 2009.

7. Basic Gas Chromatography by Harold M. McNair, James M. Miller, John Wiley and Sons, 2008.

8. Modern HPLC for practicing scientists by Michael W. Dong, Wiley Inter science, 2006.

PH256 – ELECTROCHEMISTRY AND BATTERIES

Unit – 1: Fundamental Measurements in Electrochemistry:
Types of cells, cell components, Nernst equation, electrical double layer, equilibrium electrode potential, ion-solvent interaction, IUPAC convention of electrode potentials, electrochemical series, thermodynamics of electrochemical cells and applications, Polarizable and non-polarizable electrodes, types of reference and working electrodes, cell geometry, choice of reference electrodes.

Unit – 2: Electrode Kinetics:
Current-potential relationship using Butler-Volmer and Tafel equations, types of overpotential and their minimization, types of diffusion of electroactive species, hydrogen evolution reaction, oxygen evolution/reduction reaction, transition state theory and Gibbs free energy of activation.

Unit – 3: Experimental Techniques:
Cyclic voltammetry, Linear sweep voltammetry, chronopotentiometry, chronoamperometry, electrochemical impedance spectroscopy, Nyquist and Bode plot, Randle's circuit, resistance, capacitance, inductance, constant phase element, fitting of impedance spectra with suitable circuit.

Unit – 4: Energy Conversion/Storage Systems:
Fuel cells (hydrogen-oxygen and methanol-oxygen, proton exchange membrane fuel cell), Batteries (primary and rechargeable batteries): Lead-acid battery, lithium ion battery, Zn-air battery, Photo-electrochemical cells, supercapacitor, and dye-sensitized solar cells.

Unit – 5: Corrosion and its Control:
The fundamental electrochemistry of corrosion, scope and economics of corrosion, different types of corrosion, influence of environment, Evans diagram, Pourbaix diagram (potential *vs*. pH), corrosion rate measurements, Stern Geary equation, mixed potential theory and prevention of corrosion. Pitting corrosion, localized corrosion, bimetallic (Galvanic) corrosion, cathodic protection, anodic protection, coatings and inhibitors.

Text Books:
1. Gileady, Physical Electrochemistry, Fundamental, Techniques and Applications, Wiley-VCH – 2011.
2. J. Bard and L. R. Faulkner, Electrochemical Methods: Fundamentals and Appications, 2nd Edition, Wiley 2001.
Reference Books:
1. H. Reiger, Electrochemistry, 2nd Edition, Springer 1994.
2. Newman and K. E. Thomas-Alyea, Electrochemical Systems, 3rd Edition, Wiley Interscience, 2004.
3. J. Wang, Analytical Electrochemistry, 2nd Edition, Wiley-VCH, A. John Wiley & Sons, Inc., Publication, 2000.
4. M. E. Orazem and B. Tribollet, Electrochemical Impedance Spectroscopy, A. John Wiley & Sons, Inc., Publication, 2008.

PH257 – ENVIRONMENTAL AND SUSTAINABLE CHEMISTRY

UNIT 1: Environment and Sustainable Development
Concept of environment and its problems (emphasis on industrial pollution), Sustainable Development, Sustainability and Sustainability Indices (SD), Ecological footprint, Environment Conservation Strategies, Environmental Laws and Acts, Environmental Audit (EA), Environmental Impact Assessment (EIA).

UNIT 2: Environmental Chemistry
Components of environmental chemistry (equilibrium, redox, etc.) Biogeochemical cycles; Environmental aspects of air-chemistry: Air pollutants and their reactions in atmosphere (Photochemical smog; Oxygen and Ozone chemistry). Environmental aspects of water-chemistry, Concept of DO, BOD, COD, Total hardness, Carbonate system. Environmental aspects of soil-chemistry: Inorganic and Organic components of soil, Nitrogen pathways in soil; NPK in soils.

UNIT3: Waste Water Management and Treatment Technologies.
Water resources, Contaminants from industrial sources, Primary treatment, Secondary treatment (Precipitation, Coagulation, aerobic process, activated sludge system, trickling filters, anaerobic process), Tertiary treatments, Advanced waste water treatments (Ion-exchange, Adsorption, Electrodialysis etc.) and reuse of wastewater, Industrial effluent treatment systems, Reactors and bioreactors for water treatment.

UNIT 4: Solid Waste Management and Treatment Technologies
Types of Solid wastes (Municipal solid waste, Industrial solid waste etc.), Determination of composition of solid wastes, Integrated solid waste management - Planning for integrated waste management, Operation of solid waste management system, landfills, pyrolysis, composting, bio-fertilizers, Plastic wastes, Recycling technologies and Biodegradability.

UNIT 5: Hazardous Waste Management and Treatment Technologies
Definition and classification of hazardous waste, Sources of hazardous wastes Storage, collection and disposal/treatment of hazardous wastes, Heavy metal waste, its impact and remediation, Nuclear Wastes, Characteristics and–management of nuclear wastes, Biomedical and Chemical Wastes Biomedical waste, Types, management and handling, control of biomedical wastes, E-wastes. Hazardous wastes from industries and their management.

Text Books:

1 Environmental Science, Botkin and Keller, Wiley publications

2 Environmental Chemistry, Stanley E. Manahan, CRC Press

3 Water and Wastewater Technology, Mark J. Hammer and Mark J. Hammer Jr., PHI learning Pvt. Ltd

4 Solid and Hazardous Waste Management, S. C. Bhatia, Atlantic Publishers and Distributers (P) Ltd

Reference Books:

1 Essential Environment: The science behind the stories, Withgott and Laposata, Pearson publishers.

2 Environmental Chemistry: Green Chemistry and Pollutants in Environment, Lichtfouse, Eric, Schwarzbauer, Jan, Robert, Didier (Eds.), Springer-Verlag Berlin Heidelberg

3 Water and Waste water Engineering: Design principles and practice Mackenzie L. Davis. Mc graw Hill publication.

4 Wastewater Engineering: Treatment and Reuse Metcalf and Eddy, Tata McGrawHill

5 Sustainable Solid Waste Management: A Systems Engineering Approach, Chang and Pires, Wiley

PH258 – FOOD, AGRO AND PHARMACEUTICAL CHEMISTRY

Unit 1: Principles of Food Processing, Food Additives and ingredients, Food Processing, Food Toxicology.

Unit 2: Advances in Food chemistry and Nutrients, Nutraceuticals and health foods, Enzymes and Food processing, Flavour chemistry and Technology.

Unit 3: Carbohydrates, lipids, protein chemistry and Technology, Technology of Fruits and veg processing.

Unit 4: Crop production: concepts and Practices; Post harvest Management of fruits and vegetables, Agrochemicals and residues in foods.

Unit 5: Pharmaceuticals: Introduction to drug discovery: Sources of drugs-natural products, drugs from organic synthesis, drug discovery and development – Stages of drug-discovery with suitable examples

Text Books and suggested References:

1. Fellows PJ. 2005. *Food Processing Technology: Principle and Practice*. 2nd Ed. CRC.
2. Verma LR. & Joshi VK. 2000. *Post Harvest Technology of Fruits and Vegetables*. Indus Publ
3. FAO. 2007. *Handling and Preservation of Fruits and Vegetables by Combined Methods for Rural Areas- Technical Manual.* FAO Agr. Ser. Bull., 149
4. Kulp K & Ponte GJ. 2000. *Handbook of Cereal Science and Technology*.2nd Ed. Marcel Dekker.
5. Chakrabarty MM. 2003. *Chemistry and Technology of Oils and Fats*. Prentice Hall.
6. NIIR. 2004. *Handbook on Spices*. National Institute of Industrial Research Board, Asia Pacific Business Press Inc.
7. Rathore NS *et al.* 2008. *Fundamentals of Dairy Technology - Theory & Practices*. Himanshu Publ
8. Mead M. 2004. *Poultry Meat Processing and Quality*. Woodhead Publ.
9. Branen AL, Davidson PM & Salminen S. 2001. *Food Additives*. 2nd Ed.
10. Gerorge AB. 2004. *Fenaroli's Handbook of Flavor Ingredients*. 5th Ed. CRC Press.
11. Brigelius-Flohé, J & Joost *HG. 2006. Nutritional* Genomics: Impact on Health and Disease. Wiley VCH.
12. Whitehurst R & Law B. 2002. *Enzymes in Food Technology*. Blackwell Publ.
13. Concon JM.1988. *Food Toxicology - Principles & Concepts*. Marcel Dekker

PH259 – MEDICINAL CHEMISTRY

UNIT-I

Introduction - to medicinal chemistry, intermolecular binding forces, Introduction to various drug targets; Drug activity and physico-chemical properties: Solubility, partition coefficient, hydrogen bonding, chelation, bioisosterism, optical and geometrical isomerism**,** prodrugs and soft drugs. Drug-receptor interaction forces, mechanism of action.

UNIT-II

Drug synthesis

Introduction -The Drug Discovery and Development Process, combinational & parallel synthesis, Solid Phase techniques, mix and split method in combinational synthesis, dynamic combinational synthesis, solid phase synthesis, diversity-oriented synthesis, Strategies for the Synthesis of Small Molecule Libraries, structure-activity relationships, QSAR.

UNIT-III

Drug metabolism: Drug metabolism principles- Phase I and Phase II reactions, factors affecting drug metabolism, analytical methods in metabolism, ADME, bioavailability, pre-clinical and clinical development, therapeutic index & therapeutic window, Drug resistance mechanisms and synergism.

UNIT-IV

General introduction to antibiotics: Mechanism of action of lactam antibiotics and non-lactam antibiotics, antiviral agents, stereochemistry, biosynthesis and degradation of penicillins - An account of semisynthetic penicillins - acid resistant, penicillinase resistant and broad spectrum semisynthetic penicillins; Synthesis of Penicillin G, Penicillin V.

UNIT-V

Interactions: DNA-protein interaction and DNA-drug interaction. Introduction to rational approach to drug design, physical and chemical factors associated with biological activities, mechanism of drug action.

TEXT BOOKS

1. JH Block & JM Beale (Eds), Wilson & Giswold's Text book of organic Medicinal Chemistry and pharmaceutical chemistry, 11th Ed, Lipcott, Raven, Philadelphia, 2004.
2. S. N. Pandeya, Textbook of medicinal chemistry, SG Publ. Varanasi, 2003.
3. A. Burger, Medicinal Chemistry, Wiley Interscience, New York, Vol. I and II, 1970

REFERENCES

1. D. Abraham (Ed), Burger Medicinal chemistry and Drug discovery, Vol. 1 & 2. John Wiley & Sons, New York 2003, 6th Ed.
2. A. Gringauz, Introduction to Medicinal Chemistry, How Drugs Act and Why?, John Wiley and Sons, 1997.
3. B.N. Lads, MG.Mandel and F.I. way, Fundamentals of drug metabolism & disposition, William & welking co, Baltimore USA.
4. C. Hansch, Comprehensive medicinal chemistry, Vol 1 – 6 Elsevier pergmon press, Oxford.
5. G. L. Patrick, Introduction to Medicinal Chemistry, Oxford Univeristy Press, 2001.

PH260 – STEREO-SELECTIVE ORGANIC SYNTHESIS

Unit 1: Liquid Surface, Interface and surface forces

Surface tension and its measurement, surface excess, Laplace equation, Kelvin equation, Gibbs energy and surface tension, Gouy – Chapman Theory and Grahame equation, the Stern layer and Gibbs free energy of the double layer. Surface forces – Van der Waals forces between molecules, DLVO forces, capillary forces, Surface energy and Hamaker constant, Measurement of surface forces. Contact angle and its measurements. Wetting and Adhesion Characteristics.

Unit II: Surfactant, Micelles and Emulsion

Surface active agents and their classification, packing factor, micellization, critical micellar concentration (CMC), determination of CMC, factors affecting CMC of surfactants, thermodynamics of micellization, aggregation number, shape & size of aggregates, determination of aggregation number, shape and size, shape transition, reverse micelles, vesicles, colloids, emulsion, microemulsion and Macroemulsions: properties, Evolution, Aging, Coalescence and Demulsification.

Unit III: Applications of Self assembled structures

Application of surfactants in gel electrophoresis, colloids and interfaces, Micellar Catalysis, Quantitative Models, Micellar Enzymology, Phenomenon of Solubilization, Solubilization in Mixed Micelles, Drug Surfactant Interaction, Protein Surfactant Interactions, Industrial Application of Surfactants: Detergents, paints, blends, composites, emulsions, in drilling oil, oil spillage, etc.

Unit IV: Surface Chemistry, Adsorption and Catalysis

Surface Phenomena, solid-liquid interfaces, solid-gas interface, Surface Films, Langmuir-Blodgett films, self assembled mono layers, collapse pressure, Surface film of liquids. Physisorption and Chemisorption, Various adsorption isotherms: Freundlich, Langmuir and BET isotherms, Dubinin-Radushkevich isotherm, Temkin isotherm. Surface area determination. Kinetics of surface reactions involving adsorbed species, Langmuir-Hinshelwood mechanism, Langmuir-Rideal mechanism, Rideal-Eley mechanism. Mechanism of heterogeneous catalysis, phase transfer catalysis.

Unit V: Surface Analysis

Chemical analysis of surfaces and interfaces: Tensiometer, Particle Size analyser, Static and dynamic light scattering, SNS, Fluorescence spectroscopy, Langmuir-Blodget technique: Surface films-different types, surface pressure and its measurement, surface potential and its measurements and interpretation. Examination of surfaces using low energy electron diffraction, photoelectron spectroscopy, ESCA, scanning probe microscopy, Auger electron spectroscopy , SEM and TEM.

Suggested References and Books:

1. Text Book of Physical Chemistry Vol-1-4 by K.L. Kapoor
2. Physical Chemistry by D.N. Bajpai
3. Physical Chemistry by A.W. Atkins
4. Introduction to Surface Chemistry and Catalysis by Gábor A. Somorjai (John Wiley & Sons)
5. Atkins, P. W. Physical Chemistry, 7th edn. (Oxford University Press, 2006).
6. Moore, W. J. Physical Chemistry, 5th edn. (Orient Longmann, 1990).
7. Adamson, A. W., Gast, A. P. Physical Chemistry of Surfaces (John Wiley and Sons, 1997).

8. Connors, K. A. Chemical Kinetics: A Study of Reaction Rates in Solution, (VCH Publications, 1990)
9. Castellan, G. W. Physical Chemistry, 4th edn. (McGraw Hill, 1999).
10. Chakrabarty, D.K. Solid State Chemistry, 1st edn (New Age Publishers, 2005).
11. West, A.R. Solid State Chemistry and its Applications, 4th edn., (Plenum, 2007

PH261 – SURFACE AND INTERFACIAL CHEMISTRY

Unit 1: Liquid Surface, Interface and surface forces
Surface tension and its measurement, surface excess, Laplace equation, Kelvin equation, Gibbs energy and surface tension, Gouy – Chapman Theory and Grahame equation, the Stern layer and Gibbs free energy of the double layer. Surface forces – Van der Waals forces between molecules, DLVO forces, capillary forces, Surface energy and Hamaker constant, Measurement of surface forces. Contact angle and its measurements. Wetting and Adhesion Characteristics.

Unit II: Surfactant, Micelles and Emulsion
Surface active agents and their classification, packing factor, micellization, critical micellar concentration (CMC), determination of CMC, factors affecting CMC of surfactants, thermodynamics of micellization, aggregation number, shape & size of aggregates, determination of aggregation number, shape and size, shape transition, reverse micelles, vesicles, colloids, emulsion, microemulsion and Macroemulsions: properties, Evolution, Aging, Coalescence and Demulsification.

Unit III: Applications of Self assembled structures
Application of surfactants in gel electrophoresis, colloids and interfaces, Micellar Catalysis, Quantitative Models, Micellar Enzymology, Phenomenon of Solubilization, Solubilization in Mixed Micelles, Drug Surfactant Interaction, Protein Surfactant Interactions, Industrial Application of Surfactants: Detergents, paints, blends, composites, emulsions, in drilling oil, oil spillage, etc.

Unit IV: Surface Chemistry, Adsorption and Catalysis
Surface Phenomena, solid-liquid interfaces, solid-gas interface, Surface Films, Langmuir-Blodgett films, self assembled mono layers, collapse pressure, Surface film of liquids. Physisorption and Chemisorption, Various adsorption isotherms: Freundlich, Langmuir and BET isotherms, Dubinin-Radushkevich isotherm, Temkin isotherm. Surface area determination. Kinetics of surface reactions involving adsorbed species, Langmuir-Hinshelwood mechanism, Langmuir-Rideal mechanism, Rideal-Eley mechanism. Mechanism of heterogeneous catalysis, phase transfer catalysis.

Unit V: Surface Analysis
Chemical analysis of surfaces and interfaces: Tensiometer, Particle Size analyser, Static and dynamic light scattering, SNS, Fluorescence spectroscopy, Langmuir-Blodget technique: Surface films-different types, surface pressure and its measurement, surface potential and its measurements and interpretation. Examination of surfaces using low energy electron diffraction, photoelectron spectroscopy, ESCA, scanning probe microscopy, Auger electron spectroscopy , SEM and TEM.

Suggested References and Books:
1. Text Book of Physical Chemistry Vol-1-4 by K.L. Kapoor
2. Physical Chemistry by D.N. Bajpai
3. Physical Chemistry by A.W. Atkins
4. Introduction to Surface Chemistry and Catalysis by Gábor A. Somorjai (John Wiley & Sons)
5. Atkins, P. W. Physical Chemistry, 7th edn. (Oxford University Press, 2006).
6. Moore, W. J. Physical Chemistry, 5th edn. (Orient Longmann, 1990).
7. Adamson, A. W., Gast, A. P. Physical Chemistry of Surfaces (John Wiley and Sons, 1997).

8. Connors, K. A. Chemical Kinetics: A Study of Reaction Rates in Solution, (VCH Publications, 1990)
9. Castellan, G. W. Physical Chemistry, 4th edn. (McGraw Hill, 1999).
10. Chakrabarty, D.K. Solid State Chemistry, 1st edn (New Age Publishers, 2005).
11. West, A.R. Solid State Chemistry and its Applications, 4th edn., (Plenum, 2007

PH262 – SYMMETRY AND MATHEMATICS

UNIT I

Symmetry of molecules: Symmetry elements and operations, point groups. Matrix representation of symmetry operations-Great Orthogonality Theorem-Character tables. Direct product representations. Projection operators and symmetry adapted linear combinations. Applications.

UNIT II

Numbers, Functions and Variables: Numbers: Real and Complex number algebra. Vector algebra. Applications. Functions & Variables : Differential calculus-first- and higher-order derivatives, evaluation of minimum and maximum, limits & continuity. Partial differentiations. Exact and inexact differentials. Numerical differentiation. The gamma and delta functions.

UNIT III

Integral Calculus and Differential Equations: Integral Calculus: Indefinite and definite integrals, improper integrals. Methods of integration. Surface and volume integrals. Numerical integrations. Differential Equations: Ordinary first- and second-order differential equations. Partial differential equations. Solution of inexact differential equations by the method of integrating factors. Power series and extended power series solutions. Numerical solutions.

UNIT IV

Special Functions, Matrices and Determinants: Special functions: Hermite, Legendre and Laguerre polynomials, recursion relations. Matrices and Determinants. Eigenvalues and eigenvectors. Orthogonal transformation. Rank & inverse of matrix.

UNIT V

Linear systems, Non linear systems and Curve fittings: Solution of Linear Systems: Gaussian elimination, Cramer's rule. Gauss-Jordan elimination. Gauss-Seidel and Jacobi methods.
Solution of non-Linear Systems: Newton-Raphson method. Curve fittings. Probability and Statistics: Permutation & Combination. Probability. Stirling's approximation. Lagrange multipliers.

Text books:

1. Molecular Symmetry and Group Theory. Allan Vincent, John Wiley & Sons, LTD.
2. Symmetry: An introduction to group theory and its applications. R. McWeeny, Dover Publications, Inc.
3. Chemical Applications of Group Theory. F. A. Cotton, John Wiley & Sons, Inc.
4. Mathematics for Physical Chemistry. R. G. Mortimer, Academic Press.
5. Mathematics for Chemistry and Physics. G. Turrell, Academic Press.

Reference Books

1. Symmetry and Structure. S. F. A. Kettle, Wiley.
2. Advanced Engineering Mathematics. E. Kreyszig, Wiley.
3. Numerical Analysis: A Practical Approach. Melvin J. Maron, Macmillan Publishinh Co., Inc. NY & Collier Macmillan Publishers, London

CHEMICAL ENGINEERING

PH216 STRUCTURE MECHANICS OF FIBRES , YARNS AND FABRICS

UNIT - I

Basic geometry of twisted yarn – The idealised helical yarn geometry – yarn count and twist factors – Limits of twists – Real and idealised yarns – Schwarz Constant - Twist contraction: Contraction & retraction

UNIT - II

Packing of fibers – yarn idealised packing – concept of open and close packing – Deviations from ideal forms of packing – specific volume of yarns – Measurement of packing facts – yarn diameter concept and formulas

UNIT - III

Fiber migration – ideal migration – Tracer fibre technique – characteristics of migration – Strain mechanics: Strain in yarns – with and without lateral change – determination of twist angles before and after straining (simple numerical problems)

UNIT - IV

Elements of fabric geometry – pierce cloth geometry – Problems on Pierce geometry model – Concept of Kemp's race track model– Derivation of formula of Arial density of fabrics, Problems on fabric weight, cover factor and fabric cover .

UNIT - V

Tensile properties of woven fabric – Geometrical changes during extension – the load extension modulus (without considering bending energy) – Geometry of plain knitted fabrics – Empirical dimensionless relation ships, Concept of Runners ratio.

TEXT BOOKS:

1.Hearle, Grosberg and Backer , "Structural Mechanics of Fibers, Yarns and Fabrics", Wiley – Inter-Science, New York, 1987.

2.B.C.Goswami, "Textile Yarns", John Wiley & Sons, New York, 1987.

REFERENCE BOOKS:

1.Mechanics of Flexible Fiber Assemblies – J.W .S. Hearle, The Textile Institute, Manchester , 1971.

2.D.Joing, "The Mechanics of W ool S tructures – Post al", New South W ales University Publication, New South W ales, Australia, 1998.

PH217 PHYSICAL PROPERTIES OF TEXTILE FIBRES

UNIT I –
Need and Scope of Physical properties of Textile fibres – Uses from Application point of view
Fibre Structure
Introduction to fiber structure – Micellar theory, continuous theory, fringed micelles theory, fringed fibrils theory, modified fringed micellar theory – fine structure of natural, fine structure and cross-section of regenerated and synthetic fibres, Degree of order, degree of localization of order, length/width ratio of localized units, degree of orientation.

UNIT II - Characterization Techniques
Brief introduction of Methods of investigating textiles – X – Ray diffraction, IR, NMR, Thermal Analysis, Electron microscopy, Scanning Electron microscopy.- Recent development in these methods.- Role of HPLC, GPLC, TLC , TEM in understanding the fibre structure .

UNIT III - Fibre density & Tensile Properties
Fibre density – Measurement, Relation between density and order -Equilibrium absorption of water, Relation between regain and RH, Comparison of relation between regain and RH of various textile fibres (influence of temperature)- Heat of sorption – measurement of sorption. Tensile properties – factors determining the results of tensile experiments, load elongation and stress-strain curves.

UNITIV – Properties of fibres
Properties of cotton, linen, wool and silk fibres
Effects of variability – Introduction to elastic recovery –, time effect – Creep, Flexural, Torsional Rigidity.

UNIT V - Properties of fibres
Properties of polyester, nylon, viscose, acrylic fibres
TEXT BOOKS:
1. W.E.Morton and J W S Hearle, "Physical Properties of Textile Fibers", The Textile Institute, Manchester, 1994.
2. J.E.Booth, "Principles of Textile Testing", Butterworths, London, 1987.

PH218 NON WOVEN TECHNOLOGY

UNIT - I

Non woven –

Need and Scope , Definition of Nonwoven fabric -Differences between woven, knitted and Nonwovens - Classification of nonwoven on various grounds – General flow sheet of Nonwoven manufacturing process. Application of Nonwovens and role of Reverse Engineering in Nonwovens production . – Structure of Nonwoven fabrics

UNIT - II

Dry laid webs – fibre selection, web formation, Dry web making process- Fibre arrangement and different approaches for Transverse laid , Vertical laid and Random laid webs
Cross Lapper : need and types and calculations
Wet laid nonwoven – Raw materials, production process principle, special features of the wet laid process and its product. Spun laced webs choice of fibre.
Structure of Dry and Wet laid webs

UNIT - III

Mechanical Bonded Webs: Introduction to needle punching – passage of material through needle loom - Pre-needling and final needling-- specification of needle-Ornamentations in needle punching -Application of needle punching.- Structure and properties of Needle punched fabrics - Research on Needle punched nonwovens
Stitch bonded nonwoven – Machines used - stages of production –selection of materials – Properties and applications.

UNIT - IV

Hydro Entangled Nonwovens: Bonding process, properties of spun laced webs, applications-Structure , Properties ,Research and Development of Spunlaced Nonwoven fabrics
Chemical Bonded Nonwoven: Latex binder, formulation, , bonding technology – saturation, foam bonding, spray bonding, print bonding, powder bonding, application of chemical bonded nonwoven- Structure , properties , Research and Development of Adhesive Bonded Nonwoven fabrics

UNIT - V

Thermal Bonded Nonwovens: Binder , binding fibres, binding powder binding webs, methods of thermal bonding – Hot calendaring, belt calendaring, oven bonding, ultrasonic bonding, radiant heat bonding.- Structure , properties , Research and Development of Thermal Bonded Nonwoven fabrics
Melt blown nonwovens : Basic concept, Machines used , Sanjeev Malkans invention , Structure , properties , Research and Development of Melt Blown Nonwoven fabrics

TEXT BOOKS:

1.Turbak, “Nonwoven Process Performance & Testing”, Tappi Press, 1993.
2.Wilhelm Albrecht, “Nonwoven Fabric Construction Synthetic Fibres”, JWS Publications, 2007..
3. International Textile Bulletin – Nonwoven Fabric – No. 1, 2, and 3 1988 to 1990
4. Needle Punching – Purdy

MATHEMATICS

PH132 - MATHEMATICS

Unit 1 : Mathematical Logic

Statements and notations, Connectives ,Well formed formulas , truth Tables, Tautology , Equivalence implication , Normal Forms.

Unit 2 : Recurrence Relations

Generating Functions, Function of Sequences , Calculating coefficient of generating function , Recurrence Relations , Solving recurrence relations by substitution and generating functions, characteristic roots , Solution of in homogeneous recurrence relation

Unit 3 : Numerical methods

Solution of linear systems by Gauss Elimination Method and Gauss Jordan Method , Iterative Methods , Gauss Jacobi and Gauss Seidel methods.

Multi Step Method : Adams predictor and corrector methods

Unit 4 : Quadratic forms

Quadratic forms , Canonical form, Reduction to Canonical form , Rank , Positive and Negative definite ,Semi definite ,Index , Signature , Sylvester's law

Unit 5 : Solution of Differential Equations – Qualitative Properties

Qualitative properties of solutions , Strum comparison theorem , Eigen values , Eigen functions and the vibrating string

References

For unit 1 ,2

Discrete Mathematics , Richard Johnsonbaugh, Sixth Edition , Pearson Education, 2007

For unit 3

Higher Engineering mathematics , B. S. Grewal , Kanna publications, 42th edition

Numerical Methods in Engineering and Science , B. S. Grewal , Kanna publications, 42th edition

For unit 4

Linear Algebra , Kenneth Hoffman , Ray Kunz , Prentice Hall, New Delhi

For Unit 5

Differential Equations with applications and historical notes , G.F. Simmons , Tata McGraw – Hill Publication Co Ltd. New Delhi

PH230 - GRAPH THEORY

Unit 1 : Graphs

Graphs, Simple Graphs , Graph isomorphism, Incidence and Adjacency matrices , Sub graphs, Vertex degrees degrees, Paths, Cycles

Unit 2 : Trees

Trees, Cut Edge, Bonds, Cut Vertices, Cayley's Formula, The connector problem

Unit 3 : Connectivity

Connectivity, Blocks, Euler Tours,Hamilton Cycles, The travelling Salesman problem

Unit 4 : Vertex Colouring

Introduction , Chromatic Number, Chromatic Polynomials , Brooks Theorem

Unit 5 : Planar Graphs

Plane and Planar Graphs, Dual Graphs, Euler Formula, Bridges

References :

1. Graph theory with application JA Bondy& USR Murthy , North- Holland (soft copy available onnet)
2. Graph theory and its applications, NarsingaDeo

PHYSICS

PH042 – POLYMER COMPOSITES

UNIT-I
Introduction to composite materials, comparision of different materials with compositesadvantages
and disadvantages. Principles of composite reinforcement. Effect of fibrous reinforcement on composite strength.

UNIT-II
Types of reinforcement such as natural, glasses, carbon/graphite, aramid fibers, high strength and high modulus fibers. Surface treatment and various forms of fibers.

UNIT-III
Thermosetting and thermoplastic materials for the composites and their selection for a particular application

UNIT-IV
Processing and production techniques like hand-layup, bag moulding, filament winding and pultrusion

UNIT-V
Prepegs, their manufacture and characterization. Sheet moulding and dough moulding compounds and their processing. Preform and resin transfer mouldings. Hybrid and sandwich type composites.

References
1. Hand Book of Composites, by George Lubin
2. Hand Book of Fibre glass and Advanced Plastic Composites, by G. Lubin
3. Reinforced Thermoplastics, by W.V. Titov
4. Engineering Design for Plastics, by Eric Baer
5. Glass Engineering Hand Book, by E.S. Shend
6. Plastics and Composites welding Handbook by Grewell, Benatar & Park
7. Polymer and composite Rheology by R. K. Gupta
8. Reinforced Plastic Handbook by Rosato & Rosato

PH053 - MATERIAL SCIENCE & ENGINEERING

Unit-1: Dielectrics and Ferroelectrics Macroscopic description of the static dielectric constant, the electronic and ionic polarizabilities of molecules, orientational polarization, measurement or dielectric constant of a solid, the internal field of Lorentz, Clausius-Mosotti relation, elementary ideas on dipole relaxation. Classification of Ferroelectric crystals-BaTiO3 and KDP, Dielectric theory of ferro electricity, Spontaneous polarization and ferroelectric hysteresis.

Unit-2: Magnetic materials Magnetic parameters, Bohr Magneton, Origin of Permanent Magnetic Moment, Theories of para magnetism, Spontaneous magnetization, Weiss theory of Spontaneous magnetization, Nature and origin of Weiss Molecular Field, Hysteresis, The Block wall, Ferro magnetism, Anti ferromagnetic materials, Ferri magnetic materials, Hard and Soft magnetic materials, Ferrite's and their Applications.

Unit-3: Superconducting Materials Occurrence of Superconductivity, Experimental observations, Persistent Currents. Effect of magnetic fields, Meissner effect, Type I and Type II super conductors, Intermediate states, Entropy and heat capacity, energy gap, Isotope effect, Thermal conductivity, Theoretical explanations, London's equation, Penetration depth, Coherence length Cooper pairs, Elements of BCS theory, Giaver Tunneling Josephson effects (basic ideas), Applications.

Unit-4: Biomaterials Biomechanism, Developemnt of biomaterials, Classification of Biomaterials, Processing and Properties, Applications.

Unit-5: Physical Acoustics-Ultrasonics Classification of Ultrasonic waves, Properties of Ultrasonic waves, Generation of Ultrasonic waves, Ultrasonic velocity Measurements, Absorption and Dispersion of Ultrasonic waves, Applications-Industry

Textbooks: 1. Materials Science & Engineering by W.D. Callister (Jr) 2. Engineering Physics by V Rajendran, McGraw Hill Education (India) Pvt. Ltd. 3. Introduction to Solid State Physics by Charles Kittel, John Wiley & Sons Reference books: 1. Solid State Physics by A J Dekker, MCMILLAN Publishers.

ENGLISH

PH212 – LITERARY THEORY

Unit I

Why literary theory? ~ What do we do when we read? ~ Different approaches ~ Humanism ~ Romanticism ~ Realism ~ Surrealism~ Existentialism ~ Literary criticism vs. literary theory

Unit II

Russian formalism ~ New criticism ~ Reading like a New Critic ~ Reader response theory ~ Narratology **~** Dialogism ~Structuralism ~ Reading like a structuralist

Unit III

Post- Structuralism ~ Deconstruction ~ Reading like a post-structuralist ~ Psychoanalysis and literature ~ the human subject ~ Freud and post-Freudian schools of thought

Unit IV

Dialectics and Marxist Theory ~ Ideology ~ Politics and theory ~ Feminism and literary theory ~ Reading post-colonial literature ~ New Historicism

Unit V(6Hrs)

New directions in literary theory ~ The post-modern perspective ~ From the gender perspective ~ Reading like a feminist critic ~ From the subaltern perspective ~ From the eco-critical perspective ~ You, the critic and theorist

Suggested Texts for Reading :

- Barry, Peter. *Beginning Theory: An Introduction to Literary and Cultural Theory*, Manchester University Press. 3rd edition. 2017
- Eagleton, Terry. *Literary Theory: An Introduction*. Blackwell, Oxford, 1996, 2nd edition or 2008, anniversary edition.
- Barthes, Roland. “The Death of the Author”, David Lodge., Ed.Modern *Criticism and Theory: A Reade*r. London: Longman, pp. 166-172.
- Showalter, Elaine. Ed., *The New Feminist Criticism: Essays on Women, Literature and Theory*. New York: Pantheon Books, 1985**.**
- *Veeser. H. Aram. E*d.*, The New Historicism*, London: Routledge, 1989.
- Gandhi, Leela. *Postcolonial Theory: A critical introduction.* Allen & Unwin, 1998
- Gyan Prakash. “Subaltern Studies as Postcolonial Criticism.” The American Historical Review, Vol. 99, No. 5 (Dec., 1994), pp. 1475-1490
- Bakhtin, Mikhail. *Problems of Doestoevsky’s Poetics*. Trans. Caryl Emerson. Manchester: Manchester Univ. Press, 1984. pp. 5-46.

PH213 – ENGLISH LANGUAGE TEACHING

Unit 1: Background

Development of English Language Teaching in India: The exploration and transportation phase, The consolidation phase: The grand design, The dissemination phase, The identity phase: National policy on education 1968, The study group report on teaching English, National policy on education 1986, AcharyaRamamurthi Commission 1990, The globalization phase- **Areas of Research in ELT**: Materials Evaluation and Development, Methods, Testing and Evaluation, Teacher Training, and Language skills (Listening, Speaking, Reading, & Writing) Grammar and Vocabulary, English for Specific Purposes (ESP)

Unit 2 ELT Methods and Approaches

Methods and Approaches of English Language teaching~ Grammar Translation Method, Direct Method, Audio Lingual Method, Communicative Approach, Task Based Language Teaching, Desuggestopedia, The Silent Way, Community Language Learning, Technology in Language Teaching and Learning, Eclectic Approach

Unit 3: Introduction to SLA

What is Second Language Acquisition? ~ The place of second language in the world today~ Why study second language acquisition~ Development of the field of SLA~ The scope of SLA research~ Research methodology in SLA: qualitative versus quantitative methodologies~ Types of data analysis: contrastive analysis, error analysis, performance analysis, discourse analysis

Unit 4: Factors Affecting SLA

Age: studies of age and SLA, explanations of age-related differences~ Aptitude~ Social-psychological factors: motivation, attitude~ personality~ cognitive style~ hemisphere specialization~ learning strategies and other factors

Unit 5: Theories in SLA

Nativist theories: Chomsky's Universal Grammar, Krashan's Hypotheses~ Schumann's Pidginization hypothesis and acculturation model, Givon's Functional-Typological theory~ The ZISA's group's Multidimentional Model~ Swain's Output hypothesis ~ current researches in SLA

Suggested Reading:

1. Heaton, J B. (1975). *Writing English Language tests*. New York: Longman.
2. Krishnaswamy,N and Lalitha Krishnaswamy. (2006*).* *The Story of English in India*. New Delhi: Foundation
3. Larsen-Freeman, Diane & Long, Long, Michael H. (1991). *An Introduction to second language acquisition research.*Newyork: Longman

4. Richards, Jack C & Rodgers, Theodore. (1986). *Approaches and methods in language teaching*. Cambridge: CUP
5. Ur, Penny. (1991). *A course in language teaching*. Cambridge: CUP

PH222- NAYANTARA SAHGAL IN THE CONTEXT OF INDIAN WRITING IN ENGLISH

Unit I
Introduction to Indian writing in English ~ Indian Aesthetic Tradition (Theory of Rasa etc) ~ Indian Narrative Theory ~ The post colonial frame work

Unit II
Early concerns in Indian Writing in English ~ Works of some prominent Indian writers in English ~ Raja Rao ~ R. K. Narayan ~ Mulk Raj Anand ~ Bhabhani Bhattacharya ~ Salman Rushdie ~ Amitav Ghosh ~ Arundhathi Roy ~ Aravind Adiga ~ Jhumpa Lahiri

Unit III
Humanism and Renaissance ~ Humanism and Enlightenment ~ Humanism to Antihumanism ~ New Humanists ~ Irving Babbitt ~Paul Elmer More~ Stuart Pratt Sherman ~ Norman Foerster ~ Robert Shafer~ Allan Bloom ~ Rabindranath Tagore **~** M.N.Roy

Unit IV
Nayantara Sahgal, her life and her works ~ Living in postcolonial India ~ A Time to Be Happy ~ This Time of Morning ~ Storm in Chandigarh ~ Sunlight Surrounds You ~ The Day in Shadow ~ Plans for Departure ~ Rich Like Us ~ Mistaken Identity ~ A Situation in New Delhi ~ Lesser Breeds

Unit V
- As a researcher, what makes you choose the author and the genre of writing you have chosen?
- Justify your topic and its relevance to society
- What literary theories are relevant to interpret the texts you have chosen to research on?

Suggested texts for reference:

- Iyengar, K. R. Srinivasa. *Indian Writing in English* Sterling Publishers, 1984.
- Meenakshi Mukherjee. The Twice Born Fiction: Themes and Techniques of the Indian Novel in English, Arnold-Heinemann, 1974.
  Barry, Peter. *Beginning Theory: An Introduction to Literary and Cultural Theory*, Manchester University Press. 3rd edition. 2017.

PH223 - KAMALA MARKANDAYA IN THE CONTEXT OF INDIAN WRITING IN ENGLISH

Unit I

Introduction to Indian writing in English ~ Indian Aesthetic Tradition (Theory of Rasa etc) ~ Indian Narrative Theory ~The post colonial frame work

Unit II

Early concerns in Indian Writing in English ~ Works of some prominent Indian writers in English ~ Raja Rao ~ R. K. Narayan ~ Mulk Raj Anand ~ Bhabhani Bhattacharya ~ Salman Rushdie ~ Amitav Ghosh ~ Arundhathi Roy ~ Aravind Adiga ~ Jhumpa Lahiri

Unit III

Ecocritcism **~** Role of Nature and Culture **~** Ecological crisis ~ Environmental Psychology ~ Landscaping as a plot and character ~ Nature and Environment ~ Degraded environment ~ Eco literacy and Ecological Justice ~ Global capitalism~ Eco survival ~ Toxic consciousness

Unit IV

Kamala Markandaya, her life and her works **~** *Bombay Tiger* ~ *Shalimar* ~ *The Golden Honeycomb* ~ *Two Virgins* ~ *The Nowhere Man* ~ *The Coffer Dams* ~ *A Handful of Rice* ~ *Possession* ~ *A Silence of Desire* ~ *Some Inner Fury* ~ *Nectar in a Sieve*

Unit V

- As a researcher, what makes you choose the author and the genre of writing you have chosen?
- Justify your topic and its relevance to society
- What literary theories are relevant to interpret the texts you have chosen to research on?

Suggested texts for reference:

- Iyengar, K. R. Srinivasa. *Indian Writing in English* Sterling Publishers, 1984
- Mukherjee, Meenakshi. *The Twice Born Fiction: Themes and Techniques of the Indian Novel in English*, Arnold-Heinemann, 1974
- Barry, Peter. *Beginning Theory: An Introduction to Literary and Cultural Theory*, Manchester University Press. 3rd edition. 2017
- Glotfelty, Cheryll & Harold Fromm, *The Ecocriticism Reader: Landmarks in Literary Ecology* University of Georgia Press, 1996
- Guha, Ramachandra. *Environmentalism: A Global History, Penguin UK 2014.*
- Huggan, Graham & Helen Tiffin. *Postcolonial Ecocriticism: Literature, Animals, Environment*, Routledge, 2015

PH224 – DYNAMICS OF POWER AND OPPRESSION : AN INTERDISCIPLINARY STUDY OF TOTALITARIANISM

Unit-1 Some key political theories ~ Major "isms" that have shaped the world: liberalism, nationalism, imperialism, socialism, communism and fascism. ~ Some key thinkers ~ Thomas Hobbes & Leviathan ~ John Locke & philosophy of natural rights ~ Jean-Jacques Rousseau & the Social Contract ~ Montesquieu & the theory of the separation of powers ~ John Stuart Mill & his principle on liberty ~ Hannah Arendt on Totalitarianism

Unit-2 Narrative Theory ~ Testimony as a form of literary representation ~ The aspect of history and memory ~ Aspect of identification ~ Political Psychology ~ The nature of political behavior of rulers / heads of state

Unit-3 The Dairy of Anne Frank ~ George Orwell, Nineteen Eighty Four ~ Aldous Huxley, Brave New World ~ Tie Ning, The Bathing Women

Unit-4 Svetlana Alexievich, Second-Hand Time ~ Jung Chang , Wild Swans ~ Julia Alvarez, In the time of Butterflies ~ Zoya Phan, Undaunted ~ Shirin Ebadi, Until we are Free ~ Mario Vargas Llosa, The Feast of the Goat

Unit-5 As a researcher, what makes you choose the author and the genre of writing you have• Justify your topic and its relevance to society•chosen? What literary theories are relevant to interpret the texts you have chosen to research on?• Fludernik, Monika. An Introduction to Narratology Routledge, 2009

Suggested Books for reference Huhn, Peter, et al. Handbook of Narratology, Walter de Gruyter GmbH• & John T. Jost, Jim Sidanius, Ed. Political Psychology: Key Readings Psychology Press, 2004•Co KG, 2014. Langer, Lawrence L. Holocaust Testimonies: The Ruins of Memory,Yale University Press,• 1991 Ratiani, Irma, Totalitarianism and Literary Discourse: 20th Century Experience, Cambridge• Scholars Publishing, 2011.

PH225 - NARRATIVE TECHNIQUE AND PSYCHOLOGICAL REALISM IN THE WORKS OF KHAZUO ISHIGURO

Unit-1

Narrative Theory ~ Functions stories play in human affairs ~Structural analysis and what it reveals about the nature of narratives? ~Culture and its affect on the interpretation and telling of stories ~ Aspects of time and memory

Unit -2

Elements of a narrative ~ Narrative techniques ~ Difference between a Literal and a Natural narrative ~ Narrative perspectives ~ Four points of view ~ Retrospective & Introspective narrative ~ A Frame narrative

Unit-3

Key theories on the Narrative ~ Peter Brooks~ Roland Barthes ~ Algirdas Greimas ~ The ethics of narrative truth~ Space /Time Orientation in a narrative ~Literary examples of different narrative styles

Unit-4

Khazua Ishiguro, his life and his works ~ *A Pale View of Hills* ~ *An Artist of the Floating World* ~ *The Remains of the Day* ~ *The Unconsoled* ~ *When We Were Orphans* ~ *Never Let Me Go* ~ *The Buried Giant*

Unit-5

- As a researcher, what makes you choose the author and the genre of writing you have chosen?
- Justify your topic and its relevance to society
- What literary theories are relevant to interpret the texts you have chosen to research on?

Suggested Reading

- Felluga, Dino. "General Introduction to Narratology." *Introductory Guide to Critical Theory*.
- Fludernik, Monika. *An Introduction to Narratology* Routledge, 2009
- Foster, E.M. Aspects of a Novel. Hodder & Stoughton Ltd. London. 2016
- Kenan, Shlomith Rimmon *Narrative Fiction: Contemporary Poetics,* Routledge, 2003
- Lodge, David. The Art of Fiction. Random House. 2012
- Huhn, Peter, et al. *Handbook of Narratology,* Walter de Gruyter GmbH & Co KG, 2014

PH226 - REFLECTIVE TEACHING FOR LANGUAGE TEACHERS

Unit 1: Classroom Approaches

What is reflective teaching?~ Framework for Reflecting on Practices~ Approaches to classroom investigations : journals, lesson reports, surveys and questionnaires, audio or video recording of lessons, observation, action research ~ Historical Roots of Reflective Teaching ~Dewey's contribution: open-mindedness, Responsibility, Whole-heartedness ~ Schon's " Reflection-on-Action" and "Reflection-in-Action"

Unit 2: Exploring teachers' beliefs

The source of teachers' beliefs~ beliefs about English~ Beliefs about learning~ beliefs about teaching~ beliefs about the program and the curriculum~ Beliefs about language teaching as a profession

Unit 3: The Role of the Teacher

The nature of roles~ Roles reflecting institutional factors~ Role reflecting a teaching approach or method~ Role reflecting a personal view of teaching~ Cultural dimensions of roles ~ professional development through reflective practice teaching

Unit 4: Teacher Decision Making

Planning Decisions~ Interactive Decisions~ Evaluative Decisions~ Negotiating Course Content with learners~ The Structure of a Lesson: Openings, Sequencing, Pacing, Closure

Unit 5: Current Researches

Action research: Scope, Teacher Awareness, Instruments~ Critical Reflection~ Flipped classroom~ Dialogic Reflection for professional development~ Video supported Reflection~ Implicated Reading

- As a researcher, what makes you choose the author and the genre of writing you have chosen?
- Justify your topic and its relevance to society
- What literary theories are relevant to interpret the texts you have chosen to research on?

Suggested Reading

1. Borg, S. (2015). *Teacher Cognition and Language Education: Research and Practice*. Bloomsbury
2. Posner, G. (2000). *Field Experience: A Guide to Reflective Teaching.* New York: Longman.

3. Richards, J. C. & Lockhart, C. (1994). *Reflective Teaching in Second Language Classrooms*. Cambridge: CUP

Zeichner, K., & Liston, D. (1996). *Reflective teaching: An introduction*. Mahwah, NJ: Lawrence Erlbaum Associates.

PH227 - TEACHING AND TESTING OF VOCABULARY IN SECOND LANGUAGE

Unit 1: Introduction to vocabulary

Concept of a word ~ Concept of word knowledge ~ Dimensions of word knowledge: Form, Meaning and Use ~ Aspects of word knowledge

Unit2: Vocabulary learning

Processes involving vocabulary learning: Labeling, Categorizing and Network building ~ Issues involving vocabulary learning: False friends, Real friends, Strangers and Acquaintances ~ Role of schema in vocabulary learning ~ Learning burden of a word ~ Incidental learning vs. planned learning

Unit 3: Vocabulary teaching and testing

How many and which words to teach? ~ Repetition and vocabulary learning ~ Vocabulary teaching techniques ~ Challenges in vocabulary teaching ~ Rich instruction ~ Vocabulary and LSRW~ **Issues involving testing vocabulary**: Which words to test? How many words to test? Which aspects of word knowledge to test? ~ Vocabulary breadth and depth test ~ Vocabulary tests and their focuses ~ vocabulary test development

Unit 4: Vocabulary in ESP context

Academic vocabulary and Technical vocabulary: Nature, Role and Importance ~ Teaching and learning specialized (academic and technical) vocabulary ~ Contribution of CORPUS to specialized vocabulary~ Approaches to identifying specialised vocabulary for ESP

Unit5: Researching Vocabulary

Vocabulary use and acquisition~ Vocabulary and language skills~ Measuring Vocabulary Size~ measuring the quality (depth) and quantity (breath) of vocabulary knowledge~ Measuring speed processing~ Measuring organization~ Measuring attrition and degree of residual lexical retention

- As a researcher, what makes you choose the author and the genre of writing you have chosen?
- Justify your topic and its relevance to society
- What literary theories are relevant to interpret the texts you have chosen to research on?

Suggested Reading

1. Nation, I.S.P. (2001). *Learning Vocabulary in Another Language*. Cambridge: CUP

2. Schmitt, N. (2010). *Researching Vocabulary: A Vocabulary Research Manual*. New York: Macmillan
3. Thornbury, S. (2006*). How to Teach Vocabulary*. New Delhi: Pearson

PH245 - INDIAN WRITING IN ENGLISH

UNIT I CONSCIOUSNESS AND SENSIBILITY
Origin and evolution of Indian Writing in English(IWE) – Cultural heritage and modernization of values system in India- Direction of Indian Writings in English - Consciousness and sensibility in Indian English Literature.

UNIT 2 MYTHS VS. REALISM IN IWE
Novel as a genre ---Realism and the Indian Novel-- Realistic works in fiction as plausible interpretation of life --Myths in Indian Writings in English – Myths in novelists Mulk Raj Anand and R.K Narayan and others – Myths as structural parallels – Myth and religion.

UNIT 3 INDIAN ENGLISH FICTION AND NATIONAL CONSCIOUSNESS
Indian English fiction as a mirror to the changing facets of Indian life and reality --- Indian English Fiction and the freedom struggle- Gandhian Influence on IWE

UNIT 4 WOMEN WRITERS IN IWE
Study of the prominent women writers in English – Anita Desai – Bharathi Mukherjee – Arundathi Roy – Kamala Markhandeya – Kiran Desai - Nayantara Sahagal – Identity crises as a concept in Indian Women novelists – Psychological exploration of inner mind of Indian women.

UNIT 5 FEMINISM IN ANITA NAIR'S NOVEL
Introduction to feminism – Feminism and modern Indian women novelists – Women's role in maintaining or resisting patriarchy.

Suggested Readings:

- Chakravarty Joya (ed.): *Indian Writing in English: Perspectives*. New Delhi : Atlantic, 2003
- King Bruce (Ed.): *Critical Essays on Indian Writing in English*, New Delhi: O.U.P., 1968.
- Mittapalli, Rajeswar & Pier Piciucco (Ed). : Studies in Indian Writing in English, Vol-1, Atlantic Publishers, New Delhi, 2000
- Roy, Anuradha. *Pattern of Feminist Consciousness in Indian Women Writers*. New Delhi, Prestige, 1999.
- Srinivasa, Iyengar. *Indian Writing in English*. 5th Ed. Delhi: Sterling, 1985.

PH247 - CURRENT RESEARCH & PRACTICE IN TEACHING & LEARNING VOCABULARY

Unit-1 Nature of Vocabulary and language learning

Significance of Vocabulary-types of vocabulary-productive and receptive-size of the vocabulary and its impact on language acquisition-discussion about structural words/content words-vocabulary and LSRW Skills

Unit-2 Approaches to Vocabulary Instruction

Three approaches of vocabulary learning and instruction-incidental learning-extensive reading and listening-benefits of extensive learning form low –proficiency students-explicit instruction-difference between high-frequency and general academic words- knowing about General Service List (GSL) and university word list-the effect of academic success.

Unit-3 Independent Strategy Development

Importance of Independent learning-guessing from the from the context-inferring word meanings-dictionary-using habits-role of corpus-based vocabulary instruction- Coining Words: Neologisms and Lexicon of a Language-denotation and connotation-types of Register / Tone

Unit -4 Techniques as aids for Vocabulary

Translation as a technique-using realia-using drawings and pictures- mime- paraphrasing-building relationships-collocations and learner strategies- listening fluency-reading speed-writing fluency

Unit-5 Testing Vocabulary and Review of Literature

The role of testing- types of tests: summative and formative- merits and short comings of testing-proficiency tests- placements tests- criteria for testing- samples tests- review of current research.

References

1. Carter, R., & McCarthy, M. (Eds.).(1988). Vocabulary and language teaching. London: Longman.
2. Krashen, S. (1985). *The Input Hypothesis: Issues and Implications*. London: Longman.
3. Schmitt, D., & Schmitt, N. (2005). *Focus on Vocabulary: Mastering the Academic Word List*. New York: Longman Pearson Education.
4. Milton, J. (2009). *Measuring Second language Vocabulary Acquisition*. Bristol: Multilingual Matters.
5. Nation, I.S.P. (2001). *Learning Vocabulary in Another Language*. Cambridge: Cambridge University Press.

PH248 - LANGUAGE ACROSS CURRICULUM IN ESL PEDAGOGY

Unit 1 Nature and function of Language

Language- meaning and concepts- functions of language- role of language across curriculum – language learning theories –teaching L1 and L2- barriers in using language

Unit 2 language Diversity in classroom

Learning mother tongue- significance of first language - L1 interface in L2 acquisition- teaching second language - bilingualism- multilingualism- context of culture in language learning-analysis of existing models of language approaches in SLA

Unit-3 Culture and language teaching

Notion of culture- language vs culture- Language as Lingua Franca (LLF)- need for inclusion of multi languages in ESL pedagogy- communicative competence- cross cultural communication- sociolinguistics- notions of globalization, localization and glocalization of language curriculum- issue of alterative pedagogies-beyond post method.

Unit-4 Teacher Beliefs and Professionalism

Teacher cognition-belief systems- feasibility in using cross cultural pedagogy in language classes- similarities and differences in adoption of integration of skills- problem /issues related to ICT and CALL in English classes- teachers' use and awareness- gap between theory and practice- discussion of recent developments in teacher education.

Unit-5 Curriculum and material design

Syllabus vs Curriculum- principles of material development-teacher as material designer-criteria for textbook evaluation- gap between materials designers and language teachers- current debates on materials design and production- checklist for text book evaluation.

References

1. Brown, Douglas. (2001). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. London: Pearson Longman.

2. Byram Michael, Adelheid Hu (eds.). (2000). *Routledge Encyclopedia of Language Teaching and Learning*. New York: Routledge.
3. Clyne,.M 1994. Intercultural communication at work. CUP
4. Gumperz, J. J. (1982a). *Discourse strategies.* Cambridge: Cambridge University Press.

5. Krashen, S. (1985). *The Input Hypothesis*. London: Longman.

PH249 - SPEAKING SKILLS

Unit 1 Nature and function of Language

Language- meaning and concepts- functions and notions of language- types of skills - language learning theories –teaching L1 and L2- barriers in using language- receptive vs productive skills-role of oral and oral skills- role of LSRW and relation between listening and speaking.

Unit-2 Communication

Communication, meaning and concept- elements of communication – process of communication - types of communication, verbal and non-verbal communication – interpersonal, intrapersonal, group communication and mass communication – ways and means of developing communication skills- communication barriers.

Unit-3 Introduction to Phonetics

Role of pronunciation in language learning- relevance of Native variety vs local variant speech- vowels and consonants- role of intonation and rhythm and word stress-debate on 'Best English'- various approaches to teach spoken English for ESL context-interrelation between listening and speaking

Unit-4 Approaches to Teaching Speaking

Form-focused and meaning-focused- inductive vs deductive approaches to language teaching- listening and vocabulary- sub skills of speaking- 'world Englishes' and relevance of Indian variety of English – social media and language development

Unit-5 Materials, Activities and Training

Selection of texts for oral proficiency- language learning in controlled situations- authenticity in materials and input- language in real-life situations- tasks for learner interest- role plays and discussion skills- drama- information gap activities and jigsaw-nuances of speaking course- discussion about recent literature on speaking/oral proficiency – Analysis of standardized tests- IELTS/TOEFL/BEC.

References

1. Brown, G and G Yule. (1083). Teaching Spoken English. Cambridge: Cambridge University Press
2. Brumfit, C.J. (1984). Communicative Methodology in Language Teaching. Cambridge: Cambridge University Press

3. Littlewood, W J. (1992). Teaching Oral Communication: a methodological approach. Oxford: Blackwell
4. Tickoo, M L. (1995). Language and Culture in Multilingual Societies. Singapore: RELC Anthology, 36: 95-111.

PH251 - ENHANCING COMMUNICATION SKILLS THROUGH DRAMATIZATION

Unit 1 Background

Language Skill: Listening, Speaking, Reading and Writing~ Process of communication: language features, mental and social processing~ Classroom activities: acting from a script, communication games, discussion, prepared talks, questionnaires, simulations and role plays~ writing lesson sequences ~ Current research on application of dramatization technique for developing communication skills

Unit 2 Dramatization Technique

Dramatization as a method ~ Paradigm and its application to SLA ~Asperger Syndrome ~ Psycholinguistic issues ~ Speech accommodation theory ~ Neuropsychology and second language acquisition ~ Hemispheric differences ~ Multiple Perspectives: Classroom research perspective ~ Sociolinguistic perspective ~Bilingual education perspective

Unit 3: Communication skill

Physical description ~ Narrative ~ Comparison and contrast ~ Language and Style ~ Transcription ~ Discourse markers~ Body Posture ~ Gestures ~ Eye Contact ~ Facial Expressions ~ Appearance ~ Space Distance ~ Para Language ~ Tone ~Pace ~ Pitch ~ Pause

Unit 4: Testing communication skills

Tools available to test communication skills ~ Aspects of communication skills that can be tested ~ Issues in testing communication skill ~ standardized tests available in the literature

Unit 5: Communication Skill and Dramatization

- As a researcher, what makes you choose the area you have chosen?
- Justify your topic and its relevance to society
- What ELT theories are relevant to the area you have chosen to research on?

Suggested Reading:

- Wharton Tim (2009). *Pragmatics and non-verbal communication.* UK: Cambridge.
- Fast Yvona et.al. (2004). *Employment for individuals with Asperger syndrome or non-verbal learning disability: stories and strategies*. Philadelphia, USA: Jessica Kingsley Publishers.
- Harmer, J. (2015). *The Practice of English Language Teaching*. Pearson Education

- Ur, P. (1996). *A Course in Language Teaching: Practice and Theory*. Cambridge: Cambridge University Press.
- Howatt, A.P.R. (1984). *A History of English Language Teaching*. Oxford: Oxford University Press.

PH252 - CRIMINAL RECORD DOCUMENTATION: A LINGUISTIC STUDY

Unit 1 Background

Language Skill: Listening, speaking, Reading and Writing ~ process of writing ~ Types of writing ~ language features, mental and social processing ~ Introduction to legal English ~ Law and writing

Unit 2 English for Specific Purposes (ESP)

ESP vs EAP ~ need of ESP ~ ESP and General English ~ English for Professional Purposes ~ English for vocational purposes (EVP) ~ ESP in Indian Context ~ CLT approaches to ESP ~ English as Lingua-Franca ~ Elements of Legal Documentation: Apparatus ~ Limitations ~ Principles of Clear Writing ~ Principles of Diction ~ Principles of Tone ~ Principles of Grammar ~ Principles of Syntax ~ Principles of Punctuation ~ Principles of Paragraph Construction ~ Principles of Organization ~ Principles of Format.

Unit 3: Legal English and ESP

Art of Legal Writing ~ Process of Legal Writing ~ Obtaining the facts ~ Physical description ~ Narrative ~ Comparison and contrast ~ Language and Style ~ Transcription ~ Discourse markers ~ Case studies analysis ~ Legal jargon/genera of legal writing ~ Nuances of legal documentation and general writing ~ Office Memoranda ~ Motion Memoranda ~ Paragraphing ~ Effective Style.

Unit 4: Testing and Evaluation of Legal English

Evaluation of legal documents ~ Legal Writing and Law ~ Rule-Based Reasoning ~ Issues, Facts, Precedents, and Statutes ~ Interviewing the Client ~ Academic and Legal format ~ Tools to be adopted to legal documentation ~ Issues in testing legal English ~ standardized tests available in the literature

Unit 5: Researcher’s perception

- As a researcher, what makes you choose the area you have chosen?
- Justify your topic and its relevance to society
- What ESP theories are relevant to the area you have chosen to research on?

Suggested Reading:

- Neumann, Richard K., (207). *Legal reasoning and legal writing.* New York: United States of America. Wolters Kluwer.

- Krzanowski Mark Jeremy Day (2011). *Teaching English for Specific Purposes: An Introduction*. Cambridge: Cambridge University Press.

- Brian Paltridge and Sue Starfi eld (2013). *The handbook of English for specific purposes*. West Sussex, UK: John Wiley & Sons, Inc
- Fast Yvona et.al. (2004). *Employment for individuals with Asperger syndrome or non-verbal learning disability: stories and strategies*. Philadelphia, USA: Jessica Kingsley Publishers
- Harmer, J. (2015). *The Practice of English Language Teaching*. Pearson Education
- Ur, P. (1996). *A Course in Language Teaching: Practice and Theory*. Cambridge: Cambridge University Press.
- Howatt, A.P.R. (1984). *A History of English Language Teaching*. Oxford: Oxford University Press
- Stanley, G. (2013). *Language Learning with Technology: Ideas for using technology in the language classroom*. Cambridge: Cambridge University Press

ELECTRONICS & COMMUNICATION ENGINEERING

Course	Code	L	T	P	Cr
COGNITIVE RADIO TECHNOLOGY	PH093	4	-	-	4

MECHANICAL ENGINEERING

Course	Code	L	T	P	Cr
METAL MATRIX COMPOSITES	PH084	4	-	-	4
MODERN TECHNIQUES OF MATERIAL CHARACTERIZATION & TESTING	PH099	4	-	-	4
FRICTION STIR WELDING & PROCESSING	PH100	4	-	-	4
SOLAR ENERGY	PH101	4	-	-	4
NANOTECHNOLOGY	PH102	4	-	-	4

CHEMISTRY

Course	Code	L	T	P	Cr
ADVANCED ORGANIC SYNTHESIS HETERO CYCLES	PH078	4	-	-	4
ADVANCED IN ALKALINE EARTH METALLIC CHEMISTRY AND CATALYSIS	PH083	4	-	-	4
ADVANCED ORGANIC SYNTHESIS AND IDENTIFICATION OF NATURAL PRODUCTS	PH087	4	-	-	4
INSTRUMENTAL METHODS & CHARACTERIZATION TECHNIQUE	PH089	4	-	-	4
NANO BIOTECHNOLOGY	PH097	4	-	-	4
HYDRO FRACTURING & APPLICATIONS	PH096	4	-	-	4

CHEMICAL ENGINEERING

Course	Code	L	T	P	Cr
TECHNICAL TEXTILES	PH094	4	-	-	4

MATHEMATICS

Course	Code	L	T	P	Cr
NUMERICAL ANALYSIS	PH098	4	-	-	4
ORDINARY & PARTIAL DIFFERENTIAL EQUATIONS	PH105	4	-	-	4

PHYSICS

Course	Code	L	T	P	Cr
GLASS SCIENCE	PH088	4	-	-	4

ELECTRONICS & COMMUNICATION ENGINEERING

PH093 - COGNITIVE RADIO TECHNOLOGY

UNIT I –

Introduction Aware, Adaptive and Cognitive Radios. Cognitive Radio Technology, Cognitive Radio Network Architectures, Cognitive Radio Networks Applications.

UNIT II –

Cognitive Radio Networks Network Coding for Cognitive Radio Relay Networks. Cognitive Radio Networks Architecture. Terminal Architecture for CRN. Mathematical Models toward Networking Cognitive Radios. Scaling Laws of CRN.

UNIT III –

Spectrum Sensing and Spectrum Management Spectrum Sensing to detect specific Primary System. Spectrum Sensing for Cognitive Radio OFDMA Systems and Cognitive Multi-Radio Networks. Spectrum Management- Spectrum Sharing, Spectrum Pricing, Mobility Management to Heterogeneous Wireless Networks, Regulatory Issues and International Standards.

UNIT IV –

Trusted Cognitive Radio Networks Framework of Trust in CRN; Trusted Association and Routing; Trust with Learning; Security in CRN.

UNIT V –

Software Defined Radio Introduction to SDR. Evolution of SDR Baseband Requirements. SDR Architectures – Ideal SDR Architectures, Realistic SDR Architecture. SDR and Cognitive Radio Relationship.

Text Books:

1. Kwang-Cheng Chen and Ramjee Prasad, “Cognitive Radio Networks”, John Wiley & sons, 2009.
2. Ahmed Khattab, Dmitri Perkins, MagdyBayoumi, “Cognitive Radio Networks: From Theory to Practice”, Springer, 2013.
3. Walter Tuttlebee, “Software Defined Radio- Baseband Technology for 3G Handsets and Base stations”, John Wiley @ Sons, 2004

MECHANICAL ENGINEERING

PH084 - METAL MATRIX COMPOSITES

Unit-1:

Introduction and Overview of Metal based composites, overviews, key technologies and issues in the area, Fabrication of Metal Matrix Composites: Commonly used Matrices, Basic Requirements in Selection of constituents.

Unit-2:

Solidification processing of composites - XD process, Spray processes - Osprey Process, Rapid solidification processing, Dispersion Processes

Unit-3:

Stir-casting & Compo casting, Screw extrusion, Liquid-metal impregnation technique - Squeeze casting.

Unit-4:

Pressure infiltration, (Lanxide process), Principle of molten alloy infiltration, rheological behaviour of melt-particle slurry

Unit-5:

Synthesis of in situ Composites, Solid state processing techniques, powder metallurgy techniques

Reference:

1. Composite materials, K.K. Chawala, 2nd ed.,Springer-Verlag, 1987.

2. Introduction to Metal Matrix Composites,Yoshinori Nishida.

3. Nano composite Science and Technology, P. M. Ajayan, L. S. Schadler, P. V. Braun; Wiley-VCH Verlag GmbH Co, 2013.

4. Mechanics and Analysis of Composite Materials, V.V. Vasiliev, E.V. Morozov; Elsevier Science Ltd, 2001.

5. Mechanics of composite materials, Richard M. Christensen, Dover Publications, 2005.

6. Relevant journal papers.

PH099 - MODERN TECHNIQUES OF MATERIAL CHARACTERIZATION AND TESTING

Unit: 1

Introduction to optical microscopy, scanning electron microscopy (SEM), transmission electron microscopy (TEM), scanning tunneling electron microscope (STEM), atomic force microscope (AFM). Florescent microscopy

Unit: 2

Introduction to X-Ray diffraction (XRD) method, scanning parameters, indexing, Bragg's Law, phase identification and analysis

Unit: 3

Introduction to microanalysis and spectroscopy. Particle analysis methods. Thermal analysis: DTA, DSC etc

Unit: 4

Different tests to assess the mechanical behavior of materials, basic principles of micro hardness, Nano indentation, tensile, fracture, fatigue and creep tests, samples preparation methods.

Unit: 5

Tribology, Wear, surface analysis. Surface roughness and surface energy measuring techniques.

Reference books:

1. An Introduction to Materials Characterization, P. R. Khangaonkar; Penram Publishers, 2010.
2. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, Yang Leng; 2nd ed., Wiley, 2013.
3. Scanning Electron Microscopy and X-Ray Microanalysis, Joseph Goldstein, Eric Lifshin, Charles E. Lyman, David C. Joy and Patrick Echlin; 3rd ed., Springer, 2003.
4. Physical Methods for Materials Characterization, P.E.J.Flewitt, R.K.Wild ; Institute of Physics Publishing Ltd., 1994.
5. Relevant journal papers.
6. http://nptel.ac.in/courses/113106034/Dr. S. Sankaran ,IIT Madras.(NPTL)

PH100- FRICTION STIR WELDING AND PROCESSING

Unit: 1

General introduction, Historical development of welding, Fusion and pressure welding techniques, solid- state joining processes.

Unit: 2

Principle operation of friction stir welding (FSW), heat transfer and material flow in FSW, Recovery, Recrystallization, Grain Growth and Dynamic recrystallization, micro structural concepts and micro structural evolution in pure metals and alloys

Unit: 3

Tool Material Selection, Tool Features, Tool and welding design, Friction stir tools, Effect of tool geometry on material flow and weld properties, effect of process parameters in FSW.

Unit: 4

Friction Stir Processing (FSP) for Super plastic Forming**,** Friction Stir Casting Modification, Friction Stir Channeling (FSC), Composite fabrication via FSP

Unit: 5

Localized Surface Modification, Processing of Powder Metallurgy Alloys, Micro structural Refinement, Influence on Mechanical Properties, Ultra fine Grained structure/materials via FSP

Text Books:

1. Advances in Friction-Stir Welding And Processing By M-K Besharati-Givi; Parviz Asadi Woodhead Publishing is an imprint of Elsevier Publishing2014.
2. A Hand Book on Friction Stir Welding By prof. (Dr.) Bharat Raj Singh, India Edition: First, Publisher: LAP Lambert Academic Publishing, UK, Editor: A. Covali.

Reference books:

3. Friction Stir Welding and Processing Science and Engineering By Rajiv Sharan Mishra Partha Sarathi De Nilesh Kumar.
4. Friction stirs welding and processing by R.S. Mishra, Z.Y. Ma Institute of Metal Research, Elsevier 18 August 2005 B.V. All rights reserved.

PH101 - SOLAR ENERGY

UNIT – I

Principals of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT– II

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT– III

Solar Energy Storage and Applications: Different methods, Sensible latent heat and stratified storage, solar ponds. Solar Applications – Solar heating / cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT – IV

Solar Cells: Formation of a pn – junction - Space charge and internal field - Quasi - Fermi levels - The Shockley diode equation - Structure of a solar cell - The solar cell equation - Fill factor and maximum power - Various electron - hole-pair recombination mechanisms - Crystalline silicon solar cells - Thin film solar cells: CIGS, Cite and a – silicon - Tandem solar cells - Dye - sensitized solar cells - Organic solar cells

UNIT– V

Solar Electrical Energy Conversion: Solar photovoltaic energy conversion - Principles - Physics and operation of solar cells. Classification of solar PV systems, Solar cell energy conversion efficiency, I-V characteristics, effect of variation of solar insulation and temperature, losses. Solar PV power plants.

TEXT BOOKS:

1. Solar Energy, Principles of Thermal Collection and Storage, S.P. Sukhatme, Tata Mc Graw Hill Publishers, Fourth Print.
2. Solar Energy, Sukhatme S.P., Tata McGraw Hills P Co., 3rd Edition.
3. The Physics of Solar Cells. Nelson, Imperial College Press.
4. Solar Energy Fundamentals and Applications, Garg H.P., Prakash J., Tata McGraw-Hill.
5. Solar Energy Engineering Processes and Systems, Kalogirou S., Elsevier.

PH102 - NANO TECHNOLOGY

UNIT-I

Importance of Nano-technology, Emergence of Nano-Technology, Bottom-up and Top-down approaches, challenges in Nanotechnology.

General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

UNIT-II

Silicon Carbide: Application of Silicon car bide, nano materials preparation, Sintering of SiC, Xray Diffraction data, electron micro scopy sintering of nano particles, Nano particles of Alumina And Zirconia: Nano materials preparation, Characterization, Wear materials and nano composits.

UNIT-III

Mechanical properties: Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties.

UNIT-IV

Electrical properties: Switching glasses with nano particles, Electronic conduction with nano particles.

Optical properties: Optical properties, special properties and the coloured lasses.

UNIT-V

Process of synthesis of nano powders, Electrode position, Important nano materials Investigating and manipulating materials in the nano scale: Electron microscopes, scanning probe microscopes, optical microscopes for nano science and technology, X-ray diffraction.

TEXT BOOKS:

1. A.K.Bandyopadhyay,"Nano Materials",1st Edition,New Age Publishers,2009

2. T.Pradeep,"Nano the Essentials",3rd Edition,Tata McGraw Hill, 2009

REFERENCE BOOKS

1. Guozhong Cao,"Nano structures and Nano Materials: Synthesis, Properties and Application" 1st Edition, Imperial College Press, 2004.

2. Bharat Bhusan, "Springer's Hand Book of Nano-technology", 2nd Edition, Spingers Publihsers, 2007.

CHEMISTRY

PH078 - ADVANCED ORGANIC SYNTHESIS HETERO CYCLES

Unit-1: Introduction to Heterocycles 1. Defination, 2. Classification 3. Uses of heterocyclic compounds

Unit-2: Synthesis of Heterocyclic compounds 1. Pyridine, 2. Quinoline 3. Isoquinoline 4. Furan 5. Thiophene 6. Indole

Unit-3: Protection and deportation in organic chemistry 3.1) Protection and deportation of the following functional groups 1. Hydroxyl 2. Carbonyl 3. Amino and 4. carboxyl with 5. Applications

Unit-4: Stereo chemistry: 1 Classification of isomers into structural and stereo types-Optical isomerisationElementary of symmetry and chirality – Configuration of optically active molecules – DL and RS notations – Resolution of recemic mixtures. Cis and Trans isomerism; E-Z configuration. Conformational analysis of acyclic systems like Ethane and cyclic systems like cyclohexane

Unit-5: Structural elucidation of organic compounds by using instrumentation 1. Spectroscopy: a) Basic concepts, operational principles and applications of UV-VIS, and FT-IR spectroscopy. 2. Resonance spectroscopy: a) Fundamentals, b) Operational principles, types and C) Applications of Nuclear magnetic resonance (NMR) spectroscopy.

Text Book 1. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th Edition, ISBN: 978-0-470-46259-1, March 2013 Reference Book 1. Advanced Organic Chemistry, Francis A. Carey, Richard A. Sundberg, 5th Edition, 2007, ISBN-13: 978-0-387-68350-8, Springer

PH083 - ADVANCES IN ALKALINE EARTH METALLIC CHEMISTRY AND CATALYSIS

Unit – I: Alkaline-Earth Metals and their physical properties: Introduction, Alkaline earth metals, electronic configurations, periodic properties, Organomagnesium chemistry, Heavier alkaline earth metals, General protocol for the synthesis of organometallic complexes.

Unit – II: Polymer Science: Definition of polymer, Homo polymer, copolymer, Number average molecular weight, Weight average molecular weight, PDI, Polymerization principles and processes - Step, Chain and other polymerizations, polymer kinetics, Polymerization techniques, Polymer manufacture, Polymer characterization, Polymer applications: Biodegradable polymers, Non biodegradable polymers biomedical polymers, conducting polymers. Co-polymerization

Unit – III: Alkaline-Earth Metal Complexes in Homogeneous Polymerization Catalysis: Introduction, σ-Bond Metathesis and Insertion Reactivity, Schlenk Equilibrium, Chain Growth Polymerizations, Ring-Opening Polymerization of cyclic esters – -Caprolactone and Lactide polymerization, Olefin polymerization - Polymerization of Styrene and Conjugated Dienes.

Unit – IV: Heavier Alkaline-Earth Metal Chiral Complexes – Asymmetric Reactions: Asymmetric Aldol and related reactions, Asymmetric Michael and related reactions, Asymmetric Mannich and related reactions, Asymmetric Benzoylation reactions and Asymmetric Diels–Alder-type reactions.

Unit – V: Structural Diversity in Alkaline-Earth Metal Organometallic Compounds: Experimental techniques to prepare alkaline earth metal complexes, Schlenk technique, cannula techniques, Crystallization techniques, Tris(pyrazolyl)borate complexes of the Alkaline-Earth metals, Amidophosphine–Borane complexes of Alkali and Heavier Alkaline-Earth metals, Homoleptic 1,2,4-Diazaphospholide Alkaline-Earth metal complexes and Alkaline-Earth Metal complexes of a Phosphine-Borane-Stabilized 1,3-Dicarbanion. Use of Ortep, Mercury for publication materials. Reference Books: 1. Alkaline-Earth Metal Compounds – oddities and applications: Topics in Organometallic Chemistry, 2013. Editor: Sjoerd Harder. 2.

Text book of “Synthesis of Polymers: New Structures and Methods”: Editor: Dieter A. Schluter, Craig Hawker, and Junji Sakamoto, 2012. References: 3. (a) Harder, S. Chem. Rev. 2010, 110, 3852. (b) Kobayashi, S.; Yamashita, Y. Acc. Chem. Res. 2011, 44, 58. 4. Ravi K. Kottalanka, Srinivas Anga, Kishor Naktode, Payel Laskar, Hari Pada Nayek, and Tarun K. Panda, Organometallics, 2013, 32, 4473−4482. 5. Keith Izod, Corinne Wills, Salima El-Hamruni, Ross W. Harrington, Paul G. Waddell, and Michael R. Probert Organometallics, 2015, 34 (11), pp 2406–2414. 6. Olaf Michel, H. Martin Dietrich, Rannveig Litlabø, Karl W. Törnroos, Cäcilia Maichle-Mössmer, and Reiner Anwander, Organometallics, 2012, 31 (8), pp 3119–3127.

PH087 - ADVANCED ORGANIC SYNTHESIS AND IDENTIFICATION OF NATURAL PRODUCTS

UNIT-I

REACTIVE INTERMEDIATES & HETEROCYCLIC CHEMISTRY:

Generation, Structure, Stability and reactivity of Carbocations, Carbanions, free radicals, Carbenes, nitrenes and Benzyne. Synthesis and Reactions of furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline and indole; Skraup synthesis, Fisher indole synthesis.

UNIT-II

STEREOCHEMISTRY & CONFORMATIONAL ANALYSIS:

a) Criteria for chirality (one and more than one chiral centers); R – S nomenclature Optical activity in the presence and absence of chiral carbon. Racemic mixture- racemisation and resolution of racemic mixture. Stereo chemistry of compounds containing nitrogen, sulphur and phosphorous.
b) Geometrical isomerism – E, Z- nomenclature – physical and chemical methods of determining the configuration of geometrical isomers.
c) Conformations of monocyclic compounds – cyclohexane- chair, boat and twist boat cyclohexanes, energy profile diagram – Mono and di- substituted cyclohexanes –conformations and physical properties.

UNIT-III

SYNTHESIS IN ORGANIC CHEMISTRY:

Oxidation- Swern, Prevost and Woodward oxidations, Reduction- LiAlH4 , NaBH4 , Clemmensens reduction, Birch reduction, Modern Organic Synthetic Reactions: Aza-Cope and Aza-Wittig reactions, Baylis-Hillman reaction, Click reaction, Heck reaction, Julia- Kocienski olefination, Mukiyama aldol reaction, Mitsunobu reaction, McMurray reaction, Peterson's stereoselective olefination, Suzuki coupling.

UNIT-IV

PRINCIPLES OF SPETROSCOPY:

i) IR Spectroscopy: Introduction, Principles, Characteristic vibrational frequencies of functional groups, Fermi resonance, Effect of hydrogen bonding on vibrational frequencies.
ii) Electronic spectroscopy: Introduction, Principles and Wood -Ward Fieser rules.
iii) NMR Spectroscopy (1 H NMR): Introduction, Principles, factors effecting the chemical shifts, spin spin coupling, first order spectra
iv) Mass Spectrometry: Introduction, Principles, use of isotopic peaks, salient feature of fragmentation of organic compounds, McLafferty rearrangements, retro Diels-Alder fragmentation and ortho effects.
v) Simple problems on structure determination based on the above spectral methods.

UNIT-V

NATURAL PRODUCT CHEMISTRY:

Natural Product Chemistry: a) IR, UV, 1 HNMR and mass spectral studies of the following classes of Natural Products: i) Coumarins ii) Flavones iii) Isoflavones iv) Flavanones v) monoterpenes vi) Quinoline and isoquinoline alkaloids (cusparine and papaverine).

TEXT BOOKS

1. Stereo Chemistry of carbon compounds – E.L. Eliel.

2. Modern organic Reactions, H.O.House, Benjamin.
3. Spectrometric identification of organic compounds - pavia

REFERENCE BOOKS

1. Advanced organic chemistry – reaction, mechanism and structure, Jerry March, John Wiley.
2. Advanced organic chemistry, F.A.Carey and R.J.Sundberg, Plenum.
3. Organic Chemistry Volume 2 FINAR, Pearson Education.
4. Spectrometric Identification of Organic Compounds- Robert M. Silverstein, FX

PH089 – INSTRUMENTAL METHODS & CHARACTERIZATION TECHNIQUE

UNIT 1 : Spectroscopy Uv-visible-FTIR Spectrophotometry-Raman Spectroscopy-Instrumentation-Quantitave analysisApplications.

UNIT 2 : Fluorometry and Phosphorimetry Introduction- Comparison of absorption and Floroscent Methods-Instrumentation-Applications of Fluorometry and Phosphorimetry-Comparison of Fluorometry and Phosphorimetry.

UNIT 3 : Magnetic Resonance Spectroscopy Introduction to NMR-Instrumentation-Chemical shift-Applications,Introduction to ESR-TheoryInstrumentation-Applications.

UNIT 4 : X- ray Diffraction X-ray diffraction - DebyeScherrer formula-Powder method of diffraction - Determination of particle size-Applications.

UNIT 5 : Imaging Techniques Scanning Electron Microscopy (SEM) - Transmission Electron Microscopy (TEM) - Scanning Tunneling Microscope (TEM)-Field Ion Microscopy (FEM).

Text books: 1. Instrumental methods and analysis-Willards,Merrit et.al (CBS)2011 2. Instrumental Methods of Chemical Analysis-Gurudeep R.Chatwal, Sham K.Anand., Himalaya publishing house (2009) 3. Text book of Nanoscience and Nano technology-B.S.Murthy et.al, University Press(2012) Reference books: 1. Enclopedia of characterization-C.Richard Brundle et.al(2006)

PH097 - NANO BIOTECHNOLOGY

Unit 1: Introduction to Nanomaterials and Nanobiotechnology

History of nanomaterials, Different Classification Schemes of nanomaterials, Various applications of nanomaterials, Concept of nanobiotechnology, Important areas of Nanobiotechnology.

Unit 2: Synthesis and Characterization of Nanomaterials:

Different synthetic strategies, Top-down and Bottom-up approach, Biological and Green synthesis of nanomaterials, Functional Nanomaterials, Important Characterization techniques, Microscopy, X-ray-based techniques, Spectroscopic techniques, Surface Area Analysis, Magnetic Nanomaterials.

Unit 3: Nanomedicine and Nanoparticle-based Drug Delivery Systems:

Idea of nanomedicines, Recent examples and current challenges of nanomedicines, Nanobiomaterials, Different types of drug-delivery systems**,** Silica, Carbon, Polymers, metal-composites, Loading of drugs**,** Different strategies for controlled release of drugs, Current status and future direction.

Unit 4: Nanobioimaging and Nanobiosensors:

Concept of Bioimaging and Biosensing**,** Immuno Fluorescent Biomarker Imaging, Immuno gold labelling, Colorimetric Sensing, Iron Oxide Nanoparticles in Magnetic Resonance Imaging, Optical nanosensors for intracellular imaging, Cancer imaging, Nanolithography.

Unit 5: Environmental Applications of Nanobiotechnology:

Application of Nanobiotechnology in removal of pollutant, Risk Analysis in Food Technologies, Applications of Nanobiotechnologies in Food Preservation, Water Purification Techniques, Current status, challenges and future potential.

References:

1. Claudio Nicolini, Nano biotechnology & Nano biosciences Pan Stanford Publishing Pte. Ltd, 2009.
2. C.A. Mirkin and C.M. Niemeyer, Nano biotechnology- II, More Concepts and Applications, WILEY-VCH, Verlag Gmb H&Co, 2007.

PH096 - HYDRO FRACTURING & APPLICATIONS

UNIT-1

Engineering Instruments

Viscometer, water bath, pressurised Atmospheric consistometer, atmospheric consistometer, ultrasonic cement analyser, static gel strength analyser, gas migration, high temperature curing chamber, fluid loss equipment.

UNIT-II

Drilling fluids and Cementing

Fundamental concept of cementing, cementing Design, low weight slurrys , high weight slurrys, cementing chemicals, like retarder , accelerator's, cement dispersant, bonding agents, fluid loss agents, silica properties.

UNIT-III

Hydra fracturing Fluids and Applications

Types of fracturing, preparation of frac concentration XLFC-1B, breakers, solvents, antisettling agents, operational applications.

UNIT-IV

Simulation Fluids and Applications

Concept of simulation, preparation of simulation fluids, classification, operational application.

UNIT-V

Acidizing Fluids and Applications

Base concept of acidizing , preparation of 15 % acid mixture , corrosion inhibitor ,antibacterial agents, types of acidizing chemicals in operational application.

CHEMICL ENGINEERING

PH094 - TECHNICAL TEXTILES

UNIT 1: Overview of Technical Textil:s projections tions of technical textiles., ', : ClassificatiZ inducts, "'rii' market overview azind0gro0wt4hk—i•Automotive Textiles: Applicatiori of textiles in au airbags and bekts. Their production and properties otofmteoxbtiilleess.uRseedg uinirethmeestraspopf pneumatic tyres, applications.

UNIT 2 :Architectural and Construction Textiles: I Construction ,Applications of Coated Fabrics in Structures, Awnings and Canopies, Textiles as Roofing Materials n ntroduction, Fabrics for Architecture and , Storage Vessels, Fibre Reinforced Co Textiles for Acoustic and heat Insulation ncrete and Cements,

UNIT 3 : (Protective Textiles: Requirements of textiles used against fire, chemicals, ballistic, wind, rain. Interactions between protection and thermal comfort xtiles in sports: Physiological comfort of sportswear .Types of textiles used in the manufacturing of sports textiles. Functional requirements of these textiles

Unit 4 : Military and Defense Textiles: Introduction, Protective Clothing and Individual uipment, Textile Used in Defense Systems and Weapons. ,■'" nctional requirements and types of textiles used for paper making, medic) agricultural, packaging and footwear, Aerospace applicatiss,- 4

UNIT-5 Gerpal Industrial Text' Textiles in Agriculture, Textile in Ele •onics, Transp,t.-- Bags ya Sheets, Fabrics to Control Oil Spills, Canvas Covers and Tara ins, Ropes and Nets, Home and Office Furnishings, Miscellaneous Applications, Cloth tech

REFERENCE BOOKS" I. The Textile Institute Advances in Fibre Science by S. K. Mukhopadhya Textile Fibres: Developments & Innovations Vol. 2 by V. K. KothTaeri 2. chnomic Publishing 3. S.Adanur "Wellington Sears Handbook of Industrial textiles", Co., Inc Lancaster, Penny ISBN: 1-56676-340-1, 1995. les', Text.Prog, Vol. 29, Mukhopadhyay, S.K. and partridge J.F,' Automotive Texti Horrocks, A.R and Anand 5, 'Technical Textiles', Text.Inst. 1999, ISBN: 1855733854. No.1/2, 1998, ISBN: 1870372212.1

MATHEMATICS

PH098 - NUMERICAL ANALYSIS

UNIT-I

SOLUTION OF EQUATIONS: Roots of equations-method of false position-Newton's method-statement of fixed point heorem - Fixed point iteration: $x = g(x)$ method-Solution of linear system by Gauss Elimination and Gauss-Jordan Methods-Iterative Methods : Gauss Jacobi and Gauss-Seidel Methods.

UNIT-II
INTERPOLATION AND APPROXIMATION: Lagrange polynomials-Divided difference-Newton's Forward and Backward Difference Interpolation Formulas. Finite differences and divided differences.

UNIT-III
NUMERICAL DIFFERENTIATION AND INTEGRATION: Numerical Integration by trapezoidal and Simpson's 1/3 and 3/8 Rules-Two and three point Gaussian quadrature formulas-Double integrals Using trapezoidal and Simpson's Rule.

UNIT-IV
INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS: Single Step Methods:Taylor Series Method-Euler and Modified Euler Methods-Fourth order Runge-Kutta Method for solving first and second order equations-Multi Step Methods: Adams predictor and corrector Methods.

UNIT-V

BOUNDARY VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS AND INITIAL & BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS: Finite difference solution of second order ordinary differential equation-Finite difference solution of one dimensional heat equation by explicit and implicit methods-one dimensional wave equation and two dimensional Laplace and Poisson equation.

TEXT BOOKS

1. Engineering Mathematics-Koneru Sarveswara Rao Published by Orient BlackSwan/ Universities Press (2002)
2. Numerical Methods-S.R.K.Iyengar,R.K.Jain.
3. *Numerical Methods* for Scientific and engineering Computations-M. K. Jain, *S.R.K.*Iyenger and *R.K. Jain*

REFERENCE BOOKS

1. R K Jain, S R K Iyengar, “Advanced Engineering Mathematics”, 2nd Edition, Narosa Publishing House.
2. Erwin Kreyszig, “Advanced Engineering Mathematics”, 8th Edition, John Wiley & Sons (Asia) Pvt. Ltd. 2001.
3. H. K. Dassand Er. RajnishVerma, Higher Engineering Mathematics, S.Chand& Co., New Delhi, 2011.

PH105 - ORDINARY & PARTIAL DIFFERENTIAL EQUATIONS

UNIT-I

Differential equations of first order and their applications: Overview of differential equations- exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

UNIT-II

Higher Order Linear differential equations and their applications: Linear differential equations of second and higher order with constant coefficients, RHS term of the type f(X)= e ax , Sin ax, Cos ax, and xn, e ax V(x), x n V(x), method of variation of parameters. Applications bending of beams, Electrical circuits, simple harmonic motion.

UNIT-III

Partial Differential Equations: solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations. Classification of second order linear Partial Differential Equations, solutions of one dimensional heat equation, wave equation and two-dimensional Laplaces equation under initial and boundary conditions

UNIT-IV

Applications of partial differential equations: Method of Seperation of Variables, Equation of Vibrating String, Solution of Wave Equation by Dalembert's Method, One Dimensional Heat flow, Two dimensional Heat flow, Equation of Heat flow in two Dimensions in polar Coordinates, Transmission Line Equations, Laplace Equation, Vibrating Membrane, Solution of Equation of the Vibrating Membrane.

UNIT-V

Laplace and Fourier Transforms and their applications: Laplace Transforms Properties. Solution of Differential Equations by Laplace Transforms, Electric Circuit, Solution of Simultaneous Differential Equations by Lapalce transforms, Solution of Partial differential equations by Laplace transforms. Fourier Transforms Properties and its application to solve initial and boundary value problems.

TEXT BOOKS

1. Engineering Mathematics-Koneru Sarveswara Rao Published by Orient BlackSwan/ Universities Press (2002)
2. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
3. Higher Engineering Mathematics – B.S. Grewal, Khanna Publications.

REFERENCE BOOKS

1. Advanced Engineering Mathematics by E. Kreyszig, John Wiley and Sons Publisher.
2. Engineering Mathematics by N. P. Bali, Lakshmi Publications.
3. A text Book of Engineering Mathematics, C. Sankaraiah, V. G. S. Book Links.
4. A text Book of Engineering Mathematics, Shahnaz Bathul, Right Publishers.

PHYSICS

PH088 - GLASS SCIENCE

Unit-1:

The non-crystalline solids & the glasses: Formation from liquid phase. Formation from a gaseous phase. Formation from a solid phase. Definition of glass. Vitreous transition. Phenomenological study.Thermodynamic study. Theory of vitreous transition. Determination of transition temperature

Unit-2:
Conditions of verification, Structural theory (Zachariasen model etc.) Kinetic theory of glass (Nucleation & Growth). Structure of Glass: XRD, SAXS and other methods of determining glass structure. Structural models of glass. Reaction mechanisms. Ion exchange & network breakdown processes. Glass durability controlling factors.

Unit-3:
Thermodynamic basis of phase separation in glasses, Immiscibility in glasses. Kinetics of demixing. Application of immiscibility diagrams. Spindale decomposition.

Density & Thermal expansion measurements
Density & Thermal expansion measurements & their implications and their dependence on compositions. Thermal history effects. Effect of crystallization. Additive rule.

Unit-4:
Diffusion in Glasses. Electrical conductivity of glasses, Dielectric properties. Optical properties of glasses. Refractive index, Molar volume & Ionic refractivity, Birefringence. Photosensitive/Photo chromic glasses

Unit-5:
Glass production, Basic processes of glass making, Batch process, Continuous process, Raw materials selection, Batch house & mixing, Batch transportation, Tank furnace, Batch feeding, Melting & refining, Bottle glass, Sheet glass, Other glasses, Annealing, Thermal treatment, Chemical treatment, Production control & planning

Text books:

1. Glasses and the Vitreous State **Author**: J. Zarzycki
2. Chemistry of Glasses **Author**: A. Paul
3. Handbook of Glasses **Author**: R. H. Doremus

Reference books:

1. Spectroscopy & Structure of Glasses **Author**: C. A. Angell
2. Handbook of Glass Manufacture **Author**: F.V. Tooley

3. Glass Engineering Handbook **Author**: E. B. Shand.
4. Handbook of Glass Properties **Author**: G. W. Morey
5. Handbook of Glasses **Author**: R. H. Doremus

BIOTECHNOLOGY

Course	Code	L	T	P	Cr
ADVANCED BIOPROCESS ENGINEERING	PH008	4	-	-	4
MACHINE LEARNING FOR BIOTECHNOLOGISTS	PH036	4	-	-	4
PLANT GENOMICS & BIOTECHNOLOGY	PH037	4	-	-	4
PLANT MOLECULAR BREEDING	PH041	4	-	-	4
BIOANALYTICAL TECHNIQUES	PH061	4	-	-	4
PHARMACEUTICAL SCIENCES	PH062	4	-	-	4
EXPERIMENTAL STUDIES ON CERTAIN SELECTED MAN GROVES SPECIES OF NIZAMPATNAM SANITARY	PH063	4	-	-	4
CLINICAL BIOTECHNOLOGY	PH064	4	-	-	4
MEDICAL BIOTECHNOLOGY	PH065	4	-	-	4
MOLECULAR GENETICS	PH066	4	-	-	4
METHOD DEVELOPMENT & VALIDATION FOR QUANTITATIVE ESTIMATION OF BIOACTIVE MOLECULES IN PHARMACETICAL DOSAGE FORMS & BIOLOGICAL SAMPLES	PH067	4	-	-	4
PHARMACOLOGICAL SCREENING OF INDIAN MEDICAL PLANTS FOR ANTI-MICROBIAL, ANTI-OXIDANT & ANTI-CANCER BIOLOGY	PH071	4	-	-	4
GENES, GENOMICS AND PROTEOMICS	PH266	4	-	-	4

ELECTRONICS & COMMUNICATION ENGINEERING

Course	Code	L	T	P	Cr
DIGITAL IMAGE PROCESSING	PH059	4	-	-	4
TRANSFORMS TECHNIQUES	PH081	4	-	-	4

ELECTRICAL & ELECTRONICS ENGINEERING

Course	Code	L	T	P	Cr
ADVANCED POWER SYSTEM PROTECTION	PH002	4	-	-	4
POWER SYSTEM AUTOMATION	PH028	4	-	-	4
POWER SYSTEM PLANNING AND RELIABILITY	PH029	4	-	-	4
SMART GRID	PH030	4	-	-	4
SOFT COMPUTING	PH031	4	-	-	4
ENERGY AUDITING AND MANAGEMENT SYSTEM	PH264	4	-	-	4

MECHANICAL ENGINEERING

Course	Code	L	T	P	Cr
COMPOSITE MATERIALS	PH033	4	-	-	4
POLYMER CHARACTERIZATION	PH048	4	-	-	4

MANAGEMENT SCIENCES

Course	Code	L	T	P	Cr
FINANCIAL MANAGEMENT	PH006	4	-	-	4
HUMAN RESOURCE MANAGEMENT	PH013	4	-	-	4
SECURITY ANALYSIS & PORTFOLIO MANAGEMENT	PH055	4	-	-	4

CHEMISTRY

Course	Code	L	T	P	Cr
INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS	PH038	4	-	-	4
SEPARATION METHODS & ANALYTICAL TECHNIQUES	PH039	4	-	-	4
RECENT ADVANCES IN MATERIAL CHEMISTRY	PH060	4	-	-	4
MANUFACTURING PROCESSES OF FIBER REINFORCED POLYMER COMPOSITES	PH068	4	-	-	4
CHARACTERIZATION OF FIBER REINFORCED POLYMER COMPOSITES	PH069	4	-	-	4
ADVANCED ORGANIC SYNTHESIS	PH072	4	-	-	4

FLAVANOIDS	PH076	4	-	-	4
PHARMACEUTICAL WASTE WARER TREATMENT TECHNIQUES	PH079	4	-	-	4
QUINONE ISOXAZOLE THIOPHENE HYBRIDS	PH080	4	-	-	4
HETERO CYCLES	PH268	4	-	-	4

CHEMICAL ENGINEERING

Course	Code	L	T	P	Cr
Advanced Chemical Process Equipment Design and Drawing	PH001	4	-	-	4
Advanced Process Dynamics and Control	PH003	4	-	-	4
Advanced Separation Processes	PH004	4	-	-	4
Advanced Transport Phenomena	PH005	4	-	-	4
Applied Numerical Methods	PH007	4	-	-	4
Chemical Process Equipment Design	PH009	4	-	-	4
Chemical Process Safety	PH010	4	-	-	4
Computational Methods	PH011	4	-	-	4
Energy Management	PH012	4	-	-	4
Enzyme and Microbial Technology	PH015	4	-	-	4
Fermentation Technology	PH016	4	-	-	4
Interfacial Science and Engineering	PH017	4	-	-	4
Mathematical Methods in Chemical Engineering	PH018	4	-	-	4
Membrane Technology	PH019	4	-	-	4
Modeling and Simulation of Chemical Processes	PH020	4	-	-	4
Optimization Techniques	PH021	4	-	-	4
Particulate Technology	PH022	4	-	-	4
Petroleum Refinery Processes	PH023	4	-	-	4
Polymer Engineering	PH024	4	-	-	4
Reaction Engineering and Reactor Design	PH025	4	-	-	4
MULTI VARIETY STATISTICS	PH073	4	-	-	4

Statistical Methods	PH263	4	-	-	4

MATHEMATICS

Course	Code	L	T	P	Cr
MULTI VARIATE STATISTICS	PH073	4	-	-	4
STATISTICAL METHODS	PH263	4	-	-	4

PHYSICS

Course	Code	L	T	P	Cr
VACUUM & THIN FILM TECHNOLOGY	PH040	4	-	-	4
CONDENSED MATTER PHYSICS & CHARACTERIZATION TECHNIQUES	PH074	4	-	-	4

BIOTECHNOLOGY

PH008- ADVANCED BIOPROCESS ENGINEERING

UNIT - I

KINETICS OF MICROBIAL GROWTH, STERILISATION AND PRODUCT FORMATION: Different modes of operation - batch, fed batch and continuous cultivation. Simple unstructured kinetic models for microbial growth- Monod model, Growth of filamentous organisms, Substrate and product inhibition on cell growth and product formation. Different types of industrial sterilization, Thermal death kinetics of microorganisms, Batch and continuous heat sterilization of liquid media, Filter sterilization of liquidmedia, Air sterilization and design of depth filters.

UNIT - II

METABOLIC STOICHIOMETRY AND ENERGETICS: Stoichiometry of cell growth and product formation, Elemental balances, degrees of reduction of substrate and biomass, Available electron balances, Yield coefficients of biomass and product formation, Maintenance coefficients energetic analysis of microbial growth and product formation, Oxygen consumption and heat evolution in aerobic cultures.

UNIT - III

BIOREACTOR OPERATION: Choosing the cultivationmethod, design and operation of a typical aseptic, aerobic fermentation process, Environmental requirements for animal cell cultivations, Reactors for large scale production using animal cell, plant cell cultivation, Active and Passive Immobilization of cells, Diffusional limitations in Immobilized cells, Bioreactorconsiderations in Immobilized cell.

UNIT - IV

TRANSPORT PHENOMENA IN BIOPROCESS SYSTEM: Gas – Liquid mass transfer in cellular systems, Determination of oxygen rates, Mass transfer for freely rising or falling bodies, Correlations formass transfer coefficient and interfacial area, Mass transfer across free surface, Other factors affecting K_La, Heat transfer correlations.

UNIT - V

MIXED CULTURE AND SOLID STATE FERMENTATION: Introduction, Major classes of interactions inmixed cultures, simple models describing mixed cultures interactions, Mixed cultures in nature and industrial utilization of mixed cultures, Solid-state fermentation.

TEXT BOOKS:

1. Shuler, M.L. and Kargi, F. "*Bioprocess Engineering – Basic concepts* – 2nd Ed., Prentice Hall of India Pvt. Ltd., 2005
2. Peter F. Stanbury, Stephen J. Hall & A. Whitaker, *Principles of Fermentation Technology,* 2nd ed., Butterworth – Heinemann anImprint of Elsevier India Pvt. Ltd., 2005.

REFERENCEBOOKS:

1. Bailey and Ollis, "Biochemical Engineering Fundamentals", 2nd Ed., McGrawHill, 1986.
2. Pauline M. Doran, "Bioprocess Engineering Calculation", Blackwell Scientific Publications.

PH036 – MACHINE LEARNING FOR BIOTECHNOLOGISTS

Unit-I : Introduction to the world of machine learning: What is ML; Problems, data, and tools; Visualization; Matlab

Unit – II : **Regression:** Linear regression; SSE; gradient descent; closed form; normal equations; features Overfitting and complexity; training, validation, test data

Unit – III: Unsupervised learning: clustering, k-means, hierarchical agglomeration, discussion on clustering and EM

Unit – IV : **Supervised learning:** Regression, Classification, Support vector machines and large-margin classifiers, Markov models; autoregressive models

Unit – IV: **Clustering:** k-means, adaptive hierarchical clustering, Gaussian mixture model.

TEXT BOOK:

1. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012. This book will cover all the material in the course.

REFERENCE BOOK:

- ✓ Stephen Marsland, Machine Learning: An Algorithmic Perspective. http://www.amazon.com/Machine-Learning-AlgorithmicPerspective%20Recognition/dp/1420067184%20.
- ✓ Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/en-us/um/people/cmbishop/prml/.
- ✓ Tom Mitchell, Machine Learning http://www.cs.cmu.edu/~tom/mlbook.html.

PH037 - PLANT GENOMICS & BIOTECHNOLOGY

UNIT 1 Plant Genomics

1.1 Plant nuclear genome- genome organization in plant nucleus, Plant organellar genomes - plastid and mitochondrial genomes

1.2 Plant epigenome –epigenomic reprogramming in gametogenesis and seed development in plants, endosperm imprinting, histone modifications in response to light, natural epigenome variation in plants, heterosis

1.3 Plant genome sequencing strategies- high-throughput sequencing technologies, single molecule and real time sequencing, assembly & alignment programs, genome browsers

1.4 Plant proteomics- high throughput approaches–mass spectrometry based proteomics

1.5 Plant metabolomics- analytical platforms–GC-MS, NMR, MALDI

UNIT 2 Plant Metabolic Engineering

2.1 Secondary metabolites-transport storage and turnover, ecological functions & uses of secondary metabolites in biotechnology

2.2 Terpenoids- synthesis of IPP, phenyltransferase and terpene synthase reactions, modification of terpenoid skeletons

2.3 Alkaloid biosynthesis– nicotine and tropane alkaloids, benzyl isoquinoline alkaloids, moneterpene indole alklaoids

2.4 Phenolic compounds – phenyl propanoid, phenyl propanoid-acetate pathways, Lignin& flavonoid biosynthesis

2.5 Coumarins – classification, simple coumarins and Furanocoumarins, stilbenes, styrylpyrones and arylpyrones

UNIT 3 Plant Cell Biotechnology

3.1 Introduction to plant cell culture – different plant tissue culture media, role of plant growth regulators in tissue culture

3.2 Plant cell culture technique- callus and cell suspension cultures; applications of plant cell cultures

3.3 Somatic embryogenesis – induction of somatic embryos, production and applications of synthetic seeds

3.4 Cryo-preservation- theoretical basis, methods and applications of cryo-preservation.

3.5 Plant secondary metabolites produced by cell cultures, strategies to improve secondary metabolite production in plant cell cultures –cell line selection, medium optimizations, permeabilization, elicitation, cell immobilization, biotransformation

UNIT 4

Transgenic Plants

4.1 Co-integrated vectors, binary vectors, novel and specialized vectors for transformation

4.2 Selectable markers (positive & negative selection), novel selection methods and restriction enzymes to control T-DNA integration; marker free transgenic technology; analysis of transgenic plants

4.3 Chloroplast transformation – advantages of chloroplast transformation; transplastomic plants -applications

4.4 Molecular farming- advantages of transgenic plants as bioreactors, expression systems, sub-cellular targeting, plant expression hosts, downstream processing & purification

4.5 Molecular farming for biopharmaceuticals – (plantibodies, plantigens, therapeutic proteins & edible vaccines)

Activities:

1. To isolate commercially important secondary metabolites.

2. To develop transgenic plants for stress tolerance.

PH041 - PLANT MOLECULAR BREEDING

UNIT 1Principles of Plant Breeding

1.1 Introduction to plant breeding: Domestication of crop plants – Centers of origin and diversity

1.2 Basic features of plant breeding, Objectives of plant breeding

1.3 Plant genetic resources and conservation strategies: Sources of plant genetics resources; Methods of germplasm conservation; Evaluation and utilization of plant genetic resources

1.4 Reproductive systems in plants: Sexual reproduction – self and cross fertilization – Autogamy, Allogamy and often cross pollinated plants; Asexual reproduction and Apomixis

1.5 Genetic basis of breeding: Mating systems of plants

UNIT 2 Plant Breeding Methodologies

2.1 Breeding Methods in self-pollinating crops: Pure line selection; Pedigree method; Bulk population methods; Single seed descent method; Back cross method and Multilines

2.2 Breeding methods in cross pollinating crops: Mass selection; Ear-torow selection; Progeny selection and Recurrent selection methods

2.3 Hybrid Breeding – Development and evaluation of inbred lines, A, B and R lines, Development of hybrids, male sterility systems

2.4 Mutation breeding: types of mutations – mutagenic agents: physical and chemical mutagens; Mutation breeding in seed crops and vegetative propagated crops – TILLING and EcoTILLING

2.5 Cultivar release - Seed certification and multiplication

UNIT 3 Specific Breeding Methods

3.1 Breeding for disease resistance: Genetics of pathogenicity, Genetics of disease resistance; Methods of breeding for disease resistance

3.2 Breeding for insect resistance: Mechanisms of insect resistance; Breeding methods for pest resistance

3.3 Breeding for abiotic stress tolerance - drought, salinity

3.4 Breeding for abiotic stress tolerance - cold stress tolerance, heat stress tolerance and flooding tolerance

3.5 Breeding for yield and morphological traits – ideotype concept, lodging and shattering resistance, photoperiod response, early maturity

UNIT 4 Biotechnological Approaches for Crop Improvement

4.1Introduction to plant cell-tissue culture: Cellular totipotency, factors affecting shoot bud differentiation; Plant tissue culture techniques in crop improvement - Micropropagation

4.2 Tissue culture applications; Haploids and di-haploids in breeding, Somaclonal variations and their role in crop improvement, Protoplast fusion in crop improvement and breeding, germplasm preservation

4.3 Transgenics in crop improvement: Gene transfer methods in plants, Production of transgenics for biotic and abiotic stress tolerance; Cisgenic approaches

4.4 Transgenic male-sterility systems and development of hybrids

4.5 Gene silencing: RNAi mechanism & its applications for crop improvement

PH061- BIO ANALYTICAL TECHNIQUES

UNIT - I

SPECTROSCOPY: Principle, instrumentation and application of Colorimeter, UV – Visible Spectrophotometer, IR spectrophotometer, Flourimeter, Flame photometer, x-ray spectroscopy, NMR spectroscopy.

UNIT - II

MICROSCOPY AND ELECTROPHORESIS: Basics of phase contrast, confocal and fluorescent microscopy; electron microscopy – SEM and TEM; Flow cytometry; Electrophoresis – principles, supporting materials-paper, starch, agarose, polyacrylamide types – gel and capillary electrophoresis; disc; Isoelectric focussing; immuno-electrophoresis; isotachophoresis.

UNIT – III

CHROMATOGRAPHY: Chromatography – principles; types - paper, thin layer, adsorption, ion-exchange, affinity, gel filtration, gas liquid and HPLC; GC-MS; Simulation moving bed.

UNIT - IV

RADIOACTIVE TECHNIQUES: Radioactive isotopes, radioactive decay and their types; principles of scintillation counting; isotope dilution technique; radioactive techniques-RIA; GM counter; Scintillation counter; Autoradiography; Applications in Medicine & Diagnosis; Radiation hazards and methods for containment and prevention.

UNIT – V

THERMO ANALYTICAL TECHNIQUES: Theory of thermal analysis; thermo gravimetric; Basic theory, construction and working of Differential Thermal Analysis (DTA); Differential Scanning Calorimeter (DSC).

TEXT BOOKS:

1. Willard and Merrit, “Instrumental Methods and Analysis” . 6th ed, CBS Publishers & Distributors.
2. Keith Wilson, Kenneth H. Goulding, “A Biologist Guide to Principles and Techniques of Practical Biochemistry”, 3rd ed., ELBS series.
3. Skoog and West, “Fundamentals of Analytical Chemistry”, 1982.

REFERENCE BOOKS:

1. Ewing GW, “Instrumental Methods of Chemical Analysis”, McGraw Hill Book Company, 1989.

Braun. H, “Introduction to Chemical Analysis”, McGrawHill, 1987.

PH062-PHARMACEUTICAL SCIENCES

UNIT-I

INTRODUCTION TO PHARMACEUTICALS: History & Definition of Drugs. Sources of Drugs - Plant, Animals, Microbes and Minerals, Routes of drug administration. Different dosage forms.

UNIT-II

BIO PHARMACEUTICS: Introduction, their role in formulation development & clinical settings, fate of drugs after administration. Drug absorption: drug absorption mechanisms, factors affecting drug absorption (physiochemical, biological, metabolic, formulations and dosage form considerations).

UNIT-III

DRUG DISTRIBUTION & PROTEIN BINDING OF DRUGS: Distribution of drug through organ /tissue - factors affecting distribution (Physicochemical properties of drugs, organ/tissue size, blood flow to the organ, physiological barriers to the distribution of drugs, drug binding blood / tissue / macromolecules). Protein /tissue binding of drugs- factors affecting protein binding of drugs, significance and kinetics, tissue binding of drugs.

UNIT-IV

DRUG METABOLISM & EXCRETION OF DRUGS: Biotransformation of drugs- drug metabolizing enzymes & organs, phase I & phase II reactions, factors affecting biotransformation, drug metabolism significance, Excretion of drugs - renal excretion of drug, factors affecting renal excretion of drugs, nonrenal routes of excretion of drug & factors affecting them, enterohepatic circulation.

UNIT-V

PHARMACOKINETICS: Introduction, basic concepts- rate processes in biological systems, Pharmacokinetics drug interaction and their significance in combination therapy. Clinical pharmacokinetics: dosage adjustment in patient with and without renal and hepatic failure.

TEXT BOOKS:

1. Brahmankar DM, Jaiswal SB Biopharmaceutics and pharmacokinetics. VallabhPrakashan Publishers 2015.
2. Ram I Mahato, Ajit S. Narang Pharmaceutical Dosage Forms and Drug Delivery, Second Edition CRC press 2011.
3. Katzung, Basic and clinical pharmacology 11th edition, Tata McGraw Hill edition, 2009.

REFERENCE BOOKS:

1. Sabine Globig and William Hunter Jr.Current Research in Pharmaceutical Technology 1st Edition Apple Academic Press 1st edition. 2011.
2. Rang and Dales, Pharmacology 6th edition, Churchhill living stone Elsevier Publiction, 2008.
3. KD Tripathi, Essentials of medical pharmacology 6th edition, Jaypee brothers Medical Publishers (P) Ltd, 2008.

PH063-EXPERIMENTAL STUDIES ON CERTAIN SELECTED MANGROVE SPECIES OF NIZAMPATNAM SANCTUARY

UNIT-1

Mangrove vegetation and niches of Indian sub-continent special emphasis of peninsular India.

UNIT-2

Estuaries and influence of mangrove vegetation with concern to the climate changes and its impacts.

UNIT-3

Research articles and literature sources of mangrove plant wealth.

UNIT-4

Ex-situ and *in-situ* conservation practices for mangrove restoration programmes.

UNIT-5

Govt. and non Govt.agencies and N.G.Os role to conservation and sustainable utilization of mangrove plant wealth.

TEXT BOOKS /REFERENCE BOOKS:

1. T. Ravi Shankar, L. Gnanappazham R. Ramasubramanian D. Sridhar M. NavamuniyammalV.SelvamAtlas of Mangrove Wetlands of India Part-2, Andhra Pradesh.(2002)

2. Forest Survey of India. 1999. Status of Forest Report, Ministry of Environment and Forest, Government of India, New Delhi.

3. Blasco, F. and Aizpura, M. 2002. Mangroves along the coastal stratch of the Bay of Bengal: Present status, IndianJournal of Marine Sciences, 9 - 20.

4. Mittal, R. 1993. Management plan for Coringa Wildlife Sanctuary, Forest Department, Government of Andhra Pradesh, Hyderabad.

5. Rangarao, V., Reddy, B. S. R., Raman, A. V.andRamana Murthy, M. V.2003. Oceanographic features of the Bay _ Mangrove water ways of Coringa, East coast of India, Proceedings of AP Akademy Sci., 135-142.

6. Reddy, B.S.R. and Prasad, K.V.S.R.1982. The sand spit near Kakinada - Further studies, Indian J Ear Sci., 9: 167 -173.

PH064-CLINICAL BIOTECHNOLOGY

UNIT-I

FUNDAMENTALS OF CARDIOVASCULAR DISEASE: Global burden of cardiovascular disease, cardiovascular disease in India, functional anatomy of heart, physiology of cardiovascular system, cardiac pathology

UNIT-II

CORONARY ARTERY DISEASES: Valvular Diseases, Dilated cardiomyopathy, restrictive & infiltrative cardiomyopathy, hypertrophic cardiomyopathy, Myocarditits and specific cardiomyopathies, Anti-platelet therapy.

UNIT-III

PHYSIOLOGY OF CARDIAC FUNCTION: Cardiac rate and rhythm, disturbances of cardiac rhythm, cardiac contraction, factors affecting cardiac function, drugs affecting cardiac function, cardiac hypertrophy and chronic heart failure in mice. Recording the effects of acetyl choline and non-adrenaline on the B.P and ECG of an anesthetized rat.

UNIT-IV

MOLECULAR TECHNIQUES: Purification of genomic DNA from living cells, Manipulation of purified DNA; Introduction of DNA into living cells - methods of Gene transfer, DNA methylation, DNA hybridization, DNA sequencing, DNA fingerprinting;

UNIT-V

EXPRESSION AND DETECTION OF CLONES: Cloning strategies, sequencing, DNA fingerprinting; Blot analysis- Southern, Northern, Western blot; dot and slot blot; PCR- Principles, designing of primers, methodology. Applications of PCR.

TEXT BOOKS :

1. T.A.Brown, "Gene Cloning & DNA analysis", 5th Ed., Blackwell, 2006.
2. Primrose SB, "Principles of Gene manipulation and Genomics", 5th edition, Blackwell Scientific Publications, 2006.
3. S.K.Kulkarni (2011), Hand book of experimental pharmacology, VallabhPrakashan publishers, 2011.

REFERENCE BOOKS:

1. David Friefelder, "Essentials of Molecular Biology", 7th ed., Narosa Publishing house, 2006.
2. Rang and Dales, Pharmacology 6th edition, Churchhill living stone Elsevier Publication, 2008.

PH065-MEDICAL BIOTECHNOLOGY

UNIT-I

INTRODUCTION TO THYROIDISM: Thyroid gland; Thyroid disorders-Hypothyroidism, Hyperthyroidism, TreatmentCongenital hypothyroidism; Hypothyroidism in infants; Hypothyroidism in children and teens; Complications of untreated hypothyroidism

UNIT-II

CONGENITAL HYPOTHYROIDISM: Screening for congenital hypothyroidism, Initial diagnosis, Interpreting results and starting treatment, Long term care of congenital hypothyroidism patients.

UNIT-III

GENE STRUCTURE AND MUTATIONS: Spontaneous and induced mutations; Selection of mutants-Ames test; Chromosomal aberrations; Fine structure of genes in prokaryotes and Eukaryotes; Genetic control of development in Drosophila.

UNIT-IV

MOLECULAR TECHNIQUES: Purification of genomic DNA from living cells, Manipulation of purified DNA; Introduction of DNA into living cells - methods of Gene transfer, DNA methylation, DNA hybridization

UNIT-V

EXPRESSION AND DETECTION OF CLONES: PCR- Principles, designing of primers, methodology, Applications of PCR. Cloning strategies, Sequencing, DNA fingerprinting; Blot analysis-Southern, Northern, Western blot; dot and slot blot.

TEXT BOOKS:

1. Werner and Ingbar Thyroid-A fundamental and clinical text. Tenth Edition 2012.
2. T.A.Brown, “Gene Cloning & DNA analysis”, 5th Ed., Blackwell, 2006.
3. Primrose SB, “Principles of Gene manipulation and Genomics”, 5th edition, Blackwell Scientific Publications, 2006.
4. P.K. Gupta, “Genetics”, 3rd ed., Rastogi Publications, 2005.

REFERENCE BOOKS:

1. David Friefelder, “Essentials of Molecular Biology”, 7th ed., Narosa Publishing house, 2006.
2. William H. Elliott and D.C. Ellioit, “Biochemistry & Molecular Biology”, 3rd ed., Oxford University Press, 2007.

PH066-MOLECULAR GENETICS

UNIT-I

GENERAL MICROBIOLOGY: Physical and chemical methods of sterilization techniques - Basic techniques for isolation, cultivation and enumeration of microorganisms – Staining of microorganisms – Microscopy-Collection, preservation and transportation of specimens for microbiological analysis – Structure, composition and functions of bacterial cell and its different components.

Unit-II

SYSTEMIC BACTERIOLOGY: Systematic study of taxonomic position, distribution, morphology and staining characters, growth requirements and characteristics, antigenic structure, virulence factors, pathogenecity, diagnosis, immunity and control of with respect to the gram positive and gram negative anaerobic organisms.

UNIT-III

BACTERIAL GENETICS: Bacterial growth; measurement of bacterial growth, bacterial growth curve-Maintenance and preservation of bacteria. Stock culture collections; Preservation methods; Short and long term preservation at low temperatures Cryopreservation and freeze drying. Gene transfer mechanisms – conjugation, transformation, transduction, Plasmids, transposons, cosmids, insertion sequences, and Recombinant DNA technology -Antimicrobial agents: Classes of antimicrobials and mechanism of action.

UNIT-IV

MOLECULAR BIOLOGY: DNA replication in prokaryotic and eukaryotic cells — Isolation and purification of DNA/RNA from prokaryote Types and function of DNA polymerases Principle and applications of molecular diagnostic tests: PCR and its types, application of PCR-Gel electrophoresis: Agarose and PAGE –native PAGE, SDS-PAGE –genomic DNA Preparation – DNA Sequencing techniques.

UNIT-V

GENETIC ENGINEERING/RECOMBINANT DNA TECHNOLOGY: Restriction endonucleases-cloning and expression vectors, plasmids, cosmids, phages – shuttle vectors – cloning and expression in prokaryotic and eukaryotic hosts –screening and characterization of DNA clones, transformation of bacterial and animal cells- oligonucleotide synthesis-DNA markers and their applications. Biotechnological approaches for disease diagnosis - safety aspects of genetic engineering – ethical issues related to use of biotechnology products – patenting and intellectual property rights.

TEXT BOOKS/REFERENCE BOOKS:-

1. S.Ram Reddy et al, "A Text book of Molecular bio-technology", Himalaya Publishing House, 1sted. New Delhi, India, Himalaya pub. House, 2007.

2. Keith Wilson and John Walker, “Essentials of bio-chemistry”, Cambridge University press, 5thed, UK.

3. Joanne Willey et al, “A text Book of Prescott Microbiology”, McGraw Hill, 9thed, 2014, PP.1 to 1014.

4. Mark.L.Wheelis, Principles of Modern Microbiology,1st ed,2008.

5. Jeffrey C.Pammerville, Alcamo’s Fundamentals of Microbiology, Jones and Bartlett publishers, Sudbury, 7thed, 2008.

6. B.K.khontia, Basic Microbiology- An illustrated lab manual, Daya publishing Housing, Delhi, 1sted, 2011.

7. Jacquelyn.G.Black, Microbiology-Principles and explorations, Jhon Wiles & Sons, Inc9van Hoffmann press0, USA, 6thed, 2013.

8. Stuart Hogg, essential Microbiology, Wiley and Blackwell, 2nded, 2013.

9. Sambrook and Russell, Molecular cloning-A Laboratory manual, cold spring harbor laboratory press, 3rded, NewYork,Vol.1,2 & 3,2001 PP.1.1-18.136.

PH067-METHOD DEVELOPMENT & VALIDATION FOR QUANTITATIVE ESTIMATION OF BIOACTIVE MOLECULES IN PHARMACETICAL DOSAGE FORMS & BIOLOGICAL SAMPLES

UNIT I

MEDICINAL & AROMATIC PLANTS

Indian System of Medicine, Medicinal & Aromatic Plants in India, Basic principles of plant taxonomy, Agronomic features, Description of at least 10 plants species. Database on medicinal plants. Traditional knowledge and digital library.

UNIT II

PHYTOCHEMICAL SCREENING AND ISOLATION

Phytochemicals- Classification and types: Alkaloid, Flavonoid, Polyphenol, Tannin, Terpenoid and Saponin. Preparation of crude extracts and essential oils. Plant Tissue Culture techniques to enhance secondary metabolite production.

UNIT III

PHYTOCHEMICALS CHARACTERIZATION

Qualitative and quantitative identification and characterization methods for crude drugs and active phyto compounds: TLC, HPTLC, Column Chromatography, UV-Vis, FTIR, GCMS, LCMS, and NMR, QSAR and molecular docking.

UNIT IV

APPLICATIONS OF PHYTOCHEMICALS AND NATURAL PRODUCTS

Antimicrobial,antioxidant, anti-inflammatory, antiulcer, antidiabetic, anti-cancer, antihypertensive, hepatoprotective, wound healing and immunomodulatory phytochemicals. Biocides, biofungicides and biopesticides. Nutraceuticals. Cosmetic products.

UNIT V

IPR AND TYPICAL EXAMPLES OF PHYTODRUGS

Definition of the terms: Patent, IPR, Breeder's right, Bioprospecting and Bio piracy. A few examples of phytodrugs and their mode of action: Andrographolide, Vinblastine, Vincristine, Curcumin, Asiaticoside, Cinnamaldehyde, Anthocyanins, Ferulic acid, Kaempferol, Morindin.

Books:

1) P.C. Trivedi (2009) Indian Medicinal Plants, Vedic Books, New Delhi, ISBN: ISBN:9788179102787.

2) Dr. Biren Shah (2019) Pharmacognosy and Phytochemistry, free ebooks publisher.

PHBT032-PHARMACOLOGICAL SCREENING OF INDIAN MEDICAL PLANTS FOR ANTI-MICROBIAL,ANTI-OXIDANT & AMP; ANTI-CANCER BIOLOGY

UNIT I

MEDICINAL & AROMATIC PLANTS -

Indian System of Medicine, Medicinal & Aromatic Plants in India, Basic principles of plant taxonomy, Agronomic features, Description of at least 10 plants species. Database on medicinal plants. Traditional knowledge and digital library.

UNIT II

PHYTOCHEMICAL SCREENING AND ISOLATION -

Phytochemicals- Classification and types: Alkaloid, Flavonoid, Polyphenol, Tannin, Terpenoid and Saponin. Preparation of crude extracts and essential oils. Plant Tissue Culture techniques to enhance secondary metabolite production.

UNIT III

PHYTOCHEMICALS CHARACTERIZATION

Qualitative and quantitative identification and characterization methods for crude drugs and active phyto compounds: TLC, HPTLC, Column Chromatography, UV-Vis, FTIR, GCMS, LCMS, and NMR, QSAR and molecular docking.

UNIT IV

APPLICATIONS OF PHYTOCHEMICALS AND NATURAL PRODUCTS

Antimicrobial, antioxidant, anti-inflammatory, antiulcer, antidiabetic, anti-cancer, antihypertensive, hepatoprotective, wound healing and immunomodulatory phytochemicals. Biocides, biofungicides and biopesticides. Nutraceuticals. Cosmetic products.

UNIT V

IPR AND TYPICAL EXAMPLES OF PHYTODRUGS

Definition of the terms: Patent, IPR, Breeder's right, Bioprospecting and Bio piracy. A few examples of phytodrugs and their mode of action: Andrographolide, Vinblastine, Vincristine, Curcumin, Asiaticoside, Cinnamaldehyde, Anthocyanins, Ferulic acid, Kaempferol, Morindin.

Books:

1) P.C. Trivedi (2009) Indian Medicinal Plants, Vedic Books, New Delhi, ISBN: ISBN:9788179102787.

2)Dr. Biren Shah (2019) Pharmacognosy and Phytochemistry, free ebooks publisher.

PH266 - GENES, GENOMICS & PROTEOMICS

UNIT I

Introduction to Genes and Genomics: Definition of gene, genome, trancriptome and proteome; Organization and structure of genomes; Genome size; Sequence complexity; Introns and Exons; Isolation of Chromosomes; chromosome micro dissection and its applications.

UNIT II

Gene Identification and Expression: Genome annotation; Traditional routes of gene identification; Open-reading Frame definition and it's detection; Identifying the function of a new gene; Gene ontology; Global expression profiling; Traditional approaches to expression profiling.

UNIT III

Analysis of Proteomics: Introduction to Proteomics; Mining proteomes; Bridging Genomics and Proteomics; Analysis of proteomes – SDS-PAGE; Detecting proteins in Polyacrylamide gels; Two-dimensional polyacrylamide gel electrophoresis- Procedure, Image analysis of 2-DE gels; Mass spectrometry.

UNIT IV

Analysis of Genomics: Micro array techniques- Types of micro arrays, Designing a microarray experiment, Applications of Microarray Technology, Chip array, Shotgun method**.**

UNIT V

Applications of Genomics and Proteomics: Insights from genome sequencing of various species; Applications of proteome analysis; Applications of Proteomics.

TEXT BOOKS:

1. S. B. Primrose and R.M. Twyman "Principles of Genome Analysis and Genomics", 7th Edition, Blackwell Publishing, 2006.
2. S. Sahai, "Genomics and Proteomics, Functional and Computational Aspects" Plenum Publication, 1999.

REFERENCE BOOKS:

1. Andrezej K Konopka and James C. Crabbe, "Compact Hand Book – Computational Biology", Marcel Dekker, USA, 2004.
2. Pennington & Dunn, "Proteomics from Protein Sequence to Function", 1 st edition, Academic Press, San Diego, 1996.

ELECTRONICS & COMMUNICATION ENGINEERING

PH059 - DIGITAL IMAGE PROCESSING

UNIT-I

FUNDAMENTALS STEPS OF IMAGE PROCESSING: Components of an Image processing system, Image sampling and quantization, relationship between the pixels. Gray level transformation, Histo-gram processing, Smoothing and sharpening spatial filters, Smoothing and sharpening fre-quency domain filters.

UNIT-II

IMAGE COMPRESSION AND SEGMENTATION: Compression models, Error free coding, lossy coding, compression standards. Image segmentation: Edge linking and boundary detection, Thresholding, Region based segmentation.

UNIT-III

VIDEO REPRESENTATION: Video formation, perception and representation: Color perception and specification, Video capture and display, Analog video raster, Analog color TV systems, Digital Video Sampling: Basics of lattice theory, sampling over lattice, Sampling of video signals, filtering operations, Conversion of signals sampled on different lattices, Sampling rate conver-sion of video signals.

UNIT-IV

VIDEO MODELING: Camera model, illumination model, object model. Scene model, Two dimen-sional motion models 2-D motion estimation: Optical flow, General methodologies, Pixel based motion estimation, Block matching algorithm, Mesh-based motion estimation, Global motion estimation. Application of motion estimation in video coding.

UNIT-V

VIDEO CODING: Information theory, binary encoding, Scalar quantization, Vector quantization, Wave- form based video coding: Block based transform coding, Predictive coding, Object based scalability, and Wavelet Transform based coding.

TEXTBOOKS:

1. Digital Image Processing 3e by Rafael C. Gonzalez Richard E. Woods Pearson Education India; Third edition (23 June 2016).

2. Video Processing and Communications (Prentice-Hall Signal Processing Series) by Yao Wang JornOstermannYa-Qin Zhang Pearson (27 September 2001).

REFERENCEBOOKS:

1. Digital Video Processing (Prentice-Hall Signal Processing Series) by A. Murat Tekalp Prentice Hall; 2 edition (18 June 2015).

2. Handbook of Image and Video Processing (Communications, Networking and Multimedia) 2nd ,Kindle Edition by Alan C. Bovik Academic Press; 2 edition (21 July 2010).

PH081 – TRANSFORM TECHNIQUES

UNIT -I : Fourier Analysis:Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -II : Transforms:Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT,– definition, properties and applications

UNIT -III : Continuous Wavelet Transform (CWT):Short comings of STFT, Need for wavelets, Wavelet Basis Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation-Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV : Multi Rate Analysis and DWT:Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V : Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Biorthogonal basis-BSplines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS: 1. Raghuveer M.Rao and Ajit S. Bopardikar, “Wavelet Transforms-Introduction theory and applications” Pearson Edu, Asia, New Delhi, 2003. 2. Soman. K. P, Ramachandran. K.I, “Insight into Wavelets from Theory to Practice” Printice Hall India, 1st Edition, 2004. REFERENCE BOOKS: 1. Jaideva C Goswami, Andrew K Chan, “Fundamentals of Wavelets- Theory, Algorithms and Applications” John Wiley & Sons, Inc, Singapore, 1999. 2. Vetterli M. Kovacevic, “Wavelets and Sub-band Coding”, PJI, 1995. 3. C. Sydney Burrus, “Introduction to Wavelets and Wavelet Transforms”, PHI, 1st Edition, 1997. 4. Stephen G. Mallat,v, ”A Wavelet Tour of Signal Processing” , Academic Press, 2nd Edition 5. S.Jayaraman, S.Esakkirajan, T.Veera Kumar, “Digital Image Processing” , TMH, 2009.

ELECTRICAL & ELECTRONIC ENGINEERING

PH002- ADVANCED POWER SYSTEM PROTECTION

UNIT-1

Static Relays classification and Tools

Comparison of Static with Electromagnetic Relays, Basic classification, Level detectors and Amplitude and phase Comparators – Duality – Basic Tools – Schmitt Trigger Circuit,Multivibrators, Square wave Generation – Polarity detector – Zero crossing detector – Thyristor and UJT Triggering Circuits. Phase sequence Filters – Speed and reliability of static relays.

UNIT-2

Amplitude and Phase Comparators (2 Input)

Generalized equationsfor Amplitude and Phase comparison – Derivation of different characteristicsof relays – Rectifier Bridge circulating and opposed voltage type amplitude

Comparators – Averaging & phase splitting type amplitude comparators –Principle of sampling comparators.

UNIT-3

Static over current (OC) relays

Instantaneous, Definite time, Inversetime OC Relays, static distance relays, static directional relays, static differentialrelays, measurement of sequence impedances in distance relays, multi inputcomparators, elliptic & hyperbolic characteristics, switched distance schemes,

Impedance characteristics during Faults and Power Swings

UNIT-4

Carrier plot protection scheme

Carrier current protection schemes,relative merits & demerits, carrier aided distance protection schemes, transferschemes, blocking scheme and acceleration schemes.

Differential relay Principle and characteristics, mal-operation of differential relay,protection of transformers, protection of generators.

UNIT-5

Numerical Protection

Introduction, numerical relay, numerical relayingalgorithms, mann-morrison technique, Differential equation technique, discretefourier transform technique, odeling zed harr transform technique, wavelettransform technique, numerical overcurrent protection , numerical distanceprotection , numerical differential protection.

TEXT BOOKS

1. W. A. Almore, “Protective Relaying Theory and Applications,” Marcel Dekker Inc; New York, 1994.
2. J. L. Blackburn, “Applied Protective Relaying,” Westinghouse Electric Corporation, New York, 1982.
3. Van C. Warrington A. R. “Protective Relays: Their Theory and Practice,”, Vol 1, Chapman & Hall Ltd, London, 1962

REFERENCEBOOKS

1.Bhavesh Bhalja, R. P. Maheshwari and N. G. Chothani, “Protection and Switchgear,” Oxford University Press, New Delhi, India, 2011.

2. P. M. Anderson, Power System Protection, IEEE Press, New York, 1999.
3. A. T. Johns and S. K. Salman, “Digital Protection for Power Systems,” Peter Peregrinus Ltd, UK, 1995.
4. S. H. Horowitz and A. G. Phadke, “Power System Relaying,” John Wiley & Sons, New York, 1996.
4. A. G. Phadke and J. S. Thorp, “Computer Relaying for Power Systems,” Research study press Ltd, John Wiley & Sons, Taunton, UK, 1988.

PH028 - POWER SYSTME AUTOMATION

UNIT-1
INTRODUCTION TO SCADA
Evolution of Automation systems, History of Power system Automation, Supervisory Control and Data Acquisition (SCADA) Systems, Components of SCADA systems, SCADA applications, SCADA in power systems, SCADA basic functions, SCADA application functions in Generation, Transmission and Distribution.

UNIT-2
SCADA SYSTEM COMPONENTS
Advantages of SCADA in Power Systems, The Power system 'Field', Types of data &signals in the Power system, Flow of Data from the field to the SCADA Control center. Building blocks of SCADA systems, Classification of SCADA systems.

UNIT- 3
FEATURES OF RTU
Remote Terminal Unit (RTU), Evolution of RTUs, Components of RTU, Communication, Logic, Termination and Test/HMI Subsystems, Power supplies, Advanced RTU Functionalities.

UNIT-4
COMMUNICATION SYSTEM STANDARDS FOR SCADA
Intelligent Electronic Devices (IEDs), Evolution of IEDs, IED functional block diagram, The hardware and software architecture of IED, IED Communication subsystem, IED advanced functionalities, Typical IEDs, Data Concentrators and Merging Units, SCADA Communication Systems.

UNIT-5
FEATURES OF HMI
Master Station, Master station software and hardware configurations, Server systems in the master station, Small, medium and large master station configurations, Global Positioning Systems, Master station performance, Human Machine Interface (HMI), HMI components, Software functionalities, Situational awareness, Case studies in SCADA.

TEXT BOOKS
1. Mini S. Thomas, John D McDonald, Power Systems SCADA and Smart Grid, CRC Press, Taylor and Francis, 2015.
2. Electric Power Substation Engineering John D. Mc Donald CRC Press, Taylor and Francis, 2012.

REFERENCE BOOKS
1.Control and Automation of Electrical Power Distribution systems, James North cote- Green, R Wilson, CRC Press, Taylor and Francis, 2006.
2.Electric Power Distribution, Automation, Protection and Control, James Momoh, CRC press, Taylor and Francis, 2008.
3. Biswarup Das, Power Distribution Automation, IET, 2016.

PH029 – POWER SYSTEM PLANNING AND RELIABILITY

UNIT-1
PLANNING AND FORECASTING
Objectives of planning – Long and short term planning - Load forecasting – characteristics of loads – methodology of forecasting – energy forecasting – peak demand forecasting – total forecasting – annual and monthly peak demand forecasting.

UNIT-2
CONCEPTS OF RELIABILITY AND RELIABILITY IN GENERATION
Reliability concepts – exponential distributions – meantime to failure – series and parallel system – MARKOV process – recursive technique. Generator system reliability analysis – probability models for generators unit and loads – reliability analysis of isolated and interconnected system – generator system cost analysis.

UNIT-3
TRANSMISSION SYSTEM AND RELIABILITY ANALYSIS
Transmission system reliability model analysis – average interruption rate - LOLP method - frequency and duration method - Sub transmission lines and distribution substations- -Design primary and secondary systems .

UNIT- 4
INTERCONNECTED SYSTEMS
Two plant single load system - two plant two load system - load forecasting uncertainty - Interconnections benefits- Introduction to system modes of failure – the loss of load approach – frequency & duration approach.

UNIT- 5
EXPANSION PLANNING
Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system

TEXT BOOKS

1.Sullivan, R.L., 'Power System Planning', Heber Hill, 1987.Digitized 5 August 2011
2.Roy Billington,Ronald L Allan, 'Reliability Evaluation of Power System', Springer USA , 1996
3.*Eodrenyi, J., 'Reliability Modeling in Electric Power System' John Wiley, 1980.*

REFERENCE BOOKS

1. X. Wang & J.R. McDonald, "Modern Power System Planning", McGraw Hill Book Company,1994.
2. Pabla, A.S., Electric Power Distribution, Tata McGraw−Hill (2008)
3. Roy Billington, 'Power System Reliability Evaluation', Gordan& Breach Scain Publishers,1990

PH030- SMAR GRIDS

UNIT- 1
INTRODUCTION TO SMART GRID
Introduction - Evolution of Electric Grid, Smart Grid Concept - Definitions and Need for Smart Grid – Functions – Opportunities – Benefits and challenges, Difference between conventional & Smart Grid, Technology Drivers

UNIT-2
ENERGY MANAGEMENT SYSTEM
Energy Management System (EMS) - Smart substations - Substation Automation - Feeder Automation, SCADA – Remote Terminal Unit – Intelligent Electronic Devices – Protocols, Phasor Measurement Unit – Wide area monitoring protection and control, Smart integration of energy resources – Renewable, intermittent power sources – Energy Storage.

UNIT- 3
DISTRIBUTION MANAGEMENT SYSTEM
Distribution Management System (DMS) – Volt / VAR control – Fault Detection, Isolation and Service Restoration, Network Reconfiguration, Outage management System, Customer Information System, Geographical Information System, Effect of Plug in Hybrid Electric Vehicles

UNIT-4
SMART METERS
Introduction to Smart Meters – Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives, Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing, Peak Time Pricing.

UNIT-5
COMMUNICATION NETWORKS & IOT
Elements of communication and networking – architectures, standards, PLC, Zigbee, GSM, BPL, Local Area Network (LAN) - House Area Network (HAN) - Wide Area Network (WAN) - Broadband over Power line (BPL) - IP based Protocols - Basics of Web Service and CLOUD Computing, Cyber Security for Smart Grid.

TEXT BOOKS
1.JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, 'Smart Grid: Technology and Applications', Wiley, 2012
2.StuartBorlase 'Smart Grid: Infrastructure, Technology and Solutions', CRC Press 2012.

REFERENCE BOOKS
1. Mini S. Thomas, John D McDonald, 'Power System SCADA and Smart Grids', CRC Press, 2015
2. Kenneth C.Budka, Jayant G. Deshpande, Marina Thottan, 'Communication Networks for Smart Grids', Springer, 2014.

PH031 – SOFT COMPUTING

UNIT-1
Fundamentals of optimization techniques
Definition-Classification of optimization problems-Unconstrained and Constrained optimization-Optimality conditions-Classical Optimization techniques (Lamda Iteration method, linear programming, Quadratic programming). Brief introduction to lamda iteration method, formulate the Lagrange function, Lamda iteration method to solve Optimal dispatch problem. Introduction to quadratic programming, Working principle, sequential programming, linear constrained optimization problem.

UNIT- 2
Linear programming
Examples of linear programming problem, The Simplex Method I, Fundamental theorem of linear programming, Weak and strong duality theorems, Integer programming, Network flow, develop a linear programming model from problem description.

UNIT-3
Genetic Algorithm
Introduction to genetic Algorithm, working principle, Principles of Genetic Algorithm- Evolutionary Strategy and Evolutionary Programming-Genetic Operators-Selection, Crossover and Mutation fitness function. GA operators; Similarities and differences between GA and traditional methods; Unconstrained and constrained optimization using Genetic Algorithm.

UNIT-4
Particle Swarm Optimization
Fundamental principle-Velocity Updating-Advanced operators-Parameter selection- Hybrid approaches (Hybrid of GA and PSO, Hybrid of EP and PSO) -Binary, discrete and combinatorial

UNIT-5
Differential Evolution
Fundamental principle, developing DE based solution techniques for OPF problems with single and multiple objectives and comparing the performance and computational effectiveness of DE with other evolutionary and conventional techniques.

REFERENCE BOOKS

1. S.S.Rao, Engineering Optimization, 3rd Edition, New Age International (P) Ltd.
2. Soft computing Technique and its application in electrical Engineering by Chaturvedi,
3. An Introduction to Optimization, 3rd Edition by K.P. Chong, Stanislaw H. Zak.

PH264 – ENERGY AUDITING AND MANAGEMENT SYSTEM

UNIT-1
INTRODUCTION
Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting-energy audit process.

UNIT-2
ENERGY COST AND LOAD MANAGEMENT
Important concepts in an economic analysis - Economic models-Time value of money- Utility rate structures- cost of electricity-Loss evaluation- Load management: Demand control techniques-Utility monitoring and control system-HVAC and energy management-Economic justification.

UNIT-3
ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT
Energy efficient motors , factors affecting efficiency, loss distribution , constructional details , characteristics - variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring-motor energy audit. Transformer Loading/Efficiency analysis, Feeder/cable loss evaluation, case study. Reactive Power management-Capacitor Sizing-Degree of Compensation-Capacitor losses-Location-Placement-Maintenance

UNIT- 4
METERING FOR ENERGY MANAGEMENT
Relationships between parameters-Units of measure-Typical cost factors- Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters – Metering location vs. requirements

UNIT-5
LIGHTING SYSTEMS & COGENERATION
Concept of lighting systems - The task and the working space -Light sources - Ballasts –Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards
Cogeneration: Forms of cogeneration - feasibility of cogeneration- Electrical interconnection.

TEXT BOOKS
1. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
2. Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann publications. 2016

REFERENCE BOOKS
1. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995
2. Energy management by Paul o’ Callaghan, Mc-graw Hill Book company-1st edition, 1998.

MECHANICAL ENGINEERING

PH033 – COMPOSITE MATERIALS

Unit — I: Basic concepts and characteristics: Geometric and Physical definitions, natural and man-made composites. Acrospace and structural applications, types and classification of composites,

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. **Particulate composites, Polymer** composites, Thermoplastics, Therrnosetts, Metal matrix and ceramic composites.

Unit—II

Manufacturing methods: Autoclave, tape production, molding methods, filament winding, man layup. pultrusion. **RTM,**

Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties_

Unit — III Coordinate transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical **examples of** stress strain transformation, Graphic interpretation of stress strain relations. Off -axis, stiffness modulus, off - axis compliance,

Elastic behavior of unidirectional composites: Elastic constants of lamina, relationship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

Unit **IV Strength of unidirectional lamina:** Micro mechanics of failure. Failure mechanisms, Strength of an orthotropic lamina, Strength of a lamina tinder tension and shear maximum stress and strain criteria, application to design.

Unit — V Analysis of laminated composite plates: Introduction, thin plate theory, specially orthotropic plate, cross and angle pLy laminated plates, problems using thin plate theory.
Reference Books:

1, Mechanics of Composite Materials/ R.. M. Jones/ Mc Draw **Hill** Company, New **York, 1975,**

2. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.

3, Analysis and performance of fibre Composites/ B. D. Agarvcial and L, **J.** Broutman/ Wiley -Inter-science, New York, 1980.

4. Mechanics of Composite Materials/ Second Edition (Mechanical Engineering)/ Autar K. Kaw Publisher: CRC

. Analysis of Laminated Composite Structures/ L. R. Calcote/ Van NostrandRainfold, New York, 1969.

6+ Advanced Mechanics of Composite Materials/ Vasiliev&MorozoviElsevier/Second Edition

PH048-POLYMER CHARACTERIZATION

UNIT I : STANDARDS AND SPECIMEN PREPARATION
Standards - BIS, ASTM, ISO, specifications and their importance with reference to polymer Preparation of test specimen by various techniques for thermoplastics, thermo sets, and elastomers conditioning and test atmospheres- Analytical tests: determination of specific gravity, density by density gradient method, bulk density, moisture absorption, particle size analysis.

UNIT II : MECHANICAL PROPERTIES
Tensile, compression, flexural, shear, tear, impact, abrasion, hardness, Creep and stress relaxation, fatigue. Friction and wear-abrasion testfatigue-burst strength-and folding endurance.

UNIT III : THERMAL AND RHEOLOGICAL PROPERTIES
Transition temperatures, Vicat softening temperature, heat distortion temperature, coefficient of expansion, specific heat, thermal conductivity, shrinkage, brittleness temperature, thermal stability, and flammability, melt flow index, Viscosity (Rotational viscometer, MDR, capillary rheometer, and torque rheometer) , DSC, TGA, DTG, etc

UNIT –IV : MORPHOLOGICAL PROPERTIES
Microscopy techniques. Electron microscopy: scanning electron microscopy (SEM), transmission electron microscopy (TEM). Scanning probe microscopy: atomic force microscopy (AFM),scanning tunneling microscopy (STM). Optical spectroscopy: UVVisible spectroscopy, Fourier Transform infrared (FTIR) spectroscopy, Raman spectroscopy.

UNIT –VOPTICAL&ELECTRICAL PROPERTIES
Optical Properties– Refractive index – light transmission – haze – clarity – gloss –colour guard and microscope.
Electrical properties- Effect of polymer structure , Insulation resistance-power factorpermittivitydielectric
strength-tracking resistance-arc resistance and antistatic test.

TEXT BOOKS:
1. Vishu Shah, "Handbook of Plastics Testing Technology", John Wiley, NY, 1998.
2. ASTM: 8.01 & 8.04; 9.01 & 9.02,2000
REFERENCES: 1. Testing of Polymers, interscience, New York, 1965.
2. G. C. Ives & J. A. Mead, and N. M. Riley "Handbook of Plastics Test Methods", ILIFEE, London, 1971
3. Roger P. Brown, "Physical Testing of Rubber", interscience, New York, 1966.
4. Nicholas P.Cheremisinoff, "Product Design and Testing of Polymeric Materials", Marcel Dekker, inc, New York, 1990

MANGEMENT SCIENCES

PH006 - FINANCIAL MANAGEMENT

UNIT - I

Perspectives on Financial Management: Finance Function & Inter linkages with other functions. Objective of the finance Function, Investment, Financing and dividend, firm value maximization, Agency Problems, Time value of Money.

UNIT - II

Capital Budgeting Decisions: Investment Appraisal Methods- NPV and other techniques.
Fundamentals of Capital Budgeting- Forecasting earnings, Risk Analysis in capital Budgeting.

UNIT - III

Working capital management: Cash cycle, operating cycle, estimation, Factors affecting working capital, Types of working capital- Inventory management, Cash Management.

UNIT - IV

Capital Structure: Cost of Capital- Component cost of capital and WACC. Capital structure and impact on firm value- MM Hypothesis with and without taxes, traditional models.

UNIT - V

Dividend Policy: Forms of dividend, Theories of dividend, Dividend payout theories and comparison of dividends versus buy backs.

TEXT BOOK:

1. Ross, Westerfield and Jaffe and Kakani (RWJK) Corporate Finance, 10/e, 2014,Tata Mc Graw Hill.

REFERENCE BOOKS:

1. Michael C Ehrhardt and Eugene F Brigham, Corporate Finance- A Focused Approach, Cengae Learning, 5/e, 2013.
2. Rajiv Srivastava and Anil Misra, Financial Management, Oxford University Press, 2/e, 2011
3. I.M.Pandey, Financial Management (10th edition), Vikas Publishing 2011.
4. Anthony, Hawkins and Merchant, Accounting: Text & Cases, 13/e, 2010.

PH013- HUMAN RESOURCE MANAGEMENT

UNIT - I

Introduction, HRM at work - The Changing Environment and Changing Role of HRM - The HR Manger's Proficiencies - Labor Legislations in India - Equal Employment Opportunity, HR Process Outsourcing - Disruptive HRM - Business HR - Employee Engagement.

UNIT - II

Job Analysis: Basics, Methods - Writing Job Descriptions and Job Specifications - The Recruitment and Selection Process: Planning and Forecasting - Effective Recruiting, Internal and External Sources of Candidates, Developing and Using Application Forms - e-Recruitment: Use of social media - Recruitment Process Outsourcing.

UNIT - III

Selection: Importance, Assessment Centre, Types of Testing, Work Samples and Simulations - Background Investigation and other Selection Methods - Basic Features of Interviews - What can Undermine and Interview's Usefulness, Designing and Conducting an Effective Interview - Orientation: Purpose, Process - Training: Process - Training Methods - Management Development, Evaluating the Training Effort.

UNIT - IV

Basic Concepts in Performance Management, Introduction to Appraising Performance – Steps and Methods in Performance Appraisal – Appraising Performance: Problems and Solutions, The Appraisal Interview – Career Management, Career Planning and Career Development – Managing Promotions and Transfers.

UNIT - V

Factors Determining Pay, Establishing Pay Rates- Payroll Management – Competency Based Pay and other Compensation Trends – Incentives: Individual, Group and Organizationwide Plans – Employee Benefits – Employee Relations – Collective Bargaining Process - Handling Grievances – Trends in HR: HR Metrics, HR Analytics.

TEXT BOOK:

1. Dessler, Varkkey: Human Resource Management, 12/e, Pearson Education India, 2014.

REFERENCE BOOKS:

1. Armstrong, Taylor: Armstrong's Handbook of Human Resource Management Practice, 13/e, Kogan Page, 2014.

2. Decenzo, Robbins: Fundamentals of Human Resource Management, 11/e Wiley, 2013.

PH055- SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

UNIT - I
The Investment Environment, Financial Instruments, Markets for investments and Trading.

UNIT - II
Risk and Return calculation, Efficient markets: concepts and forms of market efficiency, testing market efficiency. Economic analysis, Industry Analysis, company Analysis, Technical Analysis.

UNIT - III
Introduction to portfolio management, Portfolio selection and Markowitz portfolio theory, Index models, capital Asset pricing Model.

UNIT - IV
Equity Analysis and valuations, introduction to Bond Analysis, Bond pricing and yield, Bond pricing theories.

UNIT - V
Portfolio performance evaluation-Forecasting portfolio performance.

TEXT BOOKS:
1. Investments by Bodie, Kane, Marcus and Mohanty,8th edition (BKMM), Mcgraw Hill, 2012.
2. Investment Analysis and Portfolio Management by Prasanna Chandra, Tata McGraw Hill, 2013.

REFERENCE BOOKS:
1. Business Analysis and Valuation using financial statements by Palepu, Healy and Bernard (PHB), 3rd edition, Cengage Learning, 2013.
2. Chapters of book: Corporate Finance by Ross, Westerfield, Jaffe and Kakani, 8th Edition, Tata Mcgraw Hill, 2014.
3. Security Analysis and Portfolio Management by Fisher and Jordan, Prentice Hall India, 2014.
4. Damodaran on Valuation(AD)-Security Analysis for Investment and Corporate Finance, 2nd edition, Wiley, 2013.
5. Investment Analysis and Portfolio Management by Railley and Brown, Cengage, 2012.

CHEMISTRY

PH038 - INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

UNIT-I ' SPECTROSCOPY Basic concepts operational principles and applications of UV-VIS' FT-IR and Raman Spectroscopy.

UNIT-II RESONANCE SPECTROSCOPY FundamentWsr operational principles, type5 and applications of Nuclear magi tic Resonance (NM H), 'Electron Spin 1e5onance (EST), FerrOrnagnetic Rescrnance (FM Ft), Mossbauer Spectroscopy.

UNIT-Ill THERMAL ANALY51$ AND SPECTROSCOPY Therirriogravirnetylc Analysis (T 'I - Differential Scanning Calorimetry (DS) - Therrnomechanical. Anal ysis (TMA).

UNIT-IV X-Ray Differentiation of X. ray diffraction - Deb Schemer formula - powder diffraction - dislocation density strain and stre55-partide Sine Dnaly5i$ by schemer formula -Weber- Frenchmen method of p2irtIcle size determination-H RX.R.Dana lysis and imaging,

UNIT-IV MICROSCOPY Atomic manipulations - AFM - different met d5 of 0 peratiOn- 5Canning Tunneii4 Electron MicrOstopy (STEM) - Scanning Probe Microscopy (5PM). Field Erin issicl n Scanning Electron Microscopy - FESEM TrariSrrirSSOn electron microscopy-11 RTEM — Energy dispersive x-ray Spectroscopy (E CAS) and Quantitative microanalysis using ' E DS, H5

1. William 'N. Parson., Modern Optical Spectroscopy, Springer, (2007). 2. Collin Illarom.11, Mc Ca chi, Fundamentals. of Molecular Spectroscopy, McCraw Hill (19 910. 3. Harvey Elliot White, Introduction to Atomk Spectra, McCraw 1-11111, 0934). 41, Guoz Fong C.acio Nancistructures et Na no ma Nrial & Synthesis, Properlie5, Applications, World Scientific Publishing Private, Ltd., Singapore (2o04). REFERIENICE. B _ _ _ OOKS •..____. t Fri ri c I s 11. ci-Li essac and Amick Rouessac, Chemical Apia lysi s. WI oclern Imtrurneritatkin iviOlialls and Techniques (000) 2. C. N. R. Rae, A. ?kJ Iler, A. K. Cheetham, The Chemistry of NanomaiteriallE: Synthesis, Properties and Applkations., 'Volume t, Wiley-Val, Verlag Gm 1:13-1, Germany (2004).

PH039- SEPARATION METHODS AND ANALYTICAL TECHNIQUES

UNIT I

PRODUCT RECOVERY METHODS:

Extraction (liquid-liquid extraction, aqueous two-phase extraction and leaching) Membrane-based separations (micro, ultra filtration, reverse osmosis, dialysis) – theory, design and configuration of membrane separation equipment applications.

UNIT II

PRODUCT PURIFICATION:

Adsorption, Ion exchange, Gel filtration, Affinity chromatographic separation processes.

UNIT III

PRODUCT FINISHING AND EMERGING TECHNOLOGIES:

Pervaporation, super liquid extraction, foam based separation and Crystallization.

UNIT IV

CHROMATOGRAPHIC AND ELECTROPHORETIC ANALYSIS:

GC, HPLC, FPLC, Electrophoretic separations and analysis (Agarose gel, SDS – PAGE and Capillary Electrophoresis).

UNIT-V

VALIDATION OF ANALYTICAL PROCEDURES:

Methodology for validation of analytical procedures. ICH guideline for Specificity, Linearity, Range, Accuracy, Precision, Limit of detection (LOD), Limit of quantification (LOQ) and Robustness.

TEXT BOOKS:

1. BIOTOL.' Series - Product Recovery in Bioprocess Technology (2004), 1st edition, Butterworth Publications.
2. Instrumental Methods of Analysis, B.K. Sharma (2001), 20th Edition, Goel Publishing House.
3. Bioseparations, B.Shivasankar (2006), Third Edition, PHI publications.

REFERENCES:

1. HPLC for Pharmaceutical Scientists, Yuri Kazakevich, Rosario LoBrutto, (2007).
2. Practical HPLC Method Development, Lloyd R. Snyder, Joseph L. Glajch, and Joseph J. Kirkland. (1997).
3. Instrumental methods of analysis, seventh edition, Hobart H.Willard, Lynne L. Marritt, John A. Dean, Frank A.Settle.
4. ICH guideline Q2 (R1) Validation of analytical procedures: Text and methodology.

PH060- RECENT ADVANCES IN MATERIALS CHEMISTRY (RAMC)

Unit-1

Introduction to solids:

Solids – types of solids –Crystal Structure-Crystalline solids, crystal systems point groups.

Unit II

Synthesis of Materials:

Preparative methods–Solid state reaction, precipitate reactions, sol-gel route, hydrothermal, salvo thermal methods, ion exchange reactions, intercalation / deintercalation reactions.

Unit-III

Properties of Materials:

Properties of solids-electrical properties, magnetic properties and optical properties etc.

Unit IV

Metal Organic Frame works:

Introduction, Preparation methods, properties and applications of few MOFs

Unit V

Characterization Techniques:

Methods of characterizing - Powder and single crystal x-ray diffraction, BET surface analysis, Adsorption by various gases.

Text Books:

1. A. R. West, Solid State Chemistry and its Applications, 2nd Edition, wily Publishers 2014.
2. David Farrusseng, *Metal-Organic Frameworks Applications from Catalysis to Gas Storage*. Wiley Publisher 2011.

Reference books:

1. Emil Zolotoyabko, Basic Concepts of X-Ray Diffraction, Wiley Publisher 2014.

PH068 – MANUFACTURING PROCESS OF FIBER REINFORCED POLYMER COMPOSITES

Unit – I: Manufacturing of Natural Fibre-Reinforced Polymer Composites
The Relationship Between Manufacturing and Design for Manufacturing in Product Development of Natural Fibre Composites; Green Composite Manufacturing via Compression Molding and Thermoforming. Compaction, Permeability and Flow Simulation for Liquid Composite Moulding of Natural Fibre Composites.

Unit – II: Manufacturing and Processing
Kenaf Fibre-Reinforced Epoxy Composites via Different Methods; Critical Concerns on Manufacturing Processes of Natural Fibre Reinforced Polymer Composites; Challenges in Machining of Natural Fibre Composites and The Manufacturing of Natural Fibre-Reinforced Composites by Resin-Transfer Molding Process.

Unit – III: Manufacturing and Techniques
Manufacturing and Properties, Manufacturing of Natural Fibre-Reinforced Polymer Composites by Solvent Casting Method, Manufacturing of Coir Fibre-Reinforced Polymer Composites by Hot Compression Technique,

Unit – IV: Bio-Nanocomposites
Bio-nanocomposites from Natural Fibre Derivatives: Manufacturing and Properties and Processability of Wood Fibre-Filled Thermoplastic Composite Thin-Walled Parts Using Injection Molding.

Text Book:
1. Manufacturing of Natural Fibre Reinforced Polymer Composites by Editors: Salit, M.S., Jawaid, M., Yusoff, N.B., Hoque, M.E, Springer International Publishing, 2015.

PH069 - CHARACTERIZATION OF FIBER REINFORCED POLYMER COMPOSITES.

Unit – I: Fiber Reinforced Polymers
Introduction, Properties of Fiber Reinforced Polymers, Classification and synthesis of Fiber Reinforced polymers, Compaction, Permeability and Flow Simulation for Liquid Composite Moulding of Natural Fibre Composites.

Unit – II: Characterization of FRPs
Chemical Characterization: Paper chromatography (PC), Thin layer chromatography (TLC), Gas chromatography (GC), Liquid column chromatography (LCC)

Unit – III: Spectroscopic Techniques for FPRs
Chemical Characterization: FT-IR, Raman spectroscopy, Mass spectrometry, NMR, , , X-Ray Powder Diffraction (XRPD),

Unit – IV: Physical Characterization
Microscopic Characterization: Optical microscopy, Scanning Electron Microscopy (SEM), Scanning Electron Microscopy with Energy Dispersive spectroscopy (SEM/EDS) and Transmission Electron Microscopy (TEM)

Unit – V: Mechanical Characterization
Aspect ratio of reinforcement, reinforcement orientation, volume fraction, thickness, and number of layers of reinforcement (in case of composite laminates). Tensile test, Compression Test, Flexural Test, Impact Test, Shear Test; Durability Characterization: Creep Testing, Fatigue Testing, Wear Testing, Fire Testing, Environmental Testing.

Text Book:

1. Characterization Techniques of Reinforced Polymer Composites, Manish K. Lila Ujendra K. Komal Inderdeep Singh, Wiley-VCH Verlag GmbH & Co. KGaA. 2014.

2. Manufacturing of Natural Fibre Reinforced Polymer Composites by Editors: Salit, M.S., Jawaid, M., Yusoff, N.B., Hoque, M.E, Springer International Publishing, 2015.

PH072- ADVANCED ORGANIC SYNTHESIS

UNIT-I
REACTIVE INTERMEDIATES
Generation, Structure, Stability and reactivity of Carbo cations, Carbo anions, free radicals, Carbenes, nitrenes and Benzyne.

UNIT-II
HETEROCYCLIC CHEMISTRY
Synthesis and Reactions of furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline and indole; Skraup synthesis, Fisher indole synthesis.

UNIT-III
STEREOCHEMISTRY & CONFORMATIONAL ANALYSIS
a)Recognition of symmetry elements and chiral structures (one and more than one chiral centers); R – S nomenciature Optical activity in the absence of chiral carbon. Stereochemistry of compounds containing nitrogen, sulphur and phosphorous.
b)Geometrical isomerism – E, Z- nomenclature – physical and chemical methods of determining the configuration of geometrical isomers.
c) Conformations of monocyclic compounds – cyclohexane- chair, boat and twist boat cyclohexanes, energy profile diagram – Mono and di- substituted cyclohexanes –conformations and physical properties.

UNIT-IV
SYNTHESIS IN ORGANIC CHEMISTRY
Oxidation and reduction of functional groups, Protecting groups, Reagents for modern organic synthesis, Named Organic Reactions and rearrangements – applications in organic synthesis, common catalysts and reagents (organic, inorganic, organometallic and enzymatic), Retrosynthesis, synthons, umpolung of reactivity

UNIT-V
ORGANOCATALYSIS
Basic concepts, enamine-, dienamine-, trienamine- catalysis, Iminium catalysis, HOMO-, LUMO-, SOMO-activation, Recent trends in organo catalysis.

TEXTBOOKS
1.Stereo Chemistry of carbon compounds – E.L. Eliel.
2.Modern organic Reactions, H.O.House, Benjamin.

REFERENCE BOOKS
1.Advanced organic chemistry – reaction, mechanism and structure, Jerry March, John Wiley.
2. Advanced organic chemistry, F.A.Carey and R.J.Sundberg,Plenum.

PH076 - FLAVONOIDS

Unit – I: The Stereochemistry of Flavonoids Introduction, Nomenclature of 2-Phenylbenzopyrans, Isoflavonoids, Neoflavonoids; Synthesis of flavonoids: Chalcones, Dihydrochalcones and Racemic Flavonoids; Asymmetric Epoxidation of Chalcones and chiral dioxiranes;

Unit – II: Isolation and Identification of Flavonoids Isolation of Flavonoids and their conjugates from biological materials; Structural characterization of Flavonoids and their conjugates by using NMR and Mass spectrometry; Identification of Flavonoid conjugate mixtures from various chromatographic techniques.

Unit – III: The Biosynthesis of Flavonoids History of Flavonoids biosynthesis, Proanthocyanidin biosynthesis, Dihydroflavonol Reductase, The 2-ODD Enzymes, Flavonoid Glycosyltransferases and Acetyltransferases, Peroxidases and Frontiers in the study of flavonoid metabolism.

Unit – IV: Transport of Flavonoids Entrance of Flavonoids into membrane-bound compartments: Proton-dependent transporters, ABC-type Transporters, MATE-type transporters; Factors involved in Flavonoid transport: GST proteins, Acylation of Flavonoids and Cytological aspects of Flavonoid transport.

Unit – V: Flavonoids as Nutraceuticals Introduction, Antioxidant activity, Anticarcinogenesis, Suppression of cancer growth and Molecular mechanisms of cancer chemoprevention by Flavonoids.

Text Books: 1. The Science of Flavonoids by Erich Grotewold, Springer publishers, 2006. 2. The Flavonoids by Jeffrey B. Harborne, Helga Marby and T. J. Marby, Springer US, 1975. 3. The Handbook of Natural Flavonoids, Volume 2, Jeffrey B. Harborne and Herbert Baxter, Wiley publishers, 1999.

PH079 – PHARMACEUTICAL WASTE WATER TREATMENT

Unit – I: Categorization of the Pharmaceutical Industry Fermentation plants; Synthesized organic chemicals plants; Fermentation/synthesized organic chemicals plants (generally moderate to large plants); Biological production plants (production of vaccines–antitoxins); Drug mixing, formulation, and preparation plants (tablets, capsules, solutions, etc.).

Unit – II: Pharmaceutical Manufacturing Processes. Challenges for Pharmaceutical Manufacturing, Technologies for Continuous Drug Product Manufacturing: Feeding, Blending, Granulation, Wet granulation, Dry granulation, Particle size reduction, Compression, Coating; Emerging technologies for continuous drug product production; Process integration and Process monitoring and control

Unit – III: Significant Parameters in PWT pH-Fecal coliform; Temperature-Manganese; BOD5, BODUlt-Phenolics; COD-Chromium; Dissolved oxygen-Aluminum; TOC-Cyanides; Solids (suspended and dissolved)-Zinc; Oil and Grease-Lead Nitrogen, (NH_4 and organic-N)-Copper Sulfides-Mercury; Toxicity-Iron.

Unit – IV: Advanced treatment Methods of Pharmaceutical Wastewater Coagulation and sedimentation, Flotation, Activated carbon adsorption, Advanced oxidation processes, Wet air oxidation(WAO), Supercritical water oxidation(SCWO), Photocatalytic oxidation, Ultrasound oxidation, Electrochemical oxidation, Ozonation, Membrane separation, Microfiltration(MF), Ultrafiltration(UF), Reverse osmosis(RO), Electrodialysis(ED) and Biological treatment.

Unit – V: Hybrid Technologies for Pharmaceutical Wastewater Treatment Combination among advanced oxidation processes, Ozonation at high pH environments, Peroxone process (O_3/H_2O_2), O_3/catalyst, UV/H_2O_2, UV/O_3, UV/SO_4^{2-}, UV/Cl_2, Electrochemical AOPs, Catalytic AOPs: Fenton process, Catalytic AOPs: Photocatalytic AOPs, Physical AOPs: Electrohydraulic discharge (plasma) oxidation, Physical AOPs: Ultrasound, Physical AOPs: Microwave, Physical AOPs: Electron beam, Combination: AOPs and other physicochemical processes, Combined AOPs and biotreatment technology, Adsorption-based combinations, Membrane-based combinations, Biological treatment-based combination,

Text Books: 1. The Science and Technology of Industrial Water Treatment by Zahid Amjad, Springer US, 2002. 2. Wastewater treatment in the pharmaceutical industry by R. Chen and K. Crowell, Springer publishers, 2012.

PH080 – QUINONE ISOXAZOLE THIOPHENE HYBRIDS

Unit I: Heterocycles: Synthesis and reactivity of Azepines, Oxepines and Thiapines. Synthesis and rearrangements of Diizipines. Synthesis of Benzoazepines, Benzodiazepines, Benzooxepines, Benzothiapines, Azocines and Azonines, synthesis of selenophenes, TGellerophenes, phospholes and Boroles.

Unit II: Synthesis of Novel Isoxazole fused Heterocycles Vilsmeir–Haack Reaction of 3-Aryl-isoxazol-2-ene-5-ones; Synthesis of 3-aryl-5-chloro-4- formyl-isoxazoles and 2,4-dichloro-3-formyl-6 unsubstituted quinolines, Synthesis of 5-chloro-4- formyl-3-phenyl-isoxazole and 2,4-dichloro-3-formyl quinoline.

Unit III: Novel thiophene derivatives Design and Synthesis of novel thiophene derivatives with sulfonamide, isoxazole, benzothiazole, quinoline and anthracene moieties; Biological evaluation and anti-cancer agent studies.

Unit IV: Diaziridinyl Quinone Isoxazole Hybrids Design, synthesis and biological evaluation of diaziridinyl quinone isoxazole hybrids: Confirmation of regioselectivity for diaziridinyl compounds; Biological evaluation: Antibacterial activity, Minimum bactericidal concentration (MBC), Biofilm inhibition assay, Antifungal activity, Minimum fungicidal concentration (MFC) and Cytotoxic activity

Unit V: Isoxazole Platform for Polyketide Assembly: Cycloaddition of Stable Benzonitrile Oxides to Stable ortho-Quinone Mono-acetals and Dehydro -genation; Claisen isoxazole synthesis TEXT AND REFERENCE BOOKS: 1. Heterocyclic Chemistry by T. Gilchrist. 2. An Introduction to the Chemistry of Heterocyclic Compounds by R M Acheson. 3. Heterocyclic Chemistry by J A Joule and K. Mills. 4. Principles of Modern Heterocyclic Chemistrry by A Paquette. 5. Handbook of Heterocylic Chemistry by A R Katritzky.

PH268- HETEROCYCLES

UNIT-I INTRODUCTION TO HETEROCYCLES:

1. Defination, 2. Classification 3. Uses of heterocyclic compounds

UNIT-II SYNTHESIS OF HETEROCYCLIC COMPOUNDS:

1. Pyridine, 2. Quinoline 3. Isoquinoline 4. Furan 5. Thiophene 6. Indole

UNIT-III PROTECTION AND DEPORTATION IN ORGANIC CHEMISTRY:

3.1) Protection and deportation of the following functional groups

1. Hydroxyl 2. Carbonyl 3. Amino and 4. carboxyl with 5. Applications

UNIT-IV STEREO CHEMISTRY:

1 Classification of isomers into structural and stereo types-Optical isomerisation-Elementary of symmetry and chirality – Configuration of optically active molecules – DL and RS notations – Resolution of recemic mixtures. Cis and Trans isomerism; E-Z configuration. Conformational analysis of acyclic systems like Ethane and cyclic systems like cyclohexane

UNIT-V

STRUCTURAL ELUCIDATION OF ORGANIC COMPOUNDS BY USING INSTRUMENTATION:

1. Spectroscopy: a) Basic concepts, operational principles and applications of UV-VIS, and
FT-IR spectroscopy. 2. Resonance spectroscopy: a) Fundamentals, b) Operational principles, types and C) Applications of Nuclear magnetic resonance (NMR) spectroscopy.

TEXT BOOK:

1. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th Edition, ISBN: 978-0-470-46259-1, March 2013

REFERENCE BOOK:

1. Advanced Organic Chemistry, Francis A. Carey, Richard A. Sundberg, 5th Edition, 2007, ISBN-13: 978-0-387-68350-8, Springer.

CHEMICAL ENGINEERING

PH001 - ADVANCED CHEMICAL PROCESS EQUIPMENT DESIGN AND DRAWING

UNIT - I

Shell and Tube Heat Exchanger Design: 1-2 parallel – counter flow: Shell and Tube Exchanger, Flow arrangements for increased heat recovery, Calculations for process conditions.

UNIT - II

Vessel Supports: Introduction and classification support, design of skirt support, considering stresses due to dead weight, wind load, seismic load and period of vibration, design of basic plates, skirt bearing plate, anchor bolt and bolting chair.

UNIT - III

Storage Vessels: Study of various types of storage vessels and application. Atmospheric vessels, vessels for storing volatile and non-volatile liquids. Storage of gases, Losses in storage vessel. Various types of roofs used for sotrage vessels. Manholes, Nozzles and mounting. Design of cylindrical storage vessels as per IS:803 should include base plates, shell plate, roof plate and wind griders.

UNIT - IV

Sieve Tray Design: Introduction, Sieve Trays: Tower Diameter, Plate Spacing, Entrainment, Weepage, Tray Layout, Hydraulic Parameters, Worksheet for Sieve Tray Design, Design of a Sieve tray Tower for Distillation.

UNIT - V

Mechanical Design: Introduction, The Mechanical Design of Heat Exchangers: General Thicknesses of various components, The Mechanical Design of Columns: Vessel Design, Vessel Supports, Manholes and Flanges,Materials of Construction.

Text Books:

1. M.V.Joshi, "Process Equipment Design", 3rd ed., McMillan India.,2000D.
2. Backhurst and Harker, "Process Plant Design", 1st ed.,Heinmann Educational Books,1973

Reference Books :

1. Q.Kern, "Process Heat Transfer", 2ne ed.,Mc Graw Hill Co.,1983.
2. Coulson and Richardson, "Chemical Engineering", Volume 6, 2nd ed., Butterworth-Heinemann Ltd,1996

PH003 - ADVANCED PROCESS DYNAMICS AND CONTROL

Unit - I

Frequency Response: Polar plots, Nyquist stability criterion, Gain margin and Phase margin, effect of addition of poles and zeros. Inverse polar plots, stability criteria in the inverse plane. Closed loop frequency response: M and á circles, correlation between transient and frequency responses.

Unit - II

Introduction to Advanced Control Systems: Cascade control, Feed forward control, Adaptive Control, Inferential control, Internal model Control, Model predictive control, Dynamic matrix control, Ratio control, Selective and split range control, Plant wide control.

Unit - III

State Space Methods: State Space representation of Physical systems: State variables, State space description, Selection of state variables, Transfer function matrix, Transition matrix, Solution of state space models.

Unit - IV

Controllability and Observability. Multivariable control: control of interacting systems, Primary and Cross controllers, Relative Gain Analysis (RGA).

Unit - V

Response of multi loop control system, Non interacting control, Decouplers. Stability of multivariable control systems.

Text Books:

1. I.J.Nagrth and M.Gopal, “Control Systems Engineering”, New Age International Publishers, 1999.
2. Donald R Coughnowr, “Process Systems Analysis and Control, Mc Graw-Hill Inc.,1991.

PH004 - ADVANCED SEPARATION PROCESSES

Objective of the Course :

Objective: The course will · Promote the application of membrane science and technology to improve processing technologies, reduce energy utilization and waste treatment techniques. This course will offer scope of research and development that can lead to next generation of products.

Unit-I

Introduction to SeparationProcesses:

Classification of separation processes; Equilibrium-based separations: General properties, operation, and complexities of Separations that involve Mass separating agents and Energy separating agents; Review of Vapor- Liquid Equilibria and other equlibria; Thermodynamic consistency test for vapor-liquid equilibrium data; Phase rule and Degrees of freedom estimations; Equlibrium ratio concept and its estimation from Depriester's charts; Bubble-point and Dew-point Calculations; Flash Calculations, Estimation of state of the mixture.

Unit-II

Binary Separation Processes:

Common approach for process design (estimation of feed locations, product qualities and theoretical stages) of Equilibrium based separations: Single Stage- Single component and Multi Stage- Single component Separation Processes involving absorption, stripping, liquid-liquid immiscible extraction, adsorption and distillation; Kremser- Brown equation and its limitations; Process design (estimation of feed locations, product qualities and theoretical stages) of Multi stage Multiple Feeds and Side Streams processes.

Unit-III

Multicomponent Separation Processes: Multicomponent Distillation: Introduction to Multicomponent Distillation, Key Components; Estimation of Minimum Theoretical Stages (Fenske's equation); Distribution of non key components in overhead and bottom products at total reflux; Determination of minimum Reflux ratio (Underwood's Method);

Approximate calculation shortcut methods for multicomponent, multistage distillation (estimation of actual reflux ratio and theoretical stages): Fenske-Underwood-Gilliland method; Feed- Stage Location (Kirke-Bride's equation); Distribution of non-key component at actual reflux; Batch Multicomponent Distillation with Reflux: Shortcut method for multicomponent Batch Distillation with constant reflux, Stage-by-stage method for Multicomponent Distillation

Unit-IV

Rate Based Separations: Membrane Separation Processes: Principles, characteristic, and classification of membrane separation processes; Membrane materials, structures, and preparation techniques; Membrane modules; Membrane characterization: Pore size and pore distribution; Bubble point test; Challenge test; Factors affecting retentivity, concentration polarization, gel polarization, fouling, cleaning and regeneration of membranes.

Unit-V

Mechanisms of Separation: Porous membranes, dense membranes, and liquid membranes. Membrane separation models: Irreversible thermodynamics; Capillary flow theory; Solution diffusion model; Viscous flow models; Models for separation of gas (vapour) mixtures; Science and technology of microfiltration, reverse osmosis, ultrafiltration, nanofiltration, dialysis and electrodialysis, pervaporation, liquid membrane permeation, gas permeation. Membrane reactors: Polymeric, ceramic, metal and bio-membrane.

Text Books:

1. R.E. Treybal, "Mass Transfer Operations", 3rd ed., McGraw-Hill, 1980.
2. G.J. Geankoplis, "Transport Processes and Unit Operations", 3rd ed., Prentice Hall, NJ, 1993.

Reference Books :

1. P.H. Wankat, "Equilibrium Staged Separations", Elsevier, 1988.
2. J.D. Seader, E.J. Henley, "Separation Process Principles", John Wiley, 1998.
3. W.L. McCabe, J.C. Smith, P. Harriott, "Unit Operations of Chemical Engineering", 6th ed., McGraw-Hill, 2001.
4. King, C J, "Design of Equilibrium Stage Processes", Mc Graw-Hill Book Co. Inc., New York, 1980.

7. Coulson, J.M., and Richardson, J.F, “Chemical Engineering”, Volume 2, 4 and 6th ed’s., (SI Units). Pergamon Press Ltd., 1991.
8. Kohl, A. and Riesenfeld, F., “Gas Purification” 4th and 5th ed’s., Gulf Publishers Co, Houston, Texas. 1985.
9. Schoem, H.M, “New Chemical Engineering Separation Techniques”, Inter Science Publishers, 1972.
10. Lacey, R.E. and S.Loaeb “Industrial Processing with Membranes”, Wiley-Inter Science, NY, 1972.
11. Ronald W.Roussel “Handbook of Separation Process Technology”, John Wiley, New York, 1987.
12. Kestory, R.E., “ Synthetic Polymeric Membranes”, Wiley, New York, 1987.
13. Osadar, Varid Nakagawa I, “Membrane Science and Technology”, Marcel Dekkar, 1992.
14. Mulder M, “Basic Membrane Technology”, Kluwer Publishers, 1996.

PH005 - ADVANCED TRANSPORT PHENOMENA

UNIT - I

Basic Concepts and Review of Classical Flow Problems Using Shell Balances: Review of mathematics, Scalar, Vectors, Tensors, divergence, relation between rectangular coordinates and cylindrical coordinates, relation between rectangular coordinates and spherical coordinates, partial derivative, substantial derivative, total derivative, line integral, surface integral, integral theorems, frame of reference (Eularian and Lagrangian).

UNIT - II

The Equations of Change for Isothermal Flow: Equations of continuity, equation of motion, the equation of mechanical energy, application of Navier-Stokes equation to solve problems, the equations of change for incompressible non-Newtonian fluids.

The Equations of Change for Non-Isothermal Flow: Equations of energy, the energy equation in curvilinear coordinates, use of equations of change to set up steady state heat transfer for problems.

UNIT - III

The Equations of Change for Multi Component Systems: The equations of continuity for a binary mixture, the equation of continuity of A in curvilinear coordinates, the multicomponent equations of change in terms of the flows, the multi component fluxes in terms of the transport properties, use of equations of change to setup diffusion problems.

UNIT - IV

Velocity, temperature and concentration distributions with more than one independent variables, unsteady flow, stream function, potential flow, boundary layer theory, steady state two dimensional flow for momentum, heat and mass.

UNIT - V

Turbulent Flow: Introduction, fluctuations and time smoothened equations for velocity, temperature and concentration, time smoothing of equation of change, equation of energy, equation of continuity of A, Reynolds stresses.

Dimensional Analysis: Introduction, momentum, heat and mass transfer.

Text Books:

1. R. B. Bird, W. E. Stewart and E. N. Light foot, “Transport Phenomena”, Wiley International Edition, New York, 2002.
2. G.K. Batchelor, “An Introduction to Fluid Dynamics”, Cambridge University Press, Cambridge, 1967.

Reference Books :

1. J.C. Salterry, “Momentum Energy and Mass Transfer in Continua”, Robert e. Kridger Publishing Company, New York 1981.
2. James R. Welty, Chrles E. W icks and Robert E. Wilson, “Fundamentals of Momentum, Heat and Mass Transfer”, John Wiley & Sons, Inc New York.

PH007 - APPLIED NUMERICAL METHODS

UNIT - I

Solution of Simultaneous Linear Algebraic Equations: Introduction, Engineering Applications, Basic Concepts of Solution, Linearly Independent Equations and conditioned equations, Matrix Inversion, Equation with special form of coefficient matrix, Over – determined, Undetermined, and Homogeneous Equations.

UNIT - II

System of Equations: Simultaneous equations in matrix form, consistency of equations, types of solutions, methods of solving simultaneous equations: Giraff'S root square method, determinant method, Tri - Diagonal Matrices, Inverse Matrix, LU Factorization, Cholesky, Jacobi, Pivoting Methods, Iterative Refinement, Linear Programming-Simplex Method.

UNIT - III

Interpolation and Polynomial Approximation: Lagrange polynomial Interpolation and Approximation, Newton Interpolation Polynomial, Hermite Polynomial Interpolation, Legendre Polynomials.

UNIT - IV

Curve Fitting: Least Squares Lines, Least Squares Polynomials, Nonlinear Curve Fitting, Logistic Curve, FFT and Trigonometric Polynomials, Conic Fit, Circle of Curvature.

UNIT - V

Numerical Integration: Midpoint Rule, Newton-Cotes Integration, Trapezoidal Rule for Numerical Integration, Simpson's Rule for Numerical Integration, Simpson's 3/8 Rule for Numerical Integration, Adaptive Simpson's Rule, Gauss-Legendre Quadrature, Cubic Spline Quadrature, Monte Carlo Pi, Monte Carlo Integration, 2D Trapezoidal and Simpson Rules.

Text Books:

1. Dr.B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 37th ed.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons,7th ed., 2001.
3. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI Publishers, 4th ed.,
4. Singeresu S.Rao, "Applied Numerical Methods", Pearson Education Inc., Illustrated, 2001.

Reference Books:

1. Santosh K Gupta, "Numerical Methods for Engineering", New Age International Publishers, 1st ed.,
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, "Numerical Methods for Scientific and Engineering Computation", 5th ed.,New Age International Publication, 2007.

PH009 - CHEMICAL PROCESS EQUIPMENT DESIGN

UNIT - I

Shell and Tube Heat Exchanger Design: 1-2 parallel – counter flow: Shell and Tube Exchanger, Flow arrangements for increased heat recovery, Calculations for process conditions.

UNIT - II

Vessel Supports: Introduction and classification support, design of skirt support, considering stresses due to dead weight, wind load, seismic load and period of vibration, design of basic plates, skirt bearing plate, anchor bolt and bolting chair.

UNIT - III

Storage Vessels: Study of various types of storage vessels and application. Atmospheric vessels, vessels for storing volatile and non-volatile liquids. Storage of gases, Losses in storage vessel. Various types of roofs used for sotrage vessels. Manholes, Nozzles and mounting. Design of cylindrical storage vessels as per IS:803 should include base plates, shell plate, roof plate and wind griders.

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UNIT - V

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Text Books:

1. D.Q.Kern, “Process Heat Transfer”, Mc Graw Hill Co.
2. Backhurst and Harker, “Process Plant Design”, Heinmann Educational Books.

Reference Books :

1. M.V.Joshi, “Process Equipment Design”, McMillan India.
2. Coulson and Richardson, “Chemical Engineering”, Volume 6 Pergamon Press.

PH010 - CHEMICAL PROCESS SAFETY

UNIT - I

Introduction: Importance of process safety with examples of major accidents; which might cover chemical, petroleum & petroleum chemical Industrial.
Material Hazards: Flammability, toxicity, Reaction Hazards, Burning Characteristics, Material Properties and Hazards.

UNIT - II
Process Hazards: Temperature & Pressure effects and deviations, flow, level and other process deviations.
Ignition Sources: Flames, Hot surfaces, static electricity, and the like Explosions: Confined & Unconfined explosions, BLEVES, Dust Explosions.

UNIT - III
Hazard Analysis: Check – lists, fault trees, cause consequence diagrams, HAZOP and other methods of study. Dow procedures for safety assessment.

UNIT - IV
Safety Devices: Relief valves and Rupture disks Explosive relief, flare systems.
Safety in Plant Design & Lay-out: Electrical area classification, control of entry to confined spaces.

UNIT - V
Emergency preparedness & handling analysis of major accidents & preventive measures.

Text Books:

1. Daniel A. Crowe, Joseph F Louvar "Chemical Process Safety Fundamentals with Applications", 2nd ed., Prentice Hall International Series, 1990.
2. Roy and Sanders, "Chemical Process Safety", 3rd ed., Prentice Hall International Series, 2000.

Reference Book :

1. S.N.Saha, "Fundamentals of Chemical Engineering", 1st ed., Dhanpatrai Publishers, 2002.

PH011 - COMPUTATIONAL METHODS

UNIT - I

Variables, Operations and Plotting:

Introduction to process modeling and simulation, Examples of chemical, Biochemical and environmental engineering problems arising in fluid mechanics, thermodynamics, heat and mass transfer, separation processes, reaction engineering, process dynamics, and transport phenomena. Introduction to MATLAB, introducing the theory of variable and matrices, basic operations and plotting.

UNIT - II
Visualization & Programming:

Introducing advanced visualizations commands in MATLAB. Introduction to basic built-in MATLAB functions. Getting familiar with building user- defined functions, and understanding the importance of them for solving advanced chemical engineering models. Practicing basic flow-control in MATLAB by applying if, else, elseif, for, while loops in various problems.

UNIT - III
Solving Equations, Fitting:

Case study problems in chemical processes involving algebra, polynomials, integral functions, differentiation and integration. Applications and importance of parameter estimation in process models, linear, multiple linear and non-linear least square methods, Statistical analysis of fitted equation, Importance and applications of statistical experimental design in engineering, Sensitivity analysis, Case studies.

UNIT - IV
Differential Equations in ChemicallEnvironmental Processes: Modeling of batch and continuous processes involving heat, mass & momentum transfer, dynamic operation of chemical processes and reaction engineering that give rise to linear or nonlinear, first or higher order, ordinary or partial differentialequations.

UNIT - V
Numerical solution techniques for solving the initial and boundary value problems; Introduction to the main differental equations solvers in MATLAB. Case studies.

Text Books:

1. Curtis F. Gerald and Patrick O. Wheatly, "Applied Numerical Analysis", Addison-Wesley, 1999.
2. Holly Moore, "MATLAB for Engineers", Pearson Prentice Hall, 2007.

Reference Books :

1. Laurene V. Fausett, “Numerical Methods: Algorithms and Applications”, Pearson Prentice Hall, 2003.
2. Gerald Recktenwald, “Numerical Methods with MATLAB: Implementation and Application”, Prentice Hall, 2000.
3. Michael B. Cutlip and Mordechai Shacham, “Problem Solving in Chemical Engineering with Numerical Methods”, Prentice-Hall, 1999.
4. Steven C. Chapra and Raymond P. Canale, “Numerical Methods for Engineers”, McGraw Hill, 1998.
5. A. Constantinides and N. Mostoufi, “Numerical Methods for Chemical Engineers with Matlab Applications”, Prentice Hall International, 1999.
6. Timothy Sauer, “Numerical Analysis”, Addision Wesley, 2006.
7. Ajay K. Ray and Santosh K. Gupta, “Mathematical Methods in Chemical and Environmental Engineering”, Thomson Learning, 2nd ed., Revised, 2005.

PH012 - ENERGY MANAGEMENT

UNIT - I

Energy Scenario: Introduction, Primary and Secondary Energy, Commercial Energy and Non commercial Energy, Renewable and Non Renewable Energy, Global Primary Energy Reserves, Indian Energy Scenario, Energy Needs of Growing Economy, Long Term Energy Scenario for India, Energy Pricing in India, Energy Sector Reforms, Energy and Environment, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, The Energy Conservation Act, 2001 and its Features.

UNIT - II

Basics of Energy and its Various Forms: Definition, Various Forms of Energy, Electrical Energy Basics, Thermal Energy Basics, Units and Conversions. Energy action planning: Introduction, Energy Management System.

Project Management: Introduction, Steps in Project Management.

UNIT - III

Energy Management and Audit: Definition & Objectives of Energy Management,Energy Audit: Types and Methodology, Energy Audit Reporting Format, Understanding Energy Costs, Benchmarking and Energy Performance, Matching Energy Usage to Requirement, Maximizing System Efficiency, Fuel and Energy Substitution, Energy Audit Instruments.

UNIT - IV

Material and Energy Balance: Basic Principles, The Sankey Diagram and its Use, Material Balances, Energy Balances, Method for Preparing Process Flow Chart, Facility as an Energy System, How to Carryout Material and Energy (M & E) Balance.

UNIT - V

Financial Management: Introduction, Investment Need, Appraisal and Criteria, Financial Analysis, Financial Analysis Techniques, Sensitivity and Risk Analysis, Financing Options.

Energy monitoring and targeting: Definition, Elements of Monitoring & Targeting System, A Rationale for Monitoring, Targeting and Reporting, Data and Information Analysis, Relating Energy Consumption and Production, CUSUM, Case Study.

Text Books:

1. General Aspects of Energy Management and Energy audit by Beuro of Energy studies.
2. Encyclopedia of Energy - McGraw Hill Publication.
3. Basics of Energy, Energy action planning and Project Management.

Reference Books :

1. Handbook of Energy Engineering , The Fairmont Press Inc - Albert Thumann.
2. Energy Handbook, Von Nostrand Reinhold Company - Robert L. Loftness.
3. BP Statistical Review of World Energy.
4. Financial Management, Energy monitoring and Targeting.
5. The Energy and Resources Institute (TERI).
6. Energy Dictionary, Van Nostrand Reinhold Company, New York - V Daniel Hunt.
7. Energy Management Handbook, John Wiley and Sons - Wayne C. Turner.
8. Guide to Energy Management, Cape Hart, Turner and Kennedy.

PH015 - ENZYME AND MICROBIAL TECHNOLOGY

UNIT - I

Introduction to Microbiology: Discovery of microorganisms, Theory of spontaneous generation, Germ theory of diseases, Major contribution and events in the field of Microbiology, Development of pure culture methods, Enrichment culture methods.

UNIT - II

Major Groups of Microorganisms: Micro diversity, Diversity classification of Woese et al. Three domains of life. Five - kingdom system of Whittaker. Classification systems - Phylogenetic, Phenetic, Taxonomic ranks, Major characteristics used in Taxonomy, Molecular approaches to microbial taxonomy.

UNIT - III

Introduction to Enzymes: Methods used for investigating the kinetics of enzyme catalysed reactions, Kinetics of single substrate reactions; Estimation of Michaelis – Menten parameters,Types of inhibition & models for substrate and product.

UNIT - IV

Multi-substrate and Allosteric Enzyme Catalysed Reactions: Multisubstrate reactions mechanisms, steady state kinetics, Allosteric regulation of enzymes, Monod - Changeux -Wyman model, Koshland- Nemethy-Filmer (KNF) model.Deactivation kinetics- pH and temperature effect on enzymes.

UNIT - V

Enzyme Immobilization and Purification of Enzymes from Natural Sources: Physical and chemical techniques for enzyme immobilization

– advantages, disadvantages and applications. Effects of external mass transfer resistance, analysis of intraparticle diffusion and reaction, simultaneous film and intraparticle mass transfer resistances, immobilised enzyme bioreactors. Production and purification of crude enzyme extracts from plant, animal and microbial sources.

Text Books:

1. Prescott LM, Harley JP, Klein DA, "Microbiology", 6th ed., Wm. C. Brown, McGrawel, 2005.
2. Roger Y Stanier, "General Microbiology", Macmillan, 5th ed., 2005.

Reference Books :

1. Palmer T., "Enzymes: Biochemistry, Biotechnology and Clinical Chemistry", First East -West Press Edition, 2004
2. James E Bailey, David F., "Ollis Biochemical Engineering Fundamentals", 2nd ed., Mc GrawHill Intl. Edition.

PH016 - FERMENTATION TECHNOLOGY

UNIT - I

Fermentation Processes and Parameters: Over view on fermentation technology, history & development of fermentation industry. General requirements of fermentation processes and an overview, configuration of fermentor and ancillaries, main parameters to be monitored and controlled in fermentation processes.

UNIT - II

Media Design for Fermentation Process: Criteria for good medium, medium requirements for fermentation processes, points to be considered in the selection of different nutrients including oxygen, formulation of optimal growth and product formation, examples of simple and complex media, design of various commercial media for industrial fermentations– medium optimization methods.

UNIT - III

Sterilisation of Media: Introduction, design of batch sterilization processes – calculation of Del factor, holding time, Richard's rapid method for sterilization cycles, design of continuous sterilization processes, Sterilisation of fermenter, feeds, liquid wastes, filter sterilization of media, air, exhaust air, theory and design of depth filters.

UNIT - IV

Instrumentation for Measurement and Control of Variables: Introduction to process variables, instruments used for measurement and control of temperature, flow measurement and control, measurement and control of pressure, rate of stirring, control of foam, oxygen and pH.

UNIT - V

Production of Value Added Compounds from Renewal Sources: Production of primary and secondary metabolites: Biopolymers, Biodeseal, Bioethanol, aminoacids, antibiotics.

Text Books:

1. Peter F. Stanbury, Stephen J. Hall & A. Whitaker, "Principles of Fermentation Technology", 2nd ed., Butterworth – Heinemann An Imprint of Elsevier India Pvt. Ltd., 2005.
2. Shuler, M.L. and Kargi,F. "Bioprocess Engineering - Basic Concepts", 2nd ed., Prentice Hall of India Pvt. Ltd., 2005.

Reference Books :

1. Mukhopadhyay S.N., "Process Biotechnology Fundamentals", 2nd ed., Viva Books Private Limited, Chennai 2004.

2. Wang D.I.C., Cooney C.L., Demain A.L., Dunnil.P., Humphery A.E., Lilly M.D., " Fermentation And Enzyme Technology ", John Wiley and Sons, 1980.
3. Bailey and Ollis, "Biochemical Engineering Fundamentals", McGraw Hill, 2nd ed., 1986.
4. Pauline M. Doran, "Bioprocess Engineering Calculation", Blackwell Scientific Publications, 1st ed., 2005.

PH017 - INTERFACIAL SCIENCE & ENGINEERING

UNIT- I

Introduction: General introduction of colloids, interfaces, surfactants, and micellization. Intermolecular forces, Van der Waals forces, Brownian motion and Brownian flocculation.

UNIT- II

Surface and interfacial tension, surface free energy, Surface tension for curved interfaces, Surface excess and Gibbs equation.

UNIT- III

Thermodynamics of interfaces, Thermodynamics of micelle formation, Electrical phenomena at interfaces (Electrokinetic phenomena, Electrical double layer), Colloidal systems and colloidal stability, Emulsion and micro-emulsion.

UNIT- IV

Applications: General applications, Enhanced petroleum recovery, Novel fabrication of nanostructured particles, Engineering surfaces and interfaces, Self-assembled & nanostructured biomimeticinterfaces.

UNIT- V

Measurement techniques of surface tension, zetapotential, particle size, dynamic surface tension.

Text Books:

1. Hiemenz, P. C. and Rajagopalan, R., "Principles of Colloid and Surface Chemistry", 3rd ed., Marcel Dekker, N.Y., 1997.
2. M. J. Rosen, "Surfactants and Interfacial Phenomena", Wiley - Interscience Publication, NewYork, 1978.

Reference Books :

1. Adamson, A. W. Gast, A. P., "Physical Chemistry of Surfaces", Wiley-Interscience, New York,1997.
2. Russel, W. B., Saville, D. and Schowalter, W.R., "Colloidal Dispersions", Cambridge University Press, Cambridge, 1989.
3. "Foundation of Colloid Science", Vol. I and II, Oxford University Press, Oxford, 1992.

4. Jacob Israelachvili, “Intermolecular and Surface Forces”, Academic Press, New York, 1992.
5. D. J. Shaw, “Colloid & Surface Chemistry”, Butterworth Heinemann, Oxford, 1991.

PH018 - MATHEMATICAL METHODS IN CHEMICAL ENGINEERING

UNIT – I

Ordinary Differential Equations:

Introduction, Order and degree, First order differential equations: Batch Chemical Reactor Analysis, Variation of Tank Temperature with time, Second order differential equations: Heat Transfer through electrode, Linear differential equations: Simultaneous diffusion and chemical reaction in a tubular reactor, Continuous hydrolysis of tallow in a spray column, Simultaneous differential equations: Sulphuric acid cooling system.

UNIT – II

Partial Differentiation and Partial Differential Equations: Introduction, Interpretation of partial derivatives**,** Formulating partial differential equations: Unsteady state heat conduction in one dimension, Mass Tranfer with axial symmetry, The continuity equation, Boundary conditions: Cylindrical furnace, Particular solutions of partial differential equations: One dimensional heatconduction.

UNIT – III

Finite Differences:

Introduction, The difference operator, □ , other difference operators, Interpolation, Finite difference equations, Linear finite difference equations: Plate absorption column, Stirred tank reactors in series, Spray column, Non - linear finite difference equations: CSTRs in series, Distillation column, Differential - difference equations: Stirred tank reactors in cascade, Counter current extractor.

UNIT – IV

Treatment of Experimental Results:

Introduction, Graph Paper, Theoretical properties, Contour plots, Propagation of errors, Curve fitting, Numerical Integration.

UNIT – V

Numerical Methods:

Introduction, First – order ordinary differential equations, Higher order differential equations (Initial value type), Higher order differential equations (Boundary value type), Algebraic equations, Difference – differential equations: Absorption column, Partial differential equations: Tubular catalytic reactor.

Text Books:

1. V.G.Jenson & G.V.Jeffreys, "Mathematical Methods in Chemical Engineering", 2nd ed., Academic Press, London, 2000.
2. T.S.Sherwood & C. Reed, "Applied Mathematics in Chemical Engineering", 2nd ed., Tata McGraw Hill Publishers, 1998.

Reference Books :

1. Steve Chopra, " Numerical Methods for Chemical Engineering", 5th ed., Tata McGraw Hill Publishers, 2009.
2. Pushpavanam ,Kondaswamy, "Numerical Methods for Chemical Engineering", 1st ed., PHI Publishers, 2005.

PH019 - MEMBRANE TECHNOLOGY

UNIT - I

Introduction: Separation processes, introduction to membrane processes, history, definition of a membrane, membrane processes.

UNIT - II

Materials and Material Properties: Introduction, polymers, stereoisomerism, chain flexibility, molecular weight, chain interactions, state of the polymer, effect of polymeric structure on Tg, glass transition temperature depression.

Preparation of Synthetic Membranes: Introduction, preparation of synthetic membranes, phase inversion membranes, preparation technique for immersion precipitation, preparation technique for composite membranes.

UNIT - III

Characterization of Membranes: Introduction, membrane characterization, characterization of porous membranes, characterization of ionic membranes, characterization of non porous membranes.

Transport in Membranes: Introduction, driving forces, non equilibrium thermodynamics, transport through porous, non porous, and ion exchange membranes.

UNIT - IV

Membrane Processes: Introduction, osmosis, Pressure driven membrane processes, concentration driven membranane electrically driven processes, membrane reactors.

Polarization Phenomenon and Fouling: introduction, concentration polarization, turbulence promoters, pressure drop, gel layer model, osmotic pressure model, boundary layer resistance model, concentration polarization in diffusive membrane separations and electro dialysis, membrane fouling, methods to reduce fouling, compaction.

UNIT - V

Module and Process Design: Introduction, plate and frame model, spiral wound module, tubular module, capillary module, hollow fiber model, comparison of module configurations.

Text Book:

1. M.H.V. Mulder, “Membrane Separations”, Kluwer Publications.

PH020 - MODELING AND SIMULATION OF CHEMICAL PROCESS

UNIT - I

Mathematical Models for Chemical Engineering Systems: Principles of Modeling, fundamentals, introduction to fundamental laws: Total Continuity Equation, Equation of Energy, Equation of Motion, Transport laws.

Examples of mathematical models of chemical engineering systems: Constant hold up CSTRs, Variable Hold up CSTRs, Gas pressurized CSTR, non-isothermal CSTR, Two heated Tanks.

UNIT - II

Examples of Mathematical Models of Chemical Engineering Systems: Single component vaporizer, Batch reactor, reactor with mass transfer, ideal binary distillation column, batch distillation with hold up. **Classification of mathematical modeling**: static and dynamic models, the complete mathematical model, Boundary conditions, the black box principle.

Artificial Neural Networks: Network training, Models of training, Network architecture, Back-propagation algorithm, ANN applications.

UNIT - III

Computer Simulation: Simulation examples of Three CSTRs in series, Gravity Flow tank, Binary distillation column, Non-isothermal CSTR. **Models in Reaction Engineering:** Chemical reaction with diffusion in a tubular reactor, chemical reaction with heat transfer in a packed bed reactor, gas absorption accompanied by chemical reaction.

UNIT - IV

Models in Heat Transfer Operations: Steady state heat conduction through a hollow cylindrical pipe, Unsteady state steam heating of a liquid, heat transfer in a thermometer system, Unsteady state heat transfer by conduction.

UNIT - V

Modular Approaches and Equation Solving Approach: Modular approaches to process simulation. Analysis versus design mode.

The Equation Solving Apporach: Procedence - Ordering of equations sets, Disjointing, Tearing of system of equations.The SWS algorithm, maintaining sparsity.

Text Books:

1. Luyben, William, “Process Modelling, Simulation and Control for Chemical Engineers”, McGraw Hill, New York,1990.

2. B.V.Babu, “Process Plant Simulation”, Oxford University.

Reference Books :

1. Crowe, C.M., Hamielec, A.E., Hoffman, T.W., Johnson, A.I. Woods, D.R.and Shannon, P.T., “Chemical Plant Simulation”, Prentice Hall, inc., Englewood Cliff, New Jersey, 1971.
2. Westerberg, A.W., Hutchison, H.P., Motard, R.L. and Winter, “Process Flow Sheeting”, Cambridge University Press, Cambridge, 1979.
3. Hussain, Asghar, “Chemical Process Simulation”, Wiley Eastern Limited, NewDelhi, 1986.

PH021 - OPTIMIZATION TECHNIQUES

UNIT - I

Introduction to Process Optimization: formulation of various process optimization problems and their classification.

Basic Concepts of Optimization: convex and concave functions, necessary and sufficient conditions for stationary points.

UNIT - II

Optimization of Unconstrained Functions: one-dimensional search: Numerical methods for optimizing a function of one variable, scanning and bracketing procedures, Newton's, Quasi-Newton's and Secant methods of uni-dimensional search, region elimination methods, polynomial approximation methods.

UNIT - III

Unconstrained Multivariable Optimization: Direct methods, random search, grid search, uni-variate search, simplex method, conjugate search directions, Powell's method, indirect methods- first order, gradient method, conjugate method, indirect method-second order: Newton's method.

UNIT - IV

Constrained Optimization Algorithms: Kuhn-Tucker conditions, Transformation methods: Penalty function method, method of multipliers, Sensitivity analysis, Liberalized search techniques: Frank-Wolfe method, Cutting plane method.

UNIT - V

Specialized Algorithms: Integer Programming: Penalty function method, Branch and bound method. **Nontraditional Optimization Algorithms**: Genetic Algorithms: Working principles, differences between GAs and traditional methods, similarities between GAs and traditional methods, GAs for constrained optimization, other GA operators, Real-coded GAs, Advanced GAs.

Text Books:

1. T.F.Edgar and D.M.Himmelblau, "Optimization of Chemical Processes", Mc Graw Hill, International Editions, Chemical Engineering Series, 1989.
2. Kalyanmoy Deb, "Optimization for Engineering Design", Prentice Hall of India.

Reference Books :

1. G. S. Beveridge and R. S. Schechter, "Optimization Theory and

Practice”, Mc Graw Hill, New York, 1970.
2. Rekllitis, G.V., Ravindran, A., and Ragdell, K. M., “Engineering Optimization Methods and Applications”, John Wiley, New York, 1983.
3. S.S Rao, “Optimization Theory and Applications”.

PH022 - PARTICULATE TECHNOLOGY

UNIT- I

Introduction: Processes involving contact between solid particles and a Fluid, Packed Beds, Fluidized Beds advantages and disadvantages of fluidized beds for industrial applications. Fundamental fluidized bed behaviour, Fast fluidization circulating fluidized beds.

Particles and Fluidization: Physical properties of solid particles, size, sharp, size range, surface area of particles in a bed, Bed voidage, classification of particles according to fluidization characteristics, pressure drop across packed beds, minimum fluidization velocity and its determination.

UNIT -II

Two – Phase Theory of Fluidization: Bubbles and Fluidization Regimes, Bubble rise velocity, Bed expansion, Bubble growth and slugging, Mixing, Elutriation and Transport of solids, General mechanism of mixing of particles, mixing and segregation of particles, Terminal velocity of particles, Elutriation, transport disengaging height, solids transport. Davidson's Medal, Diffusion model, Bubbling bed model, ideal mixing stage model, two resign models.

UNIT- III

Fluidized Bed Heat Transfer : Heat Transfer in Beds of Particles, Gas

– to – particle heat transfer, Bed – to surface heat transfer, particle convection component, interphase gas connective component, Radioactive component, Estimation of Bed – to surface Heat Transfer coefficient, Heat Transfer between the Bed-Distributor, side walls, immersed tubes or components, Heat Transfer to surfaces located above the Bed, Free surface, Design for physical operation, Batch and continuous operation for Mass & Heat Transfer and Drying of solids.

UNIT- IV

Design of Simple Fluidized Beds: Introduction, Estimation of Bed Dimensions and Fluidizing velocity, Transport disengaging Height, Distributors, Heat removal from fluidized beds, staging of the beds counter flow staging, cross flow staging, cooling tubes in the bed, optimum size of a fluidized bed reactor, power consumption.

UNIT -V

Fluidized Bed Combustion: Introduction, combustion systems for solid fuels combustors and the first law of thermodynamics, fluidized Bed combustion of solid fuels, pressurized fluidized bed combustion, size of fluidized bed combustion system. Heat removal requirements, size of inert particles in the bed, velocity of fluidizing gas, turndown efficiency of fluidized bed combustion, Equipment, combustion of fuel particles in a fluidized bed, distinction between boiler and furnaces, methods of starting up, circulating or ‘fast’ fluidized bed combustion systems, control of emission.

Text Books:

1. J.R. Howard Adam Hilger, “Fluidized Bed Technology (Principles & Applications)”, IOP, Publishing Ltd., NY,1989.
2. Diazo Kunll & Octave Levenspiel, “Fluidization Engineering”, Wiley – International Edition, John Wiley & Sons, 2002.

PH023 - PETROLEUM REFINERY PROCESSES

UNIT- I

Sources of Petroleum:

Past, present and future of petroleum refining, Characterization of petroleum & Petroleum products, Chemical Composition of Crude Petroleum.
Various processes and techniques involved in thermal cracking, Catalytic cracking, Fluidized catalytic cracking, Steam reforming and partial Oxidation.

UNIT- II
Thermal Cracking:

Mechanism involved during thermal cracking reaction, Fundamentals of initiation, propagation, disproportionation and termination steps during free radical reactions.
Recent trends in the production of LDPE and HDPE, Details of thermal cracking to produce light olefins from various feed stocks.

UNIT- III
Petroleum Feed Stocks:

Effect of various parameters i.e temperature, residence time and C/H ratio on yields of important products from various feed stocks during thermal cracking.

UNIT- IV
Catalytic Cracking:

Coke formation during thermal cracking and catalytic cracking reactions from Various petrochemical feed stocks, Simple models of coke formation during thermal cracking reactions to produce maximum light olefins.

UNIT- V
Petrochemical Industry Scenario:

Various structures of deposited coke during pyrolysis, Various ways to inhibit coke formation.
Global economic scenario, Environmental aspects in general, Present Indian Scenario of Petroleumindustry,

Text Books:

1. Dr B.K. Baskara Rao, "Petroleum Refining", 3rd ed., Oxford – IBH, 1998.
2. Dr B.K. Baskara Rao, "Petrochemicals", 2nd ed., Kanna Publishers, 1998.
3. Nelson, W.L. "Petroleum Refinery Engineering", 1st ed., McGraw Hill, New

York 1961.

Reference Books :

1. Hengstebeck R.J., “Petroleum Refining”, 1st ed., McGraw Hill, New York 1959.
2. Steiner H, “Introduction to Petroleum Chemical Industry”, 1st ed., Pergamon, London, 1961.
3. V.Y.Sern, “Gas Phase Oxidation”, 2nd ed., Pergamon, London, 1964.
4. A.L. Waddams “Chemicals from Petroleum”, 1st ed., Chemical Publishing co, 1969.

PH024 - POLYMER ENGINEERING

UNIT - I

Polymer Fundamentals: Defining polymers, classification of polymers and fundamentals concepts, chemical classification of polymers based on polymerization Mechanisms. Molecular weight distributions, configuration and crystallinity of polymeric materials.

Step Growth Polymerization: introduction, esterification of homologous series and the equal reactivity hypothesis, kinetics of A-R-B polymerization using the equal reactivity hypothesis, average molecular weight in step growth polymerization, molecular weight distribution in step growth polymerization.

UNIT - II

Chain Growth Polymerization: Introduction, Radical Polymerization, Kinetic model of radical polymerization, average molecular weight in radical polymerization, verification of the kinetic model and the gel effect in radical polymerization, temperature effect in radical polymerization.

Ionic and anionic polymerization, Zigler-Natta catalyst in stereo regular polymerization, kinetic mechanism in heterogeneous stereo regular polymerization, stereo regulation by Zigler – Natta catalyst, rates of Ziegler – Natta polymerization. Diffusional effect in Ziegular- Natta polymerization

UNIT - III

Emulsion polymerization, Introduction, aqueous emulsifier solutions, Smith and Ewart theory for state II of the emulsion polymerization Estimation of the total number of particles, Nt determination of molecular weight in emulsion polymerization, emulsion polymerization in homogeneous continuous flow stirred tank reactors (HCSTRs), time dependent emulsion polymerization.

UNIT - IV

Measurement of molecular Weight and its distribution: Introduction, End group analysis colligative properties, light scattering Ultracentrifugation, Intrinsic viscosity, gel permeation chromatography.

Thermodynamics of polymer mixtures: Introduction, criteria for polymer solubility, the Flora- Huggins theory, free volume theory, the solubility parameter, Polymer blends.

UNIT - V

Theory of Rubber Elasticity: Introduction, probability distribution for the freely jointed chain, elastic force between chain ends, stress- strain behavior, the stress tensor (matrix) measurement of finite strain, the stress constitution equation, vulcanization of rubber and swelling equilibrium.

Text Book:

1. Anil Kumar, Rakesh K. Gupta, “Fundamentals of Polymers”, McGraw Hill International Edition, 1998.

PH025 - REACTION ENGINEERING & REACTOR DESIGN

UNIT - I

Non-Ideal Flow: Two- parameter models- Modeling real reactors with combination of ideal reactors, testing a model and determining its parameters.
Mixing of Fluids: Zero parameter models, segregation model, and maximum mixedness.

UNIT – II
Fluid-Particle Reactions: Application to design of various types of contacting in gas- solid operations, Development of performance equation for frequently met contacting pattern assuming uniform gas composition, application to a fluidized bed with entrainment of solid fines.

UNIT - III
Fluid-Fluid Reactions: Applications to design- Towers for fast reaction; Towers for slow reaction, Mixer- settlers (Mixed flow of both phases), semi-batch contacting patterns, Reactive distillation and extractive reactions.

UNIT - IV
External Diffusion Effects on Heterogeneous Reactions: External resistance to mass transfer.

Diffusion and reaction in porous catalysts- Diffusion and reaction in spherical / cylindrical Catalyst pellets, Internal effectiveness factor, Falsified kinetics, Overall effectiveness factor, Estimation of diffusion and reaction limited regines.
Catalysis and Catalytic Reactors: Design of reactors for gas- solid reactions. Heterogeneous data analysis for reactor design, moving bed reactors, fluidized bed reactors.

UNIT - V
Non- Isothermal Reactor Design: energy balance, non- isothermal continuous Flow, reactors at steady state, equilibrium conversion; multiple steady states-heat removed term, heat of generation, ignition- extinction curve.

Text Books:

1. Fogler, H.S., “Elements of Chemical Reaction Engineering”, Prentice

Hall, New Jersey, 1986.
2. Octave Levenspiel, “Chemical Reaction Engineering”, Wiley Eastern university, 3rd ed., New Delhi, 2001.

MATHEMATICS

PH073 – MULTI VARIATE STATISTICS

UNIT-I

ReviewsofMultivariateDistributions,MultipleandPartialCorrelation and Regression,

Multivariate Normal Distribution, Marginaland ConditionalDistributions-Maximum likelihood Estimators ofsampleMean and dispersion Matrix.

UNIT-II

DistributionofmeanvectorandSampleDispersion Matrix- James-SteinEstimator for the

MeanVector,Wishart Distribution and its Properties (withoutderivation)-Distribution of Total, Partial and Multiple correlationundernullcase–Maximumlikelihoodestimatorsof total, partial and multiple correlation– Test basedon total, partial and multiple correlations.

UNIT-III

Tests basedon Mean Vectors for oneandtwo Multivariate NormalDistributions- Hotelling'sT2 andMahalanobisD2 teststatisticswiththeirnullandnon-nulldistributions- Related ConfidenceRegions-TestingandIllustration usinglikelihood Ratio Criterion.

UNIT-IV

Principal Component Analysis, Factor Analysis Underlying Models and Illustrations-

Identification Problem, Estimation -Maximum likelihood Method Centroid Method, Canonical Correlation–Extraction -Properties.

UNIT-V

Classification Analysis using Discriminant functions- Clustering techniques-

Hierarchical Clustering-Agglomerative techniques, Single Linkage Method, Complete average linkagemethod–Non-hierarchicalmethod–K-Meanconceptofmultidimensional scaling and correspondence analysis.

Books forStudy:

1. Anderson, T.W.(1980):An Introduction Multivariate Statistical Analysis,

Second Edition, WileyEastern.

2. Applied Multivariate Statistical, 5thEdition, Richard A.JohnsonDean.W.Wichern.

3. M.JambuandLebeaux,M.O.(1983):Cluster Analysis andDataAnalysis,North- Holland PublishingCompany.

Books forReference:

1. Kshirsagar, A.M.(1972):MultivariateAnalysis, Marcel Decker.

2. Morrison, D.F.(1976): MultivariateStatistical Methods, Second Edition, McGrawHill.

3. Afifi,A.A.andAzen,S.P.(1979):StatisticalAnalysis- A Computer Oriented Approach, Academic Press.

4. N.Giri, Multivariate StatisticalInference, Academic Press.

5. Reucher, MultivariateAnalysis, AcademicPress.

PH263 - STATISTICAL METHODS

UNIT I ESTIMATION THEORY

Estimators :Unbiasedness, Consistency, Efficiency and sufficiency – Maximum likelihood estimation – Method of moments.

UNIT II TESTING OF HYPOTHESIS

Sampling distributions - Small and large samples -Tests based on Normal, t, Chi square, and F distributions for testing of means, variance and proportions – Analysis of r x c tables – Goodness of fit.

UNIT III CORRELATION AND REGRESSION

Multiple and partial correlation – Method of least squares – Plane of regression – Properties of residuals – Coefficient of multiple correlation – Coefficient of partial correlation – Multiple correlation with total and partial correlations – Regression and partial correlations in terms of lower order co - efficient.

UNIT IV DESIGN OF EXPERIMENTS

Analysis of variance – One way and two-way classifications – Completely randomized design – Randomized block design – Latin square design - 2 2 Factorial design.

UNIT V MULTIVARIATE ANALYSIS

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components : Population principal components – Principal components from standardized variables.

REFERENCES:

1. Gupta. S.C., and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, Eleventh Edition, 2002
2. J.E. Freund, Mathematical Statistical", 5th Edition, Prentice Hall of India, 2001.
3. Jay L. Devore, "Probability and statistics for Engineering and the Sciences", 5th Edition, Thomson and Duxbury, Singapore, 2002
4. Murray. R. Spiegeland Larry J. Stephens, "Schaum's Outlines- Statistics", Third Edition, Tata McGraw-Hill, 2000
5. R.A. Johnson and C.B. Gupta, "Miller & Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th Edition, 2007
6. Richard A. Johnson and Dean W. Wichern, "Applied Multivariate Statistical Analysis",

Pearson Education, Asia, 6th Edition, 2007.

PHYSICS

PH040 - VACUUM & THIN FILM TECHNOLOGY

Unit – I Production of vacuum:

Vacuum pumps: Principles of pumping , Mechanical oil sealed rotary pumps, Roots pump, Diffusion pump, Cryogenic pumps, ion pumps.

Unit – II Measurement of Low Pressure:

Manometer, Mac Leod gauge, radiometer gauge, Thermal conductivity gauges - Pirani gauge, Thermocouple gauge, Semiconductor gauge, Ionization gauges - Hot-Cathode ionization gauge , Cold – cathode ionization gauge (Penning gauge).

Unit- III Nucleation and Film growth:

Thermodynamics of nucleation, nucleation theories: Capillarity model, Atomistic or statistical model, Comparison of two models of Nucleation, Film growth

***Thickness measurement*:** Microbalance technique, crystal oscillator technique, Optical methods - Photometric method, Ellipsometry and Interferometry

Unit – IV Thin film deposition methods*:*

Introduction to thin film – Basic principle-

Physical methods: Ball milling, Thermal evaporation, Flash evaporation, Activated Reactive Evaporation (ARE), Electron beam (EB) evaporation, DC Magnetron sputtering, RF Magnetron sputtering, Pulsed laser deposition, Molecular Beam Epitaxy, Lithography, Electron Beam Lithography, Nanoimprint Lithography, Dip Pen Nanolithography.

Chemical methods: Chemical vapour deposition, Vapour Phase Epitaxy, spray pyrolysis, Spin coating, Sol-gel process, electrochemical deposition.

Unit – V Applications of thin film technology:

Thin film resistors, Thin film capacitors, Thin film solar cells, Gas sensors, Thin film solid state micro batteries, Micro and opto electronic devices, Chromogenic devices.

Text Books:

1. Vacuum Technology by Roth,(North-Holland publishing company,USA)
2. Vacuum Technology by Wadd and Bunn,
3. Thin Film Phenomena, K. L. Chopra(1969,McGraw-Hill,New York)
4. Thin Film Fundamentals by Goswami (2007,New Age International (P) Ltd.,New Delhi)
5. Hand book of thin Film by L. I. Maissel & R. Glang (1970, McGraw-Hill, New York)
6. Preparation of Thin Film by Joy George, (Marcel Dekker, Inc., New York)

References:

1. The Materials Science and Thin Films by Milton Ohring, Academic Press

1992.
2. Thin Film Deposition: Principles and Practice by Donald L. Smith, McGraw Hill 1995.
3. Ludminla Eckertova, 'Physics of thin films', Plenum press, New York 1977.

PH074 - CONDENSED MATTER PHYSICS AND CHARACTERIZATION TECHNIQUES

Unit: I Solids and Crystal Structure:

Formation of solids- Interatomic forces, Types of Bonding, Crystal lattice and Unit cell, Planes and Miller Indices, Crystal System and Symmetry, Inter-planar Spacing, Polymorphism, Single crystal and Poly crystalline material, Amorphous and Liquid state, Liquid Crystal-Solid state imperfections.

Unit – II Band theory of Solids

Remarks in free electron theory, The Bloch Theorem, The Kronig-Penney model, The motion of electrons in one dimension according to the Band theory, The distinction between metals, insulators and intrinsic semiconductors, Brillouin Zones: density of states and overlapping of energy bands.

Unit - III Spectroscopy:

Properties of Light, Optical Constants – Methods for determining optical constants: reflection & transmission methods, UV-Visible Spectrophotometry, FTIR, RAMAN (Quantitative Analysis).

Unit – IV Crystal Growth and Structural Analysis*:*

Methods of crystal growth- Hydrothermal growth, Gel growth, Growth from melt , Electrocrystallisation, Growth from vapour, Low temperature solution growth.

Bragg's law, Bragg's Spectrometer, X-ray diffraction, Laue method, Powder Crystal method, Rotating Crystal method, GIXRD.

Unit – V Texture and Morphological Studies:

Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Scanning Tunneling Electron Microscopy (STM), Energy Dispersive X-ray analysis (EDXA), X-ray Photo Electron Spectroscopy (XPS), Field Emission Scanning Electron Microscopy (FESEM), High Resolution Transmission Electron Microscopy (HRTEM).

Text books:

1. Solid state Physics by A.J.Dekkar, MacMillon Co LTD
2. Introduction to Solid state Physics by Charles Kittel, 8th edition, WSE series
3. Nano Science and Nano Technology by M.S. Ramachandra Rao and Shubra Singh, Wiley pub, 2013
4. Instrumental methods and analysis-Willards Merrit et.al (CBS)2011
5. Introduction to crystal growth methods by M.L. Caroline, 2010
6. Solid State Physics by S.O. Pillai, 7 th edition 2012
7. Elementary solid state Physics by M.AliOmer, Lpe pearson

Reference books:

1. Nano technology by M.A.Shah and K.A.Shah, Wiley Pub 2013

2. Modern optical spectroscopy by William W. Parson, Springer

3. Enclopedia of characterization-C.Richard Brundle et.al(2006)

4. Solid State Chemistry and its applications, Anthony R.West,2 nd edition

Bachelor of Computer Applications (BCA) (2015-18)

Course Structure

I Semester

S.No	Name of the subject	L	P	To	C	Internal	External	Total
1	BC101- Digital Computer Fundamentals	4		4	4	40	60	100
2	BC103- Computer Programming	4		4	4	40	60	100
3	BC105- Principles and practice of Management	4		4	4	40	60	100
4	BC107- Mathematics - I	4		4	4	40	60	100
5	BC109- Technical communication Skills Lab		3	3	2	50	50	100
6	BC111- Office Automation Lab - I		3	3	2	50	50	100
7	BC113- Computer Programming Lab		3	3	2	50	50	100
		16	9	25	22	310	390	700

II Semester

S.No	Name of the subject	L	P		To	C	Internal	External	Total
1	BC102- Data Structures	4			4	4	40	60	100
2.	BC104- Internet and Web Technologies	4			4	4	40	60	100
3	BC106- Accounting and Financial Management	4			4	4	40	60	100
4	BC108- Mathematics – II	4			4	4	40	60	100
5	BC110- Soft Skills Lab		3		3	2	50	50	100
6	BC112- Data Structures Lab		3		3	2	50	50	100
7	BC114- Internet and Web Technologies Lab		3		3	2	50	50	100
		16	9		25	22	310	390	700

III Semester

S.No	Name of the subject	L	P	To	C	Internal	External	Total
1	BC201- Object Oriented	4		4	4	40	60	100

	Programming with Java							
2	**BC203**- Database Management Systems	4		4	4	40	60	100
3	**BC205**- Software Engineering	4		4	4	40	60	100
4	**BC207**- Organization Behavior	4		4	4	40	60	100
5	**BC209**- Statistical Techniques Lab		3	3	2	50	50	100
6	**BC211**- Object Oriented Programming through Java lab		3	3	2	50	50	100
7	**BC213**- Database Management Systems Lab		3	3	2	50	50	100
		16	9	25	22	310	390	700

IV Semester

S.No	Name of the subject	L	P	To	C	Internal	External	Total
1	**BC202**- Multimedia Systems	4		4	4	40	60	100
2	**BC204**- Computer Networks	4		4	4	40	60	100
3	**BC206**- Operating Systems	4		4	4	40	60	100
4	**BC208**- E- Commerce	4		4	4	40	60	100
5	**BC210**- Multimedia Systems Lab		3	3	2	50	50	100
6	**BC212**- Computer Networks Lab		3	3	2	50	50	100
7	**BC214**- Linux basics and shell programming lab		3	3	2	50	50	100
		16	9	25	22	310	390	700

V Semester

S.No	Name of the subject	L	P	To	C	Internal	External	Total
1	**BC301**- Open source Systems	4		4	4	40	60	100

2	BC303- Data warehousing and Mining	4		4	4	40	60	100
3	BC305- Software Testing Methodologies	4		4	4	40	60	100
4	BC307- Embedded Systems	4		4	4	40	60	100
5	BC309- Open source systems Lab		3	3	2	50	50	100
6	BC311- Data warehousing & Mining Lab		3	3	2	50	50	100
7	BC313- Professional Communications Lab		3	3	2	50	50	100
		16	9	25	22	310	390	700

VI Semester

S.No	Name of the subject	L	P	To	C	Internal	External	Total
1	BC302- Information Security	4		4	4	40	60	100
2	BC304- Big data Analytics	4		4	4	40	60	100
3	BC306- Seminar	2		2	1	50	50	100
4	BC308- Project				15	40	60	100

BC101-DIGITAL COMPUTER FUNDAMENTALS

Course Description and Objective: The student should learn the Fundamental components used in a Digital Computer which is essential for the programme.

Course Outcomes: After Completion of the subject student should able to

- Identify the logic gates and their functionality

- Perform Number Conversions from one System to another System
- Design basic electronic Circuits(combinational circuits)
- Understand the Construction of Memory

Unit 1- Introduction to Number System and Codes

Decimal Numbers, Binary Numbers, Decimal to binary Conversions, Binary Arithmetic, 1's and 2's complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed numbers, Hexadecimal Numbers, Octal Numbers, Digital Codes, Error Detection Codes.

Unit 2- Logic gates

The Inverter, The AND gate, The OR gate, The NAND gate, NOR gate, The Exclusive – OR gate and Exclusive NOR gate. Boolean Algebra and Logic Simplification: Boolean Operations and Expressions, Laws and Rules, DeMorgan's Theorems, Boolean Expressions and Truth tables, The karnaugh Map, SOP minimizations.

Unit 3- Combinational Logic Analysis

Basic combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR Gates. Functions of Combinational Logic: Basic Adder, Parallel Binary Adders, Comparators, Decoders, Encoders, Code Converters, Multiplexers, Parity Generator/Checkers.

Unit 4- Latches and Flip-flops

Latches, Edge Triggered Flip-Flops, Flip-Flop Operating characteristics, Flip-Flop Applications. Counters: Asynchronous Counters, Synchronous counters.

Unit 5- Memory and Storage

Memory Basics, The RAM, The ROM, Programmable ROMs, The Flash Memory, Memory Expansion, Special Types of Memories, Magnetic and Optical Storage.

TEXT BOOK(s): 1. Floyd, Thomas L: "Digital Computer Fundamentals", 10^{th} Edition, 1997. University Book Stall.

REFERENCE BOOK(S):

1. Malvino, Paul Albert and Leach, Donald P: "Digital Principles and Applications" 4th Edition, 2000. TMH.

2. Malvino, Paul Albert and Leach, Donald P: "Digital Computer Fundamentals" 3rd Edition, 1995. TMH. 3. Bartee, Thomas C: "Digital Computer Fundamentals" 6th Edition, 1995. TMH.

BC103- COMPUTER PROGRAMMING

Course Description and Objective:

The purpose of this course is introduce to students to the field of programming using C language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

Course Outcomes: After Completion of the course student should able to

- Know the basics of computer science
- Know concepts in problem solving
- To do programming in C language

UNIT – 1 Computer and Data

Introduction - Computer Hardware, Data, Computer Software, History, Classification of computers- Workstations, Mainframe, Super computers, client and server, Data Inside the computer, Representing Data.

Algorithm - Concept, Algorithm representation, Sub algorithms. Evolution of Programming languages, Building a program, Program execution, categories of languages. CPU, Main memory, Input or Output, Interconnection of subsystems Operating systems- Definition, Evolution, Components.

UNIT –2 Introduction to C

Desirable Program Characteristics. Data types, Constants, Variables and Arrays, Declarations, Expressions Statements, Symbolic Constants, Operators and Expressions, Data Input and Output. Preparing and Running A Complete C Program.

Control Statements: Preliminaries, Branching, looping, The Switch Statement, The break Statement, The continue Statement, The comma Statement, The go to Statement.

UNIT –3 Functions

A Brief Overview, Defining a Function, Accessing a Function, Function Prototypes, Passing Arguments to a Function, Recursion.

Program Structure: Storage Classes, Automatic Variables, External (Global) Variables, Static Variables.

Arrays: Defining an Array, Processing an Array, Passing Arrays to Functions, Multidimensional Arrays, Arrays and Strings.

UNIT - 4Structures and Unions:

Defining a Structure, Processing a Structure, User-defined Data Types (Typedef), Structure and Pointers, Passing Structures to Functions, Self-referential Structures, Unions.

Pointers: Fundamentals, Pointer Declarations, Passing Pointers to a Function, Pointers and One-dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers, Passing Functions to Other Functions

UNIT - 5Data Files:

Why Files, Opening and Closing a Data File, Reading and Writing a Data File, Processing a Data File, Unformatted Data Files, Concept of Binary Files

TEXT BOOK(S):

1. Foundations of computer science, Behrouz A. Forouzan, 2nd edition.
2. Introduction to computers, 6/e, Peter Norton TMH.
3. Byron S Gottfriend, “Programming with C”, Second Edition, Schaum Out Lines, TATA Mc Graw Hill (2007)

REFERENCE BOOK(S):

1. Sinha P., “Foundation of Computing”, BPB Publication, 1st Edition, 2003
2. Rajaraman V, "Fundamental of Computers" (2nd edition), Prentice Hall of India, New Delhi. 1996.

3. Behrouy A. Foreuzan& Richard F. Gilberg, "Computer Science A structured programming Approach using C", Third Edition, Cengage Learning (2008).
4. Herbert Schildt, "The Complete Reference C", Fourth Edition, TMH (2008)

BC105- PRINCIPLES AND PRACTICE OF MANAGEMENT

Course Description and Objective*:*

Objective of the course is to provide basic perspectives of Management theories and practices. This will form foundation for further study of functional areas of management and give a conceptual framework for understanding.

Course Outcomes: After Completion of the course student should able to

- Know the basics concepts of management
- Know about various theories of Management
- Know about various functions of Management

UNIT -1 Introduction to Management

Concept of management – evaluation of management - nature ofmanagement – scope of management – functions of management – theories of management – scientific management theory – Henry fayol's theory – classification theory – human relations theory – behavioral theory – management Vs administration – universality of management

UNIT-2 Planning

Importance – advantages – disadvantages – types of plans – process of planning – steps involved in planning- Decision – Decision Making – Process and Techniques

UNIT-3 Organizing:

Principles of organization – types of organization structures, merits, demerits and suitability – Departmentation, Delegation and decentralization

UNIT-4 Directing:

Meaning and Nature of Directing - types of leaders – leadership qualities – leadership theories – motivation theories, Maslow's need hierarchy theory – Herzberg's two factor theory – theory X and theory Y – equity theory – expectations theory – communications – importance – formal and informal communication.

UNIT-5 Controlling:

Importance of controlling – need for controlling – steps involved in controlling – process of controlling – techniques in controlling.

Text Book(s):

1. Weirich& Koontz, "Essential of Management", TMH.
2. Massie, "Essentials of Management",

Reference Book(s):

1. Jonus A. F. Stoner, "Management", Thomson.
2. Heinz Weihrich, Harold Koontz, "Management A Global Perspective", TMH, 10/e, 2002.
3. Stephen P. Robbins Mary Coulter, "Management", PHI, 8/e, 2006

BC107- MATHEMATICS – I

Course Description and Objective*:*

Objective of the course is to provide basic knowledge in mathematics which is used in several branches of science and engineering. This will form foundation for further study of computer science.

Course Outcomes: After completion of the course student should able to

- Know the basics of matrices and its applications, solving system of equations
- Know about differential equations and its applications
- Know about number theory used in computer science applications

Unit -1 Matrices

Matrix, Types of matrices, Algebraic operations on matrics, Determinants, Elementary row (column) operations, Rank of a Matrix by reducing it to echelon from, Rank of a matrix by normal form, Finding the inverse of a matrix.

Unit -2Matrices – 2

Homogeneous and non-Homogeneous system of equations, Consistency criterion, Characteristic equations, Eigen values, Eigen vectors and properties, Cayley Hamilton theorem (Statement only)

Unit-3 Differential Equations – 1

Definition and examples, Order and Degree, Solutions of first order first degree differential equations, Variable separable, Equations reducible to variable separable, Homogeneous equations, non homogeneous equations

Unit -4 Differential Equations – 2

Exact differential equations, non exact equations, linear differential equations – Bernoulli's differential equations

Unit 5 Number Theory

Divisibility, Division Algorithm, Greatest Common Divisor, Euclid's algorithm to find the G.C.D. of two non-zero integers, Prime and Composite numbers, Unique Factorization theorem, Division of a given number, Euler's Ø Function

Text Books:

1. Vasishta A R : "Matrices", Krishna PrakashanMandir
2. Frank Ayres J R : "Matrices",Schaum series, TMH.

Reference Books

1. Frank Ayres J R : "Differential Equations", Schaum series, TMH.
2. S. Narayana & T. K ManicavachogamPillay : " Differential Equations" , SV Publishers
3. Remedial Mathematics, P. Seshagiri Rao
4. Apostol T M : "Introduction to Analytic Number Theory", Narosa Publishing House
5. Herstein I N : "Modern Algebra".

BC109- TECHNICAL COMMUNICATION SKILLS LAB (BUSINESS ENGLISH COMMUNICATION)

Course Description and Objective*:*

To introduce students to the specific use of language for the purposes of Business Communication which would be an essential prerequisite for success in the areas of writing and speech. The teaching efforts in this course will be directed towards making students develop their business and general writing abilities using the fundamental principles that apply to the correct use of the English language free of grammatical and other related errors

Course Outcomes:

By observing the rules of grammar, vocabulary and composition that are learnt during the course, students are made

- to appreciate the intelligent and innovative use of rules
- able to generate creative output in tune with the demands of industry and the corporate world
- The course improves their power of comprehension and the ability to express themselves with rigor through writing and speech.

UNIT-1:

Text : GLOBAL ISSUES

(Child Labour – Food Crisis – Genetic Modification – E-waste – Assistive Technology)

Grammar : Articles – Prepositions-

Vocabulary : Root–Prefixes-Suffixes - Synonyms – Antonyms

Composition : Paragraph Writing (Descriptive & Narrative) , Letter Writing (Formal - Application - Business)

UNIT-2:

Text : MEDIA MATTERS

(History of Media – Language and Media – Milestones in Media – Manipulation by Media – Entertainment Media - Interviews)

Grammar : Time and Tense (Present-Past-Future; Helping Verbs; Modals)

Vocabulary : Use of Adjectives

Composition : E-mail - Report-Writing – Writing Advertisements

UNIT-3:

Text : LESSONS FROM THE PAST

(Importance of History – Differing perspectives – Modern Corporatism – Lessons from the Past)

Grammar : Subject-Verb Agreement - If Conditional

Vocabulary : Idioms & Phrases – One-word Substitutes

Composition : Summarizing and Note-making

UNIT-4:

Text : TRAVEL AND TOURSIM

(Advantages and disadvantages of Travel – Tourism – Atithidevobhava – Tourism in India)

Grammar : Sentence Transformation (Degrees, Voice, Speech & Synthesis)

Vocabulary : Phrasal Verbs

Composition : Letter Writing (Formal - Application - Business)

Practice : Situational Conversations – Role-Plays

(Introducing; Greeting; Enquiring; Informing; Requesting; Inviting -Emotions; Directions; Descriptions; Agreements; Refusals; Suggestions)

UNIT-5:

Text : GETTING JOB-READY

(SWOT-Analysis – Companies and Ways of Powering Growth – Preparing for Interviews)

Grammar : Common Errors

Vocabulary : Connectives – Discourse Markers

Composition : Profile - Curriculum Vitae – Problem Solving (Case Studies)

Practice : Group Discussions

Textbook(s):

1. Mindscapes - Orient Black Swan, 2012.

Reference Book(s):

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient Longman, 2003.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, Macmillan Ltd., 2000.
4. Sasikumar.V and P.V. Dhamija,. Spoken English: A Self-Learning Guide to Conversation Practice, 34th Reprint, Tata McGraw Hill, New Delhi, 1993.
5. Margaret M Maison, “Examine your English”, 1st edition, Orient Longman, 1999.
6. Meenakshi Raman and Prakash Singh, “Business Communication”, 2nd edition, Oxford University Press, 2012

BC111- OFFICE AUTOMATION LAB

Course Description and Objective*:*

0ffice tools course would enable the students in crafting professional word documents, excel spread sheets, power point presentations using the Microsoft suite of office tools.To familiarize the students in preparation of documents and presentations with office automation tools.

Course Outcomes:

By learning the course, the students will be able

- to perform documentation
- to perform accounting operations
- to perform presentation skills

Word

Word Orientation : The instructor needs to give an overview of Microsoft word & Importance of MS Word as word Processor, Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

Task 1 : Using word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

Task 2 : Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes.

Task 3 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

Task 4 : Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel

Excel Orientation :The instructor needs to tell the importance of MS Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files, Using help and resources

{Comdex Information Technology course tool kit Vikas }

Task1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2 : Calculations - Features to be covered:- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3 : Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Task 4 : Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

MS Power Point

Task1 : Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows

Task 2 : This session helps students in making their presentations interactive. Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Task 3 : Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes :- Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing

Task 4 : Power point test would be conducted. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Text Book(s) :

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book,3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

4.PC Hardware and A + Handbook – Kate J. Chase PHI

BC113- COMPUTER PROGRAMMING LAB

Course Outcomes:

A comprehensive problem solving skills through C language is offered to enable the students to write diversified solutions using this language.

l.a) Write a C program to find the sum of individual digits of a positive integer.

b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

2.Write a C program to find whether :

a) The given number is Armstrong or not.
b) The given number is Strong number or not.
c) The given number is Perfect number.

3. a) Write a C program to calculate the following Sum:

$Sum=1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$

b) Write a C program toe find the roots of a quadratic equation.

4.a) Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.
ii) To find the GCD (greatest common divisor) of two given integers.
iii) To solve Towers of Hanoi problem.

5.a) The total distance travelled by vehicle in 't' seconds is given by distance = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

b) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

6.a) Write a C program to find both the larges and smallest number in a list of integers.

b) Write a C program that uses functions to perform the following:

i) Addition of Two Matrices
ii) Multiplication of Two Matrices

7.a) Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to given main string from a given position.
ii) To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not

8.a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

b) Write a C program to count the lines, words and characters in a given text.

9.a) Write a C program to generate Pascal's triangle.

b) Write a C program to construct a pyramid of numbers.

10.Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

11.Write a C program that uses functions to perform the following operations:

i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers
(Note: represent complex number using a structure.)

12.a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

BC102- DATA STRUCTURES

Course Description and Objective:

The main objective of this course is to provide an introduction to basic data structures and manipulation by using C programming language. It enables the students to understand Abstract Data Types. It also enables the students to understand the behavior of data structures (lists, stacks, queues, trees (binary trees and tree traversals, height-balanced trees), graphs, hash tables). It improves his ability to analyze a problem and determine the appropriate data structure for the problem.

Course Outcome:

Having successfully completed this course, the student will be able to:

- Apply C programming techniques such as pointers, dynamic memory allocation, structures to developing solutions for particular problems.
- Design and implement abstract data types such as linked list, stack, queue and tree in C programming language using static or dynamic implementations.
- Evaluate and choose appropriate abstract data types to solve particular problems.

UNIT – 1Concept of Data Structures

Implementation of Data Structures Arrays: One-dimensional array, multidimensional arrays, pointer Arrays, linked lists: Types of linked list, applications of linked lists.

UNIT – 2Stack

Introduction to stack, Representation of a stack, operations on stack, applications of stacks; Queue: Representation of Queues, Operations on Queue, various Queue structures, Applications of Queues.

UNIT-3Trees

Definition and concepts of trees, Representation of Binary tree, types of Binary trees, Tree Traversals operations of Binary search tree, Introduction to AVL trees.

UNIT-4Graph

Terminologies, Representation of Graphs, operations on graphs, Graph traversals, Applications of Graphs, minimum spanning trees.

UNIT-5Sorting Techniques

Insertion sort, selection sort, merge sort, heap sort, searching Techniques : linear search, binary search and hashing.

Text Book(s):

1. DebasisSamanta, "Classic Data Structures", PHI Learning Private Limited, 2nd edition, 2011.

2. E. Horowiz& S. Sahani, "Fundamentals of Data Structures", Galgotia Book Source Pvt. Limited, 3rd edition, 2003.

Reference Book(s):

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education.

2. SartajSahni, Data Structures, Algorithms and Applications in C++ , Universities Press, Second Edition, 2005

3. Jean Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications,Tata Mc-Graw Hill, Second Edition, 26th Reprint 2004

BC104-INTERNET AND WEB TECHNOLOGIES

Course Description and Objective:

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

Course Outcomes:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas.

UNIT-1 Networking Protocols and OSI Model

Introduction, Protocols in Computer Communications, the OSI Model, OSI Layer Functions.
Internet Working Concepts, Devices, Internet Basics, History and Architecture: Introduction, Why Internet Working?, Problems in Internet Working, Dealing with Incompatibility Issues, A Virtual Network, Internet Working Devices, Repeaters, Bridges, Routers, Gateways, A Brief History of the Internet, Growth of the Internet.

UNIT-2 WWW, HTTP, TELNET

Introduction, Brief History of WWW, the Basics of WWW and Browsing, Hyper Text Markup Language, Common Gateway Interface, Remote Login.

UNIT-3 JavaScript and AJAX

Introduction, JavaScript, Basic Concepts, Controlling JavaScript Execution, Miscellaneous Features, JavaScript and Form Processing, Pop-up Boxes.
AJAX:
Introduction, How AJAX Works? , Life without AJAX, AJAX Coding, Life with AJAX.

UNIT-4 Introduction to XML

What is XML?, XML versus HTML, Electronic Data Interchange, XML Terminology, Introduction to DTD,Document-Type Declaration,Element-Type Declaration,AttributeDeclaration,Limitations of DTDs, Introduction to Schema, Complex Types, Extensible Stylesheet Language Transformations, Basics of Parsing, JAXP

UNIT-5 Creating Good Web Pages

Introduction, Top Level Navigation, Creating Sample Layouts, Metaphor, Theme, and Storyboard, Screen Resolution,3-Column Layout, Using Frameworks, Using Graphics, Usability for the Handheld Devices, Creating Multilingual Web sites, XHTML and Web Browser Compatibility Issues, Designing the Basic Elements of a Home Page.

TEXT BOOKS:

1. AchyutGodbole,AtulKahate"WebTechnologies:TCP/IP,Web/Java Programming, and Cloud Computing”,ThirdEdition,McGraw Hill Education.

Reference Books:

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
2. Raj Kamal, “Internet and Web Technologies”, Tata McGraw-Hill.

BC106- ACCOUNTING AND FINANCIAL MANAGEMENT

Course Description and Objective*:*
This course is intended to provide knowledge on accounting practices to equip students with concepts, process and reporting of financial statements in modern organizations.
Course Outcomes: The student will be able to

- understand the basic concepts of accounting
- analyze and perform Financial Accounting and statements

.

UNIT-2Accounting

Introduction, Double entry system of Accounting and book keeping, Rules of debit & credit and their application, Meaning of terms like debtor, creditor, assets, liabilities, goods, journal, ledger, vouchers, insolvency, invoice/credit verification, etc.,

UNIT-2Accounting Cycle

Systems of Accounting, Process of accounting transactions, Classification of Accounts, Journal-Ledgers, Trial balance.

UNIT-3Final Accounts

Trading - Profit & Loss Account - Balance sheet. – Problems with Simple Adjustments

UNIT-4 Ratio Analysis

Meaning – Advantages and Disadvantages, Types of Ratio's- Liquidity, Solvency, Turnover, Profitability

UNIT-5 Cost Accounting and decision-making

Meaning of key terms, objectives of cost accounting- Elements of cost- Preparation of cost sheet- CVP-Analysis (Break-even point Analysis).

TEXT BOOK(S):

1. R K Sharma and S K Gupta "Accounting Management",
2. Maheshwari, S.N., &Maheshwari, S.K. (2012). *Advanced Accountancy* (10th edi), New Dehli:Jain Book Agency.

Reference Book(s):

1. Jain S.P., &Narang K L. (nd). *Basic Financial Accounting*, *I*, New Dehli:Kalyani publishers.

2. Shukla, M. (nd). *Advanced Accounts*, New Delhi:S Chand Group

3. Radhaswamy, M & Gupta, R.L. (2008). *Advanced Accountancy. 2*, New Delhi:Sultan Chand & Sons.

BC108- MATHEMATICS – II

Course Description and Objective:

Objective of the course is to provide basic knowledge in mathematics which is used in several branches of science and engineering. This will form foundation for further study of computer science.

Course Outcomes: After completion of the course student should able to

- Know about the derivativesof functions of two and several variables partial differential equations and its applications
- Know about Coordinate geometry which is required for computer graphics etc
- Know about Group theory, Group Homomorphisms and graph theory used in computer science applications

Unit-1 Partial Differentiation

Functions of two variables, Partial derivatives, Second and higher order derivatives, Maxima and minima, Simple applications, Jacobian.

Unit -2 Coordinate Geometry

Coordinate System (2 dimensional), Distance between two points, mid point formula, division in a given ratio, Geometrical representation of rectangle, rhombus, parallelogram, Equation of straight line in different forms, equations of parabola, circle, ellipse.

Unit-3 Theory of Groups

Definition of Group, Semigroup, Subgroup, Results on subgroups, Order of an element, Properties, Cyclic groups and related properties, Coset decomposition, Lagrange's theorem and its consequences.

Unit -4 Group Homomorphism and Rings

Normal subgroups and related results, Quotient group, Group homomorphism, Elementary properties, Kernel of homomorphism, Isomorphism and related results, Rings, Examples, Types of Rings, Fields Examples of Fields.

Unit -5 Introduction to Graph Theory

Graph definition, Types of graphs, Subgraph, Handshake theorem, Path, walk, circuit, cycle, Euler cycle, Hamiltonian path etc., Tree, Spanning tree.

Text Books:

- Vasishta A R : "Modern Algebra", Krishna PrakashanMandir
- T. K Manicavachogam : "Algebra", S V Publishers
- Chandrasekhar, Mathematical Foundation for Computer Science (For Graph Theory)
- Remedial Mathematics, P. Seshagiri Rao

BC110- SOFT SKILLS LAB

Course Description and Objective*:*

The Soft Skills Laboratory course is aimed at training undergraduate students and enabling them to acquire employability skills. Designed to impart work related skills, the course will help trainees develop interpersonal communication, leadership and team skills. It will give them the required competence and confidence to handle professional tasks.

Course Outcomes:

The Soft Skills course will help students

- develop professional and non-personal ways of approaching people and work through the correct use of language and speech in a workplace environment
- the ability to think critically on issues demanding attention
- enhancing self-awareness and a sense of self-worth in the students in order to improve their productivity and performance at the workplace.

UNIT-1

a) Role of language in Personality – How language reflects, impacts personality – Using gender-neutral language in MNCs – being culturally sensitive.

Activity – Appraising each other – Worksheets related to the above

b) Career Planning- job vs. career- goal setting- SWOT analysis- planning and prioritization - four quadrant time management system - time management – self-management – stress-management.

Activity: Setting a SMART goal - SWOT analysis of the self – Writing a Statement of Purpose (SOP).

c) Effective Resume-Writing: structure and presentation - planning and defining the career objective - projecting one's strengths and skill-sets – summarizing - formats and styles - covering letter.

Activity: Resume preparation –writing a covering letter.

UNIT-2

A) Functional English - Formal/informal context – purpose - interpersonal dynamics - ideation –content organization - initiating a conversation –responding appropriately - right body language.

Activity - Role play in different situations, - self-introduction - social background (family, home town etc.,) - role model - my future - likes/dislikes (movies, persons, places, food, music etc.,) - a mini project on functional English.

b) Vocabulary-Building: Etymology of words - word roots - prefixes & suffixes - synonyms & antonyms- collocations - one-word substitutes – analogies - idioms and phrases - contextual guessing of unfamiliar words – task-oriented learning (100 words).

Activity: Flash cards (200 words) – vocabulary exercises with hand-outs.

UNIT-3

a) Group Discussion: Articulation and flow of oral presentation - dynamics of group discussion – intervention – summarizing - voice modulation – content generation – Key Word Approach (KWA) – Social, Political, Economic, Legal and Technical Approach (SPELT) – View Point of Affected Part (VAP) - language relevance - fluency and coherence.

Activity: Mock sessions on four types of GD topics.

b) Facing Interviews: Interview process - understanding employer expectations - pre-interview planning - opening strategies - answering strategies – stress-based interviews - tele-interviews, video interviews- frequently asked questions (FAQs).

Activity: Writing responses to FAQs - mock interviews.

UNIT-4

a) Reading Comprehension: Reading as a skill- techniques for speed reading- skimming-scanning- appreciating stylistics - impediments for speed reading - eye fixation - sub-vocalisation - critical reading - reading based on purpose - reading for information - reading for inference -understanding tone.

Activity: Reading comprehension exercises with texts drawn from subject areas. (Hand-outs)

b) Listening Comprehension: Listening as skill - different types of listening - hidden data of communication - active listening - top-down approach - bottom-up approach.

Activity: Following different accents (Indian, British, American) listening comprehension exercises with audio and video excerpts.

UNIT-5

a) Data Commentary: Deductive & inductive reasoning - data interpretation - tables & charts - bar charts - pie charts - line graphs - ratios & proportions – percentages - coding and decoding - reasoning by analogy - artificial language etc.,

b) Analytical Thinking: Statement and Conclusion - Data Sufficiency - Statement and Argument - Statement and Assumption - Logical Deduction - Logical Problems.

Activity: Exercises with handouts.

Reference Books:

1. Edward Holffman, Ace the Corporate Personality, McGraw Hill,2001
2. Adrian Furnham, Personality and Intelligence at Work, Psychology Press, 2008.
3. John Adair Kegan Page, “Leadership for Innovation” 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, “Effective Technical Communication”, 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan & NP Singh , “Speaking English Effectively” 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect
7. K.R. Lakshminarayana& T. Murugavel, “Managing Soft Skills”, Scitech Publications. 2009
8. Dr. S.P. Dhanvel, English and Soft Skills, Orient Blackswan, 2011
9. Rajiv K. Mishra, Personality Development-, Rupa& Co. 2004.

10. R.S.Agarwal, Verbal & Non-verbal Reasoning, S. Chand& Co. Latest edition.

BC112- DATA STRUCTURES LAB

Course Description and Objectives:

The course is designed todevelop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures .

Course Outcomes:

At the end of this lab session, the student will

- Be able to design and analyze the time and space efficiency of the data structure
- Be capable to identity the appropriate data structure for given problem
- Have practical knowledge on the applications of data structures

List of Experiments:

1. Design and Implement List data structure using i) array ii) singly linked list.
2. Design and Implement basic operations on doubly linked list.
3. Design and Implement stack using i) array ii) singly linked list
4. Design and Implement Queue using i) array ii) singly linked list
5. Design and Implement basic operations on Circular Queue
6. Design and Implement basic operations(insertion, deletion, search, findmin and findmax) on Binary Search trees.
7. Implementation of Breadth First Search Techniques.
8. Implementation of Depth First Search Techniques.
9. Implementation of Dijkstra’s Algorithm.
10. Implementation of Kruskal’s Algorithm.
11. Implementation of MergeSort.
12. Implementation of Binary Search using arrays.

References Book(S):

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
4. Seymour Lipschutz, Data Structures, Schaum's Outlines Series, Tata McGraw-Hill.
5. Ellis Horowitz, SatrajSahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, W. H. Freeman and Company.
6. R. G. Dromey, How to Solve it by Computer, Prentice-Hall of India.

BC114- INTERNET AND WEB TECHNOLOGIES LAB

Course Description and Objective:

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

Course Outcomes:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas.

List of Experiments:

1. Create a table in HTML to the following details

Book Name	Author
Operating Systems	Godbole
Data Communications and Networks	Godbole
Computer Networks	Rajkumar
OOPs	R.Nageswara Rao

2. Create a form by using various attributes of the input tags.
3. Create a web page multiple types of style sheet used in a single page.
4.Write a CGI sample program to send output back to the user.
5.Write a Java Script program by using variables.
6.Write a java script program to multiply two numbers and display the result in separate text box.
7.Write a java script program on Form Validations.
8.Write a AJAX program checking the presence of XMLHttpRequest object.
9.Write a program to create sales report for our books by using AJAX.
10.Create an XML document template to describe the result of students in an examination.The description should include the student's roll number,name,three subject names and marks,totalmarks,percentage and results.
11.Write an XSLT code to only retrieve the book titles and their prices.
12.Design a basic elements of a home page.

BC-201 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Description & Objectives:

On Completion of this course, the student will be able to understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries. Have the ability to write a computer program to solve specified problems. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

The student is expected to have

- Understanding of OOP concepts and basics of java programming (Console and GUI based)
- The skills to apply OOP and Java programming in problem solving
- Should have the ability to extend his knowledge of Java programming further on his/her own.

UNIT -1 Introduction, Classes and Objects

Creation of Java, Byte code, Java buzzwords, OOP Principles- Encapsulation, Inheritance and Polymorphism, Compiling and running of simple Java program, Data types, Variables, declaring variables, Dynamic initialization, Scope and life time of variables, Arrays, Operators, Control statements, Type conversion and casting,

UNIT-2 Concepts of classes and objects:

Class fundamentals – Declaring objects, assigning object reference variables, Introducing methods, Constructors, Usage of static with data and methods, Usage of final with data, Access control, this key word, Garbage collection, Overloading methods and constructors, Call by value, Recursion, Nested classes and Inner classes, Exploring the String class.

UNIT -3 Inheritance, Packages and Interfaces

Basic concepts, Member access rules, Usage of super key word, Forms of inheritance, Method overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, Importing packages,

UNIT -4Differences between classes and interfaces:

Defining an interface, implementing interface, applying interfaces, Variables in interface and Extending interfaces.

Concepts of Exception handling, Types of exceptions, Usage of try, Catch, Throw, Throws and Finally keywords, Built-in exceptions, Creating own exception Sub classes,

UNIT -5 Concepts of Multithreading:

Differences between process and thread, Thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, Thread priorities, Inter thread communication, Daemon threads, deadlocks, Thread groups.

Applet Class, Applet Architecture, Applet Skeleton - Applet Initialization and Termination, Overriding update(), Simple Applet, Display Methods, Requesting Repainting - A simple banner Applet, Using The Status Window, The HTML APPLET Tag, Passing parameters to Applets.

TEXT BOOK(S)

1. Herbert Schildt, "The Complete Reference Java J2SE", 7th ed., TMH Publishing Company Ltd, New Delhi, 2008.
2. Joe Wiggles worth and Paula McMillan, "Java Programming Advanced Topics", 3rd ed., TMH, 2009.

REFERENCE BOOK(S)

1. Cay Horstmann, "Big Java", 2nd ed., John Wiley and Sons, 2006.

BC203 DATABASE SYSTEMS

Course Description & Objectives:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Outcomes:

- Upon successful completion of this course, students should be able to:
- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Improve the database design by normalization.
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

UNIT-1 Database Users

Introduction, characteristics of the database approach, actors of database, advantages of database, History of database applications. Database system concepts & architecture: Data models, schemes, instances,. Database languages interfaces database system environment architectures for DBMS. Classification of DBMS systems.

UNIT-2 Data modeling using the ER model

notations , entity types, entity sets, attributes, keys, relationships, roles, constraints, weak entity types, binary and ternary relationships. EER modeling specialization, generalization. Example university EER schema.

UNIT-3 Relational Model

Relational Model & Relational Database constraints. ER-EER to relational mapping.SQL Basics.

UNIT-4 Functional dependencies

normalization, Design guidelines. Definition of FD. Normal forms based on primary keys.

UNIT-5 Disk storage

Introduction secondary storage devices placing records on diskR FID technology. Transaction processing, properties of transaction serializabulity two phase locking – recovery concepts.

TEXT BOOK(s):

RamezElmasri and Shamkant B. Navathe, Fundamentals of Database Systems (5/e), Pearson Education, 2008

REFERENCE BOOK(S):

1. Silberschatz, Korth, “Data base System Concepts”, 4th ed., McGraw hill, 2006.

2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill, 2003.

3. Peter Rob and Carlos Coronel, Database Systems- Design, Implementation and Management (7/e), Cengage Learning, 2007.

BC 205 SOFTWARE ENGINEERING

Course Description & Objectives:

This course will be helpful for the student to understand the concept of a software life cycle, the role of process models and how to apply key elements and common methods for elicitation and analysis to produce a set of software requirements. To distinguish between different types and levels of testing (unit, integration, systems, and acceptance).

Course Outcomes:

After completing the course attendees will be able to:

1. appreciate the wider engineering issues that form the background to developing complex, evolving (software-intensive) systems;
2. plan a software engineering process to account for quality issues and non-functional requirements;
3. Employ a selection of concepts and techniques to complete a small-scale analysis and design project.
4. Interact with a client to elicit input, and communicate progress.
5. Employ group working skills - including general organization, planning and time management, and inter-group negotiation, etc.

UNIT-1 Introduction:

Introduction to SE, evolving the rules of flow changing there of se, mythsSoftware process: A layered technology, process framework, CMMI process assessment

UNIT-2Process models

Process models, watesfall incremental models, evolutionary models, unified process models.

UNIT-3 Software Engineering Practice:

SE practice, communication practice, planning practices, modeling practices, construction practice, deployment requirements Engineering. Tasks, initiating it developing use cases. Building analysis model.

UNIT-4 Data Modeling:

Data modeling concepts, 0-0 analysis, scenario based modeling, flow-oriented modeling, class based modeling, types of architecture design concepts, U-I design golden rules.

UNIT-5 Testing Techniques

Testing strategies: test strategies for conventional S/W testing strategies for od s/w, validation testing, system testing, art of debugging testing, tactice – black box while box, basis path testing, control structures testing, blackbox testing BVA out methods.

TEXT BOOKS

Roger S. Pressman “Software Engineering, A practitioner’s Approach”, 6th ed., McGrawHill International Edition, 2008.

REFERENCE BOOKS

1. Sommervelle “Software Engineering”,7th ed., Pearson education, 2008.
2. Shely Cashman Rosenblatt,” Systems Analysis and Design” 1st ed., Thomson Publications, 2006.

BC 207 ORGANIZATIONAL BEHAVIOUR

Objective of the Course:
The course provides a basic knowledge of various dimensions of human behavior. This will form the foundation to study and to understand the behavior of the human beings working in organizations.

UNIT-1 Nature of OB

Nature and scope of OB - contributing disciplines to OB - Environmental and Organizational context of Organizational Behaviour.

UNIT-2 Perception - Process

Individual and Organizational factors that influence perceptional process. Role of perception in managerial activities and organizational processes.

UNIT-3Personality and Attitudes

Personality as continuum – Meaning of Personality – Johari window and Transactional Analysis Nature and Dimension of Attitudes.

UNIT-4 Group Dynamics

The Nature of groups. Kinds of groups – Stages of Group Development – Factors Contributing to Groups Cohesiveness - Meaning & types of stress – Effect of Stress – Strategies of cope with stress

UNIT-5 Conflict Management

Nature of conflict –Dynamics of Conflict –Conflict resolutionmodes – approaches to conflict management – sources of conflict in organization.

Text Books:

1. Luthans, Fred,” Organizational Behaviour”, 10/e, THM, 2007.

2. Robbins, P Stephen, Timotny A judge, “Organization Behaviour”, 12/e, PHI, New Delhi, 2007.

Reference Books:

1. OrganisationBehaviour by Nelson

2. Schermerhorn: OrganisationBehaviour,Wiley, 9/e, 2005.

3. OrganisationalBehaviourbyAswathappa

BC 209 STATISTICAL TECHNIQUES LAB

Course Description & Objectives:

The course provides a basic knowledge of statistics and make the students familiar with the software for statistics. It enables the students learn to solve simple technique which helps them to make analysis and effective decision making.

Course Outcomes:

The student will be able

- to learn basics of statistics
- and familiar with the software for statistics.
- to interpret and analyse data

List of Experiments:

1. Tabulation of data
   i. One way Frequency
   ii. Two way Frequency
2. Construction of Histogram
3. Construction of Pie Chart
4. Construction of Line Chart
5. Construction of Scatter Chart
6. Descriptive Statistics
7. Correlation Analysis
8. Simple Regression Analysis
9. Multiple Regression Analysis
10. Fitting a trend line to an observed data
11. Polynomial Trends
12. Logarithmic, power and exponential trends
13. Moving averages

TEXT BOOK

1.K.V.S Sharma, “Statistics Made Simple Do it yourself on PC” TMH, Second Edition

BC 211 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

Course Description & Objectives:

Write programs using the Java language. Basic topics considered are programs and program structure in general, and Java syntax, data types, flow of control, classes, methods, objects, arrays, exception handling, recursion, and graphical user interfaces (GUIs). Writing and testing applets for potential inclusion in web pages. Understanding how to access enterprise data bases from the application programes.

Course Outcomes:

The student is expected to have hands on experience with the following:

- Basics of java programming, multi-threaded programs and Exception handling
- The skills to apply OOP in Java programming in problem solving
- Use of GUI components (Console and GUI based)

List of topics on which programs have to cover:

1. programs on usage of data types, input and output statemetns.
2. Programs on conditional statements, operators and expressions
3. Programs on Iterative statements
4. Programs on functions and classes
5. Programs on String data type
6. programs on Inheritance concepts, interfaces,packages.
7. pograms on polymorphism concepts
8. programs on Threads concepts
9. Programs on exceptional handling
10. programs on Applet creation and usage.

REFERENCE BOOKS:

1. Dietel&Dietel, Java How to Program, 5th Edition, Pearson Education, 2009.
2. P.J.Deitel and H.M.Deitel, Java for Programmers, Pearson education, PHI, 2008.
3. P.Radha Krishna, Object Oriented Programming through Java, Universities Press, 2010.
4. Bruce Eckel, Thinking in Java, Pearson Education, 2010.
5. S.Malhotra and S.Choudhary, Programming in Java, Oxford Univ. Press, 2009.

BC 213 DATABASE MANAGEMENT SYSTEMS LAB

Course Description & Objectives:

This lab course will enhance database handling, data manipulation and data processing skills in student through SQL & PL/SQL, and helps them gain knowledge in designing forms, Menus and also helps them in developing database applications.

Course Outcomes:

- Install, configure, and interact with a relational database management system;
- Describe, define and apply the major components of the relational database model to database design;
- Learn and apply the Structured Query Language (SQL) for database definition and manipulation;
- Learn and implement the principles and concepts of information integrity, security and confidentiality;

List of experiments:

1. Database Creation- usage of Data types
2. Execute a single line and group functions for a table.
3. Execute DCL and TCL Commands.
4. Create and manipulate various DB objects for a table.
5. Create views, partitions and locks for a particular DB.
6. Writing Triggers
7. Write PL/SQL procedure for an application using exception handling.
8. Write PL/SQL procedure for an application using cursors.
9. Write a DBMS program to prepare reports for an application using functions.
10. Write a PL/SQL block for transaction operations of a typical application using triggers.
11. Procedures and Functions
12. Designing a basic application.

Typical Applications – Banking, Course registration, Electricity Billing, Library Management, Pay roll, Insurance, Inventory etc.

REFERENCE BOOKS:

1) Oracle certified associate Mysql beginner's guide.

2) Oracle certified associate Oracle 10g &11g SQL fundament

BC 202 MULTIMEDIA SYSTEMS

Course Description & Objectives:

Understand the characteristics of multimedia systems and how to address issues. Be aware of the differences among multimedia authoring systems. Be familiar with the software development process as practiced in a multimedia development environment. Be able to design, write, document, debug and evaluate a non trivial multimedia system. Appreciate and understand the legal and ethical issues associated with developing multimedia systems, particularly in regard to use of media clips developed by others.

Course Outcomes:

The student will be able to

- Write action script for a particular problem.
- Design and Draw customized GUI components.
- Apply Transformations on Components.
- To make use of fundamental concepts and formulate best practices
- Apply technical concepts and practices in specialized areas

UNIT –1 Introduction

Global structures Media – Data stain : medium , properties of M.M.S,M.M Information units Sound –Audio : Midi, search .

UNIT –2 Images x Graphs :

Basic computers Components Image process system Image Transition.
Video Animations basic computers Television .Computer based Animation.

UNIT – 3 Data compression:

Doing reg. Some Basic Compression. JPEG.,MPEC,.MPEL,.

UNIT – 4 Middleware system service Architecture

Multimedia Devices Presentation Servers X the user interface.

UNIT – 5 Middleware n system savers Architecture

Multimedia servers over the public network Multimedia confer sting.

Text books:

UNIT – I , II,III :- Multimedia computing, communications Applications. Ralf statement &klarapearson L PE.
UNITS IV, V :- Mult Media systems John.F. koegel .peasion LPE

Reference Books:

1. Multimedia Systems, By John E Koegal, Buford, IIBK.
2. Virtual Reality Systems, John Vince, ACM Press

BC 204 COMPUTER NETWORKS

Objective of the Course:

This course will focus on imparting knowledge about the aspects of data communication and computer network systems with the required basic principles behind them. To provide essential knowledge about the OSI model and TCP/IP model. To create a good foundation covering the physical, data link, network, transport and application layers.

Course Outcomes:

- To understand the communication basics.
- To have the knowledge of different networks.
- To know about different protocols.
- To understand how to find the routes by using different routing algorithms.
- To Understand the basics of Internet.

Unit-1 Introduction

uses of computer Network, Business,Home, Mibileusers, Social Issues. Network Hardware: PAN, LAN, MAN, WAN.

Network Software: Protocol Hierarchies, Design issues, service primitives

Unit-2 Reference Models

OSI, TCP/IP, Comparison, Critique of OSI, Example networks. 3G Moblie phone network, Wireless LAN, RFID, Sensor Network.

Unit-3 Physical layer

Guided Media, The Mobile phone System.

Unit-4 Datalink Layer

Design Issues, framing, elemetary protocols, Simplex, stop and wait, sliding window protocols: 1 bit, GOBACK N, Selective Repeat.

Unit-5 Network Layer

Design Issues, Virtual circuit and Datagram comparision, routing Algorithms : shortest path, flooding, Distance Vector, Congestion control Algorithms: 5 approaches.

TEXT BOOK:

1. Andrew S Tanenbaum, “Computer Networks”, 4th ed., Pearson Education, 2003.

REFERENCE BOOKS:

3. Behrouz A. Forouzan, “Data communications and Networking”, 3rded.,TMH, 2003.
William Stallings, “Data and Computer Communications”, 7th ed., Pearson Education, 2004.

BC 206 Operating Systems.

UNIT-1 Computer System and Operating System Overview:

Overview of computer operating systems, operating systems functions, protection and security, distributed systems, special purpose systems, operating systems structures and systems calls, operating systems generation.

UNIT -2 Process Management –

Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

UNIT -3 Memory Management :

Swapping, contiguous memory allocation, paging, structure of the page table , segmentation

UNIT -4 Principles of deadlock –

system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock,

UNIT-5 File system Interface-

the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation- File system structure, file system implementation, directory implementation, allocation methods, free-space management

TEXT BOOKS :

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education

REFERENCES :

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/Operating%20Systems/New_index1.html
2. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH

BC 208 E- COMMERCE

UNIT – I Electronic Commerce Environment and Opportunities:
Background, The Electronic Commerce Environment, Electronic Marketplace Technologies. Modes of Electronic Commerce: Electronic Data Interchange, Migration to Open EDI, Electronic Commerce with www/Internet, Commerce Net Advocacy, web Commerce Going Forward.

UNIT – II Approaches to Safe Electronic Commerce:
Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers and Enterprise Networks. Electronic Cash and Electronic Payment Schemes: Internet Monetary Payment & Security Requirements. Payment and Purchase Order Process, On-line Electronic cash.

UNIT – III Internet/Intranet Security Issues and Solutions:
The need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption, Enterprise Networking and Access to the Internet, Antivirus Programs, Security Teams.

UNIT – IVMaster Card/Visa Secure Electronic Transaction:
Introduction, Business Requirements, Concepts, payment Processing. E-Mail and Secure E-mail Technologies for Electronic Commerce: Introduction, The Means of Distribution, A model for Message Handling, E-mail working, Multipurpose Internet Mail Extensions, Message Object Security Services, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet.

UNIT – V Internet Resources for Commerce:
Introduction, Technologies for web Servers, Internet Tools
Relevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access and Architecture, Searching the Internet. Advertising on Internet: Issues and Technologies. Introduction, Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches and Technologies: EP and web based EP.

Text Books:

1. WebCommerceTechnologyHandbook, byDanielMinoli, EmmaMinoli, McGraw-Hill
2. Frontiers of electronicommerece by Galgotia.

Reference Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.
3. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.

BC 210 MULTIMEDIA SYSTEMS LAB

List of experiments:

1. Study of multimedia I/O devices.
2. Calculator for blind
3. Media player application
4. Design advertisement using flash/macromedia
5. Design a web application using dream viewer and fireworks
6. Create multimedia database for student ID card preparation
7. Study and use of different MPEG file formats.
8. Construction of website using pictures, videos, audio etc with proper layout.
9. Implementation Huffman algorithm for six character long string.
10. Edit the movie clip using adobe premiere.
11. Record a speech and perform compression and decompression.
12. Design a game/application in flash.
13. Convert BMP file to JPG file using any programming language.

REFERENCE BOOKS :

1. Prabhat K. Andheigh, Kiran Thakrar, "Multimedia Systems design', 1 st ed., PHI, 2008.
2. Koegel Buford, "Multimedia Systems", 4th ed., Pearson Eduaction, 2003.

BC 212 Computer networks lab

Course Description & Objectives:
Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP.Able to explain, configure, verify, and troubleshoot complex computer networks problem. A lab provides a
practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

Course Outcomes:
After completing the course, students will be able to:

- Understand the structure and organization of computer networks including the division into network layers, role of each layer, and relationships between the layers.
- Understand the basic concepts of application layer protocol design including client/server models, peer to peer models, and network naming.
- In depth understanding of transport layer concepts and protocol design; including connection oriented and connection-less models,techniques to provide reliable data delivery and algorithms for congestion control and flow control.
- In depth understanding of network layer concepts and protocol design; including virtual circuit and datagram network designs, datagram forwarding, routing algorithms, and network interconnections.

List of experiments:

1. Study of Network devices in detail
2. Connect the computers in Local Area Network
3. Implementation of Data Link Framing method - Character Count.
4. Implementation of Data link framing method - Bit stuffing
5. Implementation of Error detection method - even and odd parity.
6. Study of Network IP Addressing
7. Study of sockets in detail
8. Working on Network Protocol Analyzer Tool (Ethereal/Wireshark)
9. Working on NMAP Tool for Port scanning.

BC 214 Linux basics and shell programming Lab

Course Objectives:

- To teach students various unix utilities and shell scripting

Week1

Session-1

a)Log into the system

b)Use vi editor to create a file called myfile.txt which contains some text.

c)correct typing errors during creation.

d)Save the file

e)logout of the system

Session-2

a)Log into the system

b)open the file created in session 1

c)Add some text

d)Change some text

e)Delete some text

f)Save the Changes

g)Logout of the system

Week2

a)Log into the system

b)Use the cat command to create a file containing the following data. Call it mytable use tabs to separate the fields.

1425	Ravi	15.65
4320	Ramu	26.27
6830	Sita	36.15
1450	Raju	21.86

c)Use the cat command to display the file, mytable.

d)Use the vi command to correct any errors in the file, mytable.

e)Use the sort command to sort the file mytable according to the first field. Call the sorted file my table (same name)

f)Print the file mytable

g)Use the cut and paste commands to swap fields 2 and 3 of mytable. Call it my table (same name)

h)Print the new file, mytable

i)Logout of the system.

Week3

1) a)Login to the system
b)Use the appropriate command to determine your login shell
c)Use the /etc/passwd file to verify the result of step b.
d)Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
e)Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

2) a)Write a sed command that deletes the first character in each line in a file.
b)Write a sed command that deletes the character before the last character in each line in a file.
c)Write a sed command that swaps the first and second words in each line in a file.

Week4

a)Pipe your /etc/passwd file to awk, and print out the home directory of each user.
b)Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.
c)Repeat
d)Part using awk

Week5

a)Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
b)Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
c)Write a shell script that determines the period for which a specified user is working on the system.

Week6

a)Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
b)Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

Week7

a)Write a shell script that computes the gross salary of a employee according to the following rules:
i)If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
ii)If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic
The basic salary is entered interactively through the key board.

b)Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.

Week8

a)Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.
b)Write shell script that takes a login name as command – line argument and reports when that person logs in
c)Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

Week9

a)Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
b)Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.
c)Write a shell script to perform the following string operations:

i)To extract a sub-string from a given string.
ii)To find the length of a given string.

Week10

Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:

i)File type
ii)Number of links
iii)Read, write and execute permissions
iv)Time of last access

(Note : Use stat/fstat system calls)

Week11

Write C programs that simulate the following unix commands:
a)mv
b)cp
(Use system calls)

Week12

Write a C program that simulates ls Command
(Use system calls / directory API)

TEXT BOOKS

1)Introduction to UNIX & SHELL programming, M.G. Venkatesh Murthy, Pearson Education.
2)Unix concepts and applications, Fourth Edition, Sumitabha Das, TMH.
3)Unix for programmers and users, 3rd edition, Gaham Glass & K. Ables, pearson education.
4)Unix and shell Programming –A text book, B.A. Forouzan& R.F. Giberg, Thomson.
5)Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India.

BC 301 OPEN SOURCE SYSTEMS

Course Description & Objectives

It makes familiar of Open Source technologies like Linux, UNIX, Perl, MySQL, CGI, PHP, and AJAX which are used to develop web programming.

Course Outcomes:

- Students will get knowledge on Apache Web Server that is how to install, how to start server, how to stop, and how to restart and how to create simple static web pages
- Students get information about the differences and similarities between PERL and other programming languages like C, C++, JAVA and MYSQL
- Students can do CGI programs very effectively by these programs students can do database programs by connecting to the MYSQL server through DBI.
- Student can configure PHP files.

UNIT – 1 Introduction & Linux

Open Source Software, Structural Part: Web explained, How it works.
Introduction, Basic UNIX, Apache Web Server.

UNIT – 2 Perl & MySQL

Introduction, Perl Documentation, Syntax Rules, A Quick Introduction to OOP.
Introduction, Database Independent Interface, Table Joins, Loading & Dumping a Database.

UNIT – 3 The Common Gateway Interface

Introduction, Apache Configuration, A First CGI Program, CGI.pm Introduced, CGI.pm HTML Shortcuts, Information received by the CGI Program, Form Widget Methods, CGI Security Considerations.

UNIT - 4 PHP

Introduction, Emdedding PHP into HTML, Configuration, Language Syntax, Built-in PHP Functions, PHP & MySQL

UNIT – 5 PHP5 & AJAX

Procedural Programming versus OOP, Basic Class Definitions, Visibility, Constructors and Destructors, Static Keyword, Class Constants, Assignment versus Cloning
XMLHTTP and XMLHttpRequest, The Interfaces, Working with the Interfaces, Handling the Response, AJAX Libraries: SAJAX , CPAINT , JPSPAN.

TEXT BOOK :

1.James Lee, Brent Ware, "Open Source Web Development with LAMP", 4th ed., Addison Wesley Publishers , 2002.

REFERENCE BOOK :

1. Jason Gerner, Elizabeth Naramore, Morgan Owens, Matt Warden, "Professional LAMP", 1st ed., Wiley Publications, 2006.

BC 303 DATA WAREHOUSE AND DATA MINING

Course Description and Objectives:

This course is about knowing of how to make use of historical data so that high end business decision can be taken for the growth of an organization. The main objective of this course is to designing the intelligent machines which can take risk business decisions behalf of humans using the data mining techniques like classification, clustering, outlier detection, association rule mining.

Course Outcomes:

Students are able to

- Learn the basic concepts of Database Technology Evaluation steps and also understood the need of data mining and its functionalities
- Explore the efficient and effective maintenance of Data Warehouses.
- Apply the data mining functionalities like Clustering, Classification, Association Analysis to real world data.
- Discover interesting patterns and association rules from huge volume of data used to do classifications and predictions.
- Gain knowledge on developing areas like Web Mining, Text Mining, and Spatial Mining.

UNIT-1 Introduction DataWarehousing and Mining

Why Data Mining, What is Data Mining, Kinds of Data, Kinds of Patterns, and Technologies used, Kinds of applications adopted, Major issues in Data Mining.

Basic Concepts, Data Warehouse Modeling, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute- Oriented Induction

UNIT-2 About Data &Data Preprocessing

Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT-3 Mining Concept

Preliminary Concepts, Data Cube Computation Methods, Processing Advanced Kinds of Queries by Exploring Cube Technology, Multidimensional Data Analysis in Cube Space

Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, Which Patterns Are Interesting?—Pattern Evaluation Methods Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining

UNIT-4 Classification

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy Bayesian Belief Networks, Classification by Back propagation, Support Vector Machines, Classification Using Frequent Patterns, Lazy Learners, Other Classification Methods

UNIT-5 Cluster Analysis

Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering Probabilistic Model-Based Clustering, Clustering High-Dimensional Data

TEXT BOOKS:

1. Jiawei Han Micheline Kamber – “Data Mining Concepts & Techniques”,
Third Edition, Morgan Kaufmann Publishers, 2012.

REFERENCEBOOKS :

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, First Edition,2012.

2. Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit”, first edition John Wiley and Sons Inc., 2002.

BC 305 SOFTWARE TESTING METHODOLOGIES

Objective of the Course :
To describe principles and strategies for generating system test cases. To understand the essential characteristics of tools used for test automation.
Course Outcomes:

- The student will learn Various test processes and continuous quality improvement
- The student will learn about Methods of test generation from requirements
- The student will learn the application of software testing techniques in commercial environments

UNIT-1Introduction
Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs
Flow graphs and Path testing : Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-2Transaction Flow Testing
Transaction flows, transaction flow testing techniques. Dataflow testing:-Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.
Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-3Paths, Path products and Regular expressions
Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

UNIT-4 Logic Based Testing
Overview, decision tables, path expressions, kv charts, specifications.
State, State Graphs and Transition testing : State graphs, good & bad state graphs, state testing, Testability tips.

UNIT-5 Graph Matrices and Application
Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. Usage of JMeter and Winrunner tools for functional / Regression testing (Ref Text book2).

TEXT BOOKS :
1. Boris Beizer, “Software Testing techniques”, 2nd ed., Dreamtech, 2006.
2. Dr.K.V.K.K.Prasad, “Software Testing Tool”, 1st ed., Dreamtech. 2008.(Unit - 5)
REFERENCES BOOKS :
1. Brian Marick, “The craft of software testing”, 2nd ed., Pearson Education, 2007.
2. Edward Kit, “Software Testing in the RealWorld “, 2nd ed., Pearson Educaton, 2008.

BC 307 EMBEDDED SYSTEMS

Course Description &Objectives :

The course emphasis on Comprehensive treatment of Embedded Hardware and Real Time Operating systems along with case studies in tune with the requirements of Industry. The example-driven approach will put students on a fast track to understanding embedded-system programming and applying what they learn to their projects.

Course Outcomes:

- Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems..
- Become aware of the architecture of the processor and its programming aspects (assembly Level)
- Become aware of interrupts, hyper threading and software optimization.
- Design real time embedded systems using the concepts of RTOS.

UNIT-1Introduction to Embedded Systems :

Applications of ES, Embedded Hardware Units and Devices, Embedded Software, Examples of Embedded Systems, Design Metrics in ES, Challenges in ES Design.

UNIT-2Introduction to 8051 :

8051 Micro controller Hardware, Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

UNIT-3Data Transfer and Logical Instructions :

Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Further Details on Interrupts.

UNIT-4Introduction to Real Time Operating Systems :

Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.

UNIT-5Principles Basic Design :

Using a Real-Time Operating System: Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System

TEXT BOOKS:

1. Raj Kamal, "Embedded Systems", 2nd ed., TMH, 2009. (Unit - I)
2. Kenneth J. Ayala, Thomson, "The 8051 Microcontroller", 3rd ed., 2008. (Unit - II, III)
3. David E. Simon, "An Embedded Software Primer", 1st ed., Pearson Education, 2008 (Unit - IV, V)

REFERENCE BOOKS :

1. Wayne Wolf, "Computers as Components-principles of Embedded Computer system Design", 1st ed.,Elseveir, 2009.
2. Labrosse "Embedding system building blocks", 2nd ed., CMP Publishers, 2007.

BC 309 OPEN SOURCE SYSTEMS LAB

Course Description & Objectives

It makes familiar of Open Source technologies like Linux, UNIX, Perl, MySQL, CGI, PHP, and AJAX which are used to develop web programming.

Course Outcomes:

- Students may get knowledge on Apache Web Server that is how to install, how to start server, how to stop, and how to restart and how to create simple static web pages
- Students get information about the differences and similarities between PERL and other programming languages like C, C++, JAVA and MYSQL
- Students can do CGI programs very effectively by these programs students can do database programs by connecting to the MYSQL server through DBI.
- Student can configure PHP files.
- Student may have information about AJAX.

List of Experiments

1. Basic UNIX and LINUX commands.

2. Write a Perl program to display Hello World.

3. Write a Perl program to inserts, selects, updates, deletes information using MySQL queries through a DBI module.

4. Write a Perl program to inserts, selects, updates, deletes information using MySQL queries through a MySQL module.

5.Write a PHP program on various string handling functions.

6.Write a PHP program to inserts, selects, updates, deletes information using MySQL queries through a MySQL module.

7.Write an AJAX program to create a form.

8.Write an AJAX program to inserts, selects, updates, deletes information using MySQL queries through a MySQL module.

BC 311 DATA WAREHOUSE AND DATA MINING LAB

Course Description & Objectives:

The main objective of this lab is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. At the end to compare and contrast different conceptions of data mining.

Course Outcomes:

Students will be able

- To evaluate the different models of OLAP and data preprocessing.
- To enlist various algorithms used in information analysis of Data Mining Techniques.
- To demonstrate the knowledge retrieved through solving problems .

List of Experiments

1. Explore various commands given in PL/SQL in Oracle 8.0
2. Execute multi-dimensional data model using SQL queries.
3. Implement various OLAP operations such as slice, dice, roll up, drill up, pivot etc.
4. Implementation of Text Mining on the data warehouse
5. Explore the correlation-ship analysis between the data set
6. Evaluate attribute relevance analysis on a weather data warehouse
7. Evaluate Information Gain of an attribute in the student database
8. Experiment to predict the class using the Bayesian classification
9. Find out a weight & bias updating using the Back Propagation Neural Network
10. To perform various data mining algorithms on the give data base using WEKA

REFERENCE BOOK:

1.Jiawei Han, Micheline Kamber“ Data Mining: Concepts and Techniques” 3rd edition ,Morgan Kaufmann, 2012
2. Ramesh Sharda, DursunDelen, David King Business Intelligence, 2/E; Efraim Publisher Turban,pearson Education, 2011
3. Berry, Gordon S. Linoff, “Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management”, John Wiley & Sons Inc publishers, 3rd Edition, 2011.

BC 313 PROFESSIONAL COMMUNICATION LABORATORY

Course Description and Objectives:

The Professional Communication course is aimed at improving written communication skills of undergraduate students and preparing them to meet professional challenges in the work spheres. Writing and Personality are not two exclusive spheres of influence and this course will work on the relationship between professional writing and a personality that is able to meet the goals of an organization in creative and innovative ways. The course will expose students to conventions of corporate communication and documentation procedures involved in the day-to-day functioning of the business world.

Learning outcomes:

After going through the course, students will acquire competency to write logical sentences and paragraphs, use appropriate diction, grammar and punctuation. They will be able to compose clear and concise messages and produce business documents for mailing to external recipients or intra-organizational circulation.

UNIT-1 Elements of Technical Writing :

Sentence structure - reducing verbosity - arranging ideas logically – building coherence - paragraph level and document level - topic sentence - cohesive devices – transitionals – paraphrasing – précis-writing.

Mechanics of Writing: Stylistic elements – the rapporteur- the purpose- the reader (audience) -elementary rules of grammar- choice of diction - elementary principles of composition - matters of form – punctuation - conventions of business communication - language and tone - weak links in business correspondence - ethical concerns in business writing

UNIT-2 Parts of the Report:

Writing an abstract - features of a good abstract – approach - compare and contrast - cause and effect.

Types of Technical Reports : Drafting a technical proposal - formal and informal proposals - factual reports, feasibility reports, survey reports – parts of a report - title page – declaration – acknowledgements – table of contents - abstract – introduction – conclusion – citations – references - appendices - oral reports and presentations

UNIT-3 Letter-Writing:

Formal and informal letters - structure of formal letters - expressions of salutations, introductory and concluding paragraphs - different types of letters - sales letter - complaint letter - adjustment letter - letter to the editor - covering letter - claim letter – letter of condolence.

UNIT-4Business Correspondence :

E-mail – nature and scope - e-mail etiquette – Common Errors in composing e-mails – Quotations - Inviting quotations - sending quotations –placing orders Office Communication - agenda - notice - circular

Effective Resume-Writing: Structure and presentation - defining career objective - projecting one's strengths and skill-sets Summarizing - formats and styles - covering letter.

UNIT-5Business Proposals:

Drafting business proposals - calculating profit and loss-averages - ratios and proportions – partnership - simple interest - compound interest - calculating volumes and areas

Course of action - cause and effect- theme detection - making judgments - logical deductions - analyzing arguments – syllogisms - Venn diagrams- 2 matching definitions - verbal reasoning - numerical reasoning - working out justifications.

Reference Books:

1. Strunk , William, Jr.The Elements of Style, Fourth Edition,
2. Rozakis, Laurie, Ph.D, (2003). English Grammar for the Utterly Confused, McGraw-Hill
3. Sharma. C. (1978) Business Correspondence & Report Writing, Tata McGraw-Hill
4. Kirkman, John. Good Style: Writing for science & technology, Routledge Study Guides, second edition.
5. Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11thReprint.Tata McGraw-Hill. New Delhi

BC- 302 information security

Objective of the Course :
This Course focuses towards the introduction of network security using various cryptographic algorithms. Underlying network security applications. It also focuses on the practical applications that have been implemented and are in use to provide e_mail and web security.

UNIT-1 Classical Encryption Techniques :
Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography

UNIT-2 Block Ciphers And Data Encryption Standards:
Block Cipher Principles – Data Encryption Standard – Strength of DES – Differential and Linear Cryptanalysis - Block Cipher Design Principles.- Advanced Encryption Standard – Evaluation Criteria of AES – AES Cipher – More on Symmetric Ciphers – Multiple encryption and Triple DES – Block Cipher Modes of Operation – RC4.

Unit-3 Public-Key Encryption And Hash Funcitons :
Principles of Public –Key Cryptosystems – RSA Algorithm – Key Management – Message Authentication and Hash Functions – Authentication Requirements – Authentication Functions – Message Authentication – Hash Functions – Security of Hash Functions and MACs- Digital Signatures - Authentication Protocols – Digital Signature Standard.

UNIT-4 Network Security Introduction:
Security Trends – Security attacks – Security services – Security Mechanisms – A Model for Network Security Model APPLICATIONS Kerberos – X.509 Authentication Service – Public Key Infrastructure – Pretty Good Privacy – S/MIME- IP Security Overview – IP Security architecture- Authentication Header – Encapsulating Security Payload – Combining Security associations – Key Management

UNIT-5 Web Security:
Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction. SYSTEM SECURITY Intruders – Intrusion Detection – Password Management – Malicious Software - Firewalls – Trusted Systems.

TEXT BOOKS :
1. William Stallings, “Cryptography and Network security”, 4th ed., Pearson Education, 2010.
2. William Stallings “Network Security Essentials Applications and Standards”, 2nd ed.,Pearson Education, 2009.
REFERENCE BOOKS :
1. Eric Malwald, “Fundamentals of Network Security “, 4th ed., Pearson Education, 2010.
2. Charlie Kaufman, “Radis Perlman and Mike Speciner ,Network Security – Private Communication in a Public World”, 1st ed., Pearson Education,2009 .
3. Buchmann, Springer ,”Introduction to Cryptography”, 2nd ed., Pearson Education, 2009.

BC – 304 Big Data analytics

Course description and Objectives: The main objectives of this course is to enable the students with basic data analytic skills like regression analysis, classification techniques, clustering techniques, association rule mining. Further, this course also enables the students how to scale the above algorithms with different data environments like massive amounts of data, streaming data, distributed data and provide hands on experience on real world problems using the above theoretical background.

Course Outcomes:

- Necessary theory background to process analytics.
- Processing analytics on small scale data. ·
- Mining from massive datasets.
- Mining from distributed datasets.

UNIT - 1 Introduction To Big Data :
Introduction to Big Data Platform – Traits of Big data -Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - ReSampling - Statistical Inference - Prediction Error.

UNIT - 2 Data Analysis :
Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

UNIT - 3 Mining Data Streams :
Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT – 4 Frequent Item sets and Clustering:
Mining Frequent Itemsets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in NonEuclidean Space – Clustering for Streams and Parallelism.

UNIT -5 Frameworks And Visualization :
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packagesApproaches to modeling in Analytics – correlation, regression, decision trees, classification, association-Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies-Industry challenges and application of Analytics

TEXT BOOKS:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.

REFERENCE BOOKS:

1. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
2. Pete Warden, "Big Data Glossary", O'Reilly, 2011. 3. Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008

BC- 306 seminar

BC-308 project

I

YEAR

BACHELOR OF BUSINESS ADMINISTRATION

BBA

COURSE CONTENTS

I SEM & II SEM

17BB101 BUSINESS COMMUNICATION - I

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objectives:

To introduce students to the specific use of language for the purposes of Business Communication which would be an essential pre-requisite for success in the areas of writing and speech. The teaching efforts in this course will be directed towards making students develop their business and general writing abilities using the fundamental principles that apply to the correct use of the English language free of grammatical and other related errors.

Course Outcomes:

By observing the rules of grammar, vocabulary and composition that are learnt during the course, students are made to appreciate the intelligent and innovative use of rules in order to be able to generate creative output in tune with the demands of industry and the corporate world. The course improves their power of comprehension and the ability to express themselves with rigor through writing and speech.

UNIT - I			**10HRS**
•	Text	:	GLOBAL ISSUES (Child Labour – Food Crisis – Genetic Modification – E-waste – Assistive Technology)
•	Grammar	:	Articles – Prepositions
•	Vocabulary	:	Root–Prefixes-Suffixes - Synonyms – Antonyms
•	Composition	:	Paragraph Writing (Descriptive & Narrative) Letter Writing (Formal - Application - Business)
UNIT-II			**10HRS**
•	Text	:	MEDIA MATTERS (History of Media – Language and Media – Milestones in Media – Manipulation by Media – Entertainment Media - Interviews)
•	Grammar	:	Time and Tense (Present-Past-Future; Helping Verbs; Modals)
•	Vocabulary	:	Use of Adjectives
•	Composition	:	E-mail - Report-Writing – Writing Advertisements
UNIT - III			**10HRS**
•	Text	:	LESSONS FROM THE PAST (Importance of History – Differing perspectives – Modern Corporatism – Lessons from the Past)
•	Grammar	:	Subject-Verb Agreement - If Conditional
•	Vocabulary	:	Idioms & Phrases – One-word Substitutes
•	Composition	:	Summarizing and Note-making
UNIT-IV			**10HRS**
•	Text	:	Travel and Tourism (Advantages and disadvantages of Travel – Tourism – Atithi devobhava – Tourism in India)
•	Grammar	:	Sentence Transformation (Degrees, Voice, Speech & Synthesis)
•	Vocabulary	:	Phrasal Verbs
•	Composition	:	Letter Writing (Formal - Application - Business)
•	Practice	:	Situational Conversations – Role-Plays (Introducing; Greeting; Enquiring; Informing; Requesting; Inviting – Emotions; Directions; Descriptions; Agreements; Refusals; Suggestions)
UNIT - V			**10HRS**
•	Text	:	GETTING JOB-READY (SWOT-Analysis – Companies and Ways of Powering Growth – Preparing for Interviews)
•	Grammar	:	Common Errors
•	Vocabulary	:	Connectives – Discourse Markers

- Composition : Profile - Curriculum Vitae – Problem Solving (Case Studies)
- Practice : Group Discussions

Textbook:

1. Mindscapes - Orient Black Swan, 2012.

Reference Books:

1. V. R. Narayana Swamy, “Strengthen Your Writing”, 1st edition, Orient blackswarn, 2005.
2. Thomas Elliott Berry, “The Most Common Mistakes in English Usage”, 1st edition, Tata McGraw Hill, 2004.
3. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, Macmillan Ltd., 2012.
4. Sasikumar.V and P.V. Dhamija,. Spoken English: A Self-Learning Guide to Conversation Practice, 34th reprint, Tata McGraw Hill, New Delhi, 1995.
5. Margaret M Maison, “Examine your English”, 1st edition, Orient Longman, 1999.

17BB103 BUSINESS MATHEMATICS

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objectives:

The objective of this course is to familiarize the students with mathematical tools useful for decision making. Students will learn set theories, types of matrices, binomial theorem, derivatives of standard function and knowledge of integrals. (Proofs and derivations are excluded).

Course outcomes:

After reading this course student can able to understand

- Set, elements of set, methods of describing a set, types of sets, Venn diagrams, Operations on sets, Algebra of sets, Cartesian product of sets, Set relations and its properties.
- Types of matrices, scalar multiplication of matrix, equality of matrices, addition, subtraction, multiplication of matrices, determinants, Cramer's rule, solution of linear equations, inverse of a matrix, solution of equations by matrix method and rank of a matrix.
- Binomial theorem, position of terms, binomial coefficients and its applications.
- Understand the concept of arithmetic and geometric progressions.
- The derivative and the derivatives of standard functions, additive, multiplicative and quotient rules of derivatives, maxima and minima of a function.

SKILLS:

(These activities are only indicative; the Faculty member can innovate)

- ✓ *Identify the applications of business mathematics for solving managerial problems.*
- ✓ *Take any applications of business problem and solving using matrices.*
- ✓ *List the uses binomial theorem, arithmetic and geometric progression in business.*
- ✓ *Write the various applications of differentiation in business.*

UNIT - I **10HRS**

Set Theory: Definition of Set, Presentation of Sets, Different types of Sets- Null Set, Finite and Infinite Sets, Universal Set, Subset, Power Set etc., Set operations: Laws of algebra of Sets and problems., Cartesian product of sets.

UNIT-II **10HRS**

Matrix Algebra: Introduction operations on matrices**:** Addition, subtraction and multiplication of matrices –adjoint of matrix, inverse of a matrix - solution of simultaneous equations (Cramer's rule and matrix inverse method), rank of matrix

UNIT-III **10HRS**

Binomial Theorem: Statement of the theorem for positive integral index - General term - Middle term - Equidistant terms- Simple properties of binomial coefficient.

UNIT IV 10HRS

Arithmetic and Geometric Progressions: Introduction, Arithmetic progression, sum of a series in A.P. Arithmetic mean, geometric progression, sum of series in G.P. geometric mean.

UNIT-V **10HRS**

Differentiation: Interdiction basic laws of derivatives- product rule – quotient rule - higher order Derivatives - maxima and minima of functions.(Simple algebraic and simple trigonometric functions only)

Text Books:

1. D. C. Sancheti and Kapoor V.K ., Business mathematics, 6th edition, Sultan Chand & sons, New Delhi, 2012.

Reference Books:

1. Business Mathematics, Sancheti. D.C.,6th edition, Sultan Chand,, New Delhi, 1979.
2. Kapoor V.K., Introductory Business Mathematics", 14th revised, New Delhi, Sultan Chand, 2014.

17BB105 FINANCIAL ACCOUNTING

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objectives:

This course is intended to provide knowledge on accounting practices to equip students with concepts, process and reporting of financial statements in modern organizations. Students will learn accounting principles, accounting process, preparation of final accounts for sole trading firms and companies and bank reconciliation statement.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

- Understand Accounting concepts, conventions and principles
- Accounting system and process- journal and ledger
- Preparation of final accounts
- Preparation company accounts

SKILLS :

(These activities are only indicative, the Faculty member can innovate)

- ✓ *Contact an NGO and find out their system of accounting.*
- ✓ *Collect information with regard to the practical reasons for charging*
- ✓ *Depreciation and the methods adopted for calculating the same.*
- ✓ *Generate different types of financial and cost related reports using excel and tally.*
- ✓ *Find out the accounting system adopted by a Sole Proprietor*
- ✓ *Differences between Double Entry and Single Entry systems of Book-keeping.*
- ✓ *Analyse the differences between Profit & Loss Account and Income & Expenditure Account/ Receipts & Payments Account.*

UNIT-I **10 Hrs**

Introduction to Accounting: Meaning, Need for Accounting, Objectives of Accounting, Advantages Book-Keeping, , Accounting Terminology, Internal and External users of accounting information, Accounting Cycle, limitations of accounting, Accounting Concepts and Conventions, (GAAP).

UNIT - II 10 Hrs

Accounting systems & process: Double Entry Book-Keeping System, Process of accounting transactions, Classification of Accounts, Journal-Ledger-Trial balance.

UNIT-III **10 Hrs**

Preparation of Final Accounts: Concept of Capital and Revenue**.** Trading - Profit & Loss Account - Balance sheet – Problems with Adjustments.

UNIT - IV **10 Hrs**

Depreciation and inventory management: Meaning, need & importance of depreciation, methods of charging depreciation. Valuation of Inventory – Methods of Inventory Valuation.

UNIT - V **10 Hrs**

Company Accounts: Meaning-Importance-Types of Shares &Debentures- Issue-Forfeiture- Re-Issue-Redemption of Debentures.

Text Book:

1. S.P. Jain, K.L Narang “Financial Accounting”, 3rd Edition, Kalyani Publishers, 2016.
2. Jawahar Lal,Seea Srivastava, “Financial Accounting-Principles And Practices:, 3rd Edition, S. Chand, NewDelhi, 2014.

Reference Books:

1. Jain S.P., & Narang K L. “Basic Financial Accounting*”*, 1st Edition, Kalyani publishers, 2014.
2. Maheshwari, S.N., & Maheshwari, S.K. . “Advanced Accountancy*”*, 10th Edition, Vikas house publication ltd, 2010.
3. Shukla, M. “Advanced Accounts” 19th Edition, S Chand Group, 2016. .
4. Radhaswamy, M & Gupta, R.L. “ Advanced Accountancy*”* 17th Edition*,* Sultan Chand & Sons, 2014.

17BB107 MICRO ECONOMICS

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objective:

This course is designed to make the students familiar with the basic concepts and principles of Business Economics. In addition it develops skills to make decisions related to demand analysis, theory of production, cost analysis and different markets and pricing methods.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

- Understand and apply supply and demand analysis to relevant economic issues.
- Apply marginal analysis to the “firm” under different market conditions.
- Understand the causes and consequences of different market structures .
- Apply economic models to examine current economic issues and evaluate policy options for addressing these issues.

SKILLS:

These activities are only indicative, the Faculty member can innovate)

- ✓ *To conduct a survey on the practical application of laws of economics.*
- ✓ *To collect data on sales of consumer durable goods and predict the sales for a later year.*
- ✓ *To find different case studies relating to different market conditions and to do an analysis.*
- ✓ *To find out low demand differentiates between normal and inferior goods.*
- ✓ *To analyze the role of a business economist in the everyday functioning of an organization taking live examples.*

UNIT - I **10 Hrs**

Introduction to Economics: efinition- scarcity, welfare and wealth, scope of economics Nature and Significance of Managerial Economics, Basic Economic concepts, Micro and Macro Economics.

UNIT - II **10 Hrs**

Consumer Demand Analysis - Cardinal and Ordinal Approach: Meaning and types of Demand, Demand determinants, Law of Demand, Elasticity of Demand – Types, Degrees and Measurement of Elasticity. Demand Forecasting-kinds and methods

UNIT - III **10 Hrs**

Production Analysis: Production, production function, iso-quant, iso-cost , least-cost combination of input factors**, MRTS ,** Laws of Production – law of Variable proportions and Laws of Returns of Scale.

UNIT - IV **10 Hrs**

Cost Analysis: Cost Analysis – Types of costs, cost function, cost-output relationship in the short-run and in the long-run. Break-even analysis –schedule, chart and simple problems.

UNIT - V **10 Hrs**

Market Structure: Market, Market structure, Perfect competition – Meaning, Equilibrium of firm and industry under perfect competition, Pricing under imperfect competition – monopoly and monopolistic competition- Methods of pricing.

Books for Reference:

1. D. M. Mithani: Business Economics, , 1st Edition, Himalaya publishing house, 2017
2. Dr. P. N. Reddy & H. R. Appannaiah: Essentials of Business Economics, 1st Edition, Himalaya, 2014
3. H. Craig Petersen & W. Cris Lewis: Managerial Economics, 4th Edition, PHI, 1999
4. Joel Dean: Managerial Economics, , 1st Edition, prentice hall, 1951
5. K. Dewett: Economic Theory, Reprint Edition, S chand, 2006.

17BB109 IT TOOLS FOR BUSINESS

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objective:

The primary objective of this course is to familiarize the student with basic concepts of computers and information technology and their applications to business processes. Students will learn fundamentals of computers, MS office, MS Excel, some important softwares and their application in business decision making.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

- Understand the computer fundamentals.
- Computer softwares, internet and its applications.
- MS Office and Excel.
- Computer and IT applications in business decision making.

SKILLS:

These activities are only indicative, the Faculty member can innovate*)*

- ✓ *To conduct a survey on the practical application of laws of economics.*
- ✓ *To collect data on sales of consumer durable goods and predict the sales for a later year.*
- ✓ *To find different case studies relating to different market conditions and to do an analysis.*
- ✓ *To find out low demand differentiates between normal and inferior goods.*
- ✓ *To analyze the role of a business economist in the everyday functioning of an organization taking live examples.*

UNIT - I **10 Hrs**

Computer Fundamentals: Block Structure of a Computer, Characteristics of Computers, Generations of Computers, Classification of Computers, Computer Memory and Mass Storage Devices, Input-Output Devices.

UNIT - II **10 Hrs**

Computer Software: application and system software, programming languages and their classification, assemblers, compilers and interpreters, process of software development, operating systems: functions of operating systems. **Computer Network & Communication**: Network types, network topologies, network communication devices, physical communication media, network protocol (TCP/ IP), internet and its applications:

UNIT - III **10 Hrs**

MS Office- Text processing using word- Functions. MS Excel-Graphs, Basic statistical formulae using MS Excel, MS-Power Point –Creating Effective Presentations.

UNIT - IV **10 Hrs**

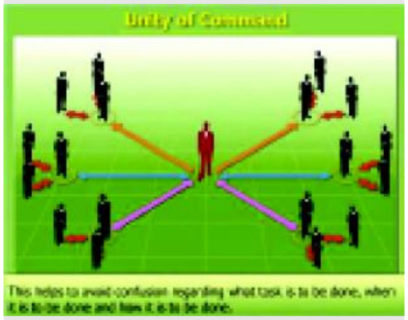
Computers and IT in business applications: Introduction, Business and Computer, E-Mail, E-Commerce, Project management, Computers in personnel Administration, Accounting, Computers in Cost and Budget Control, Marketing, Manufacturing, Materials management, Banking, Insurance And Stock-broking, Purchasing activities.

UNIT - V **10 Hrs**

World Wide Web and Business Community, Internet, E- Mail with TCP/IP.

Suggested Readings / Books:

1. ITL Education Solutions, Introduction to Information Technology, Pearson Education, 2012.
2. Turban, Rainer and Potter, Introduction to information technology, John Wiley and Sons, 2004, 3 edition.
3. Information Technology for Managers, Sudalaimuthu & Hariharan, HPH, 2010.
4. Understanding Computers Today & Tomorrow, D.Monley & CS Parker, Cengage/Thomson, 2014 15th edition.



17BB111 PRINCIPLES AND PRACTICE OF MANAGEMENT

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objectives:

The course is intended to provide knowledge on basic perspectives of management theories and practices. This will form foundation for further study of functional areas of management and provide for understanding how organizations function. In addition should will list out all the functions of any production and

Course Outcomes:

By studying this course, the student will be able to:

- Appraise the management functions in organizations.
- Apply the techniques of management such as, planning, decision making, etc.
- Understand the role of managers in organizations.
- Identify the differences in motivational needs of individuals.
- Apply the leadership styles under different management conditions.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *Present sample organization charts (structure).*
- ✓ *Show a sample template of staffing.*
- ✓ *Graphic representation of Maslow's Theory.*
- ✓ *Chart on Media of Communication.*
- ✓ *Draft Control chart of different industry/business groups.*
- ✓ *Prepare list of corporate strategies that are adopted by Indian Companies to face the challenges of competition.*
- ✓ *Select a successful retail store and give details of factor leading to its success*
- ✓ *Select a failed venture, if any known to you, and bring out reasons for its failure (Note what we learn from these success & failure stories).*
- ✓ *Select a company and prepare a SWOT analysis for the same.*
- ✓ *Mention the characteristics and skills of managers in the 21st century.*
- ✓ *List out some unethical practices prevailing in an organization.*
- ✓ *Undertake a study of some ethical practices followed by an organization.*

UNIT - I **10 Hrs**

Introduction to Management: Management: The Art and Science – Functions of management- Management Levels – Roles of Managers –Evolution of management-Theories of management:Scientific management– Henry Fayol's theory – Weber's Bureaucracy – Human relations approach – Behavioral Science Approach – Systems' View of Management - Management Vs administration .

UNIT - II **10 Hrs**

Planning: Importance – Benefits – Disadvantages – Types of plans – Process of planning – Management By Objectives- Decision – Decision Making – Process and Techniques.

UNIT - III **10 Hrs**

Organizing: Organization: Types, Organization Chart – Basic Types of organization structures– Concepts of Departmentation, Delegation and Decentralization–Staffing: Functions

UNIT - IV **10 Hrs**

Directing – Concept of Directing – Leadership: Types of leaders – Trait, Behavioral and Contingency Approaches to Leadership – Motivation: Maslow's need hierarchy theory – Herzberg's two factor theory – Theory X and Theory Y – Equity theory – Expectancy theory – Communication: Process – Barriers – Formal and informal communication- Effective Communication

UNIT - V **10 Hrs**

Controlling: Need for controlling – Steps involved in controlling – process of controlling – Tools for Control: Balanced Score Card, Financial controls, Total Quality Management

Text Books:

1. Weihrich& Koontz, "Essential of Management", 7th edition, Tata McGraw Hill, 2009.
2. Angelo Kinicki, Brian Williams, "Principles of Management", 6th edition, McGraw Hill, 2010.

Reference Books:

1. James A. F. Stoner, "Management", Thomson, 1st edition, Prentice Hall, 1986.
2. Heinz Weihrich, Harold Koontz, "Management A Global Perspective", 10th edition, TMH, 2004.
3. Stephen P. Robbins Mary Coulter, "Management", 13th edition, PHI, 2017.

17BB113 ENGLISH PROFICIENCY COURSE - I

Hours Per Week :

L	T	P	To	C
-	-	4	4	2

Course Objectives:

To equip the learners with Functional English by experiencing wide range of language usage in different Situations**.** To instill among the learners the significance of developing LSRW skills and to create a scaffolding to the learners to speak in real life situations. To help learners acquire adequate vocabulary which enable them communicate in day to day situations

Course Outcomes:

By the end of 100 hours programme, the learners will be proficient in English and ready to take an Intermediate Level English Proficiency Test by an external certifying agency viz. Preliminary English Test by Cambridge English Language Assessment.

UNIT - I **10 Hrs**

Activity-1	:	Introducing Self
Activity-2	:	Introducing Others
Activity-3	:	Expressing Needs and Necessities

UNIT - II **10 Hrs**

Activity-4	:	Expressing Likes and Dislikes
Activity-5	:	Describing People and Places
Activity-6	:	Describing Things and Processes

UNIT - III **10 Hrs**

Activity-7	:	Describing Special and Temporal Relations
Activity-8	:	Giving Instructions and Directions
Activity-9	:	Talking about Routine or Habits

UNIT - IV **10 Hrs**

Activity-10	:	Narrating Events
Activity-11	:	Commenting on Happenings
Activity-12	:	Making Predictions

UNIT - V **10 Hrs**

Activity-13	:	Retelling and Relating Events
Activity-14	:	Asking for information, Clarification and Confirmation
Activity-15	:	Discussing and Debating

17BB102 BUSINESS COMMUNICATION-II

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objectives:

The purpose of the course is to develop the students' competence and confidence to communicate at an advanced level. Students will learn how to improve LSRW skills and developing strategies for LSRW skills. They also learn business letter writing and correspondence skills.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

- Understand the essentials of an effective communication.
- How to improve LSRW skills.
- Understand strategies for developing LSRW skills.
- Understand elements of business letter writing.
- Knowledge of business correspondence and professional correspondence.

SKILLS:

(These activities are only indicative, the Faculty member can innovate*)*

✓ *Findout the barriers of communication by playing story telling games*

✓ *Write a letter to your manager and subordinates*

✓ *write a letter to your supplier about raw material requirement*

✓ *Have a telephone converstion with your clients*

✓ *Write a circular to your department regarding holiday cancellation*

UNIT - I **10 Hrs**

Basics of Communication: Communication Process & Elements, Need of Communication Skills in Management, Channels of Communication, Types of Communication, Barriers to Communication, How to overcome the Barriers, Principles of effective communication.

UNIT - II **10 Hrs**

Language and Communication: Language as a tool of communication, Importance of LSRW skills, Strategies for developing LSRW skills.

UNIT - III **10 Hrs**

Business Letter Writing: Purpose of format of a business letter, Elements of a business letter, Types of business letters, Enquiry, Sales, Quotations, Claims, Adjustment, and other social correspondence.

UNIT - IV **10 Hrs**

Business Correspondence: Reports, Memos, Notice/Circular, Agenda, Minutes, e-mail.

UNIT - V **10 Hrs**

Professional Correspondence: Interview skills, Leadership qualities, Business etiquette, Telephone etiquette, Group Discussion, Group Dynamics, Presentation skills.

Text Books:

1. Success with Grammar & Composition by K.R.Narayana Swamy.
2. Communication Skills for Technical Students by T.M.Farhatullah

Reference Books:

1. Basic Communication Skills for Technology by Andse J.Rutherford. Pearson Education Asia.2000, 2nd edition.
2. Advanced Communication Skills by V.Prasad, Atma Ram.
3. Business Communication by Raymond V. Lesikar, 1995, Mcgrew hill.
4. Writing Remedies by University Press.

17BB104 COST ACCOUNTING

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objectives:

The objective of this subject is to familiarize students with the various concepts and elements of cost. Students will prepare sample cost sheet by using methods of costing, cost reduction and cost control process-methods and techniques.

Course Objectives:

By the end of this course it is expected that the student will be able to:

- Understand cost concepts and elements of cost sheet.
- Methods of costing.
- Cost reduction and cost control process- methods and techniques.
- To prepare cost sheet by using various methods of costing.

SKILLS :

(These activities are only indicative, the Faculty member can innovate)

- ✓ *List out methods of costing adopted by industries located in the region.*
- ✓ *List out materials consumed in any two organizations of your choice.*
- ✓ *Draw a specimen of a bin–card.*
- ✓ *Draw a specimen of stores ledger.*
- ✓ *List out the various expenses of two companies and prepare the cost sheet.*

UNIT - I **10 Hours**

Introduction to Cost Accounting: Introduction – Meaning & Definition of Cost, Cost concepts-Classification of cost, preparation of cost sheet.

UNIT - II **10 Hours**

Methods of Costing: Unit Costing, Job Costing and Contract costing.

UNIT - III **10 Hours**

Process Costing: Meaning, Features, Objectives –Cost Accounting Procedure and its application in Process Industry.

UNIT - IV **10 Hours**

Standard Costing and Variance Analysis: Meaning –Importance of Standard Costing-Variance Analysis-Advantages- Limitations of Standard Costing.

UNIT - V **10 Hours**

Cost Reduction and Cost Control Process: Introduction—Cost reduction and Cost Control Process-Short and long range cost control-cost reduction strategies-Methods and Techniques- Value Engineering Programme.

Text Books:

1. M.N. Arora "Cost Accounting", 12th Edition, Vikas Publication, 2013.

Reference Books:

1. N.K.Prasad "Principles & Practice of cost accounting", 1st Edition, Syndicate pvt ltd, 1979.
2. G. Prasad, K.S.R.K.Prasad "Cost Accounting", 3rd Edition, Jai Bharat, 2009.

17BB106 BUSINESS PSYCHOLOGY

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objective:

The objective of this course is to gain a basic understanding of major topics in Business psychology. Emphasis is placed on what common practice entails and how it affects the individual in the organization. Students will learn elements of motivation, job satisfaction and positive psychology.

Course Outcomes:

The student will:

- Understand fundamentals of business psychology.
- Learn factors influence motivation and job satisfaction.
- Learn performance management process, elements of training and HRD.
- Understand elements of positive psychology.

SKILLS :

(These activities are only indicative, the Faculty member can innovate)

- ✓ *Undertake a study to find out how employee behavior effect from work environment and which factors affecting to employees motivation.*
- ✓ *Analyze the characteristics and components of individuals behavior.*
- ✓ *Perform a study on the determinants of individuals in work place.*
- ✓ *Analyze the organizational culture and climate and stress management of the employees in any industry.*
- ✓ *Conduct a study on the reasons for Unhappy.*

UNIT - I **10 Hrs**

Introduction to Business Psychology: Definitions & Scope Major influences on Business Psychology-Scientific management and human relations schools Hawthorne Experiments.

UNIT - II **10 Hrs**

Individual in Workplace: Motivation and Job satisfaction, stress management. Organizational culture, Leadership.

UNIT - III **10 Hrs**

Work Environment: Psychology and Work Environment; Emerging issues: Place Attachment, Pro-Environmental Behavior, and Ecological Consumerism.

UNIT - IV **10 Hrs**

Neuroscience and Behavior: **Introduction, Autonomic & Neuro - endocrine Systems, the connection between the brain and behavior.**

UNIT - V **10 Hrs**

Positive Psychology: Psychology of well being, happiness and the facts of life, happiness across the life span, gender-marriage and happiness, life above zero-positive psychology revisited.

References:

1. Miner J.B., Industrial/Organizational Psychology. N Y : McGraw Hill,1992.

2. Blum & Naylor, Industrial Psychology. Its Theoretical & Social Foundations CBS Publication, 3rd edition,2003.

3. Steve, B.R. & Marie, C.K.. Positive Psychology. Dorlings Kindersley: India,2009..

4. Snyder, R.S., positive psychology: The Scientific and practical exploration of human strengths: New Delhi, Sage Publications. 2010, SAGE PUBLICATIONS.

17BB108 MACRO ECONOMICS

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objective:

To give a broader perspective of the working of Indian economy. Students will learn concepts of national income, sources of revenue and classification of expenditures, LPG policies, WTO, TRIPS, TRIMS and GATT, agrarian structure and Indian economy. They also learn Industrial strategy and its impact on development, causes and measures of poverty.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

- Understand concepts of national income, sources of revenue and classification of expenditures.
- LPG policies, WTO, TRIPS, TRIMS and GATT.
- Agrarian structure and Indian economy.
- Industrial strategy and its impact on development.
- Causes and measures of poverty.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *To study how business cycles have impacted the global economy in the past companies.*
- ✓ *To compare the monetary policies of any two economies.*
- ✓ *Do a case study of National income accounting company and underdeveloped economy with a developed area.*
- ✓ *Find out the recent changes introduced in monetary and fiscal policies.*
- ✓ *Prepare a report of Demonetization effect on economy.*
- ✓ *Find statistical trends in unemployment.*
- ✓ *List the difference between states in context of poverty, poverty alleviation programmes, literacy, population etc.*

UNIT - I **10 Hrs**

National Income: Basic Concepts of National Income -Sect oral composition of National Income of India and changes there in Performance on the social front -Union Government- sources of Revenue and classification of expenditures, Fiscal indicators.

UNIT - II **10 Hrs**

LPG Policies: Transition from Centralized Planning to Indicative Planning -LPG policies, Relative roles of state and markets in pre-liberalization and post- liberalization periods -Globalization and its discontents -WTO, TRIPS, TRIMS,GATS.

UNIT - III **10 Hrs**

Agrarian Structure: Agrarian Structure, land Reforms, Farm subsidies, Support prices and Procurement policies, Food Security, Agrarian Crisis and Farmer suicides, WTO and Indian Agriculture .

UNIT - IV **10 Hrs**

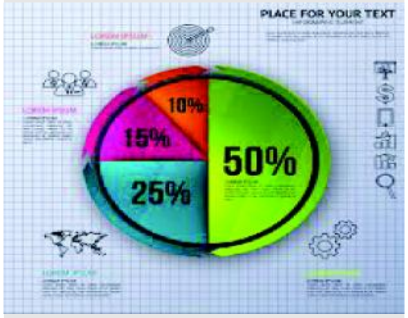
Industrial Strategy: Strategy of Industrialization, Special Economic Zones, FDI Policy-Multi-National Companies and their importance -Rise of Corporate power in India -Privatization and Dis-investment policies -Infrastructure policies.

UNIT-V **10 Hrs**

Alleviation programmes: Measures of Poverty and inequality and trends therein - Anti poverty programmmes - Public Distribution System - Wage employment programmes-Concepts of Social justice and Inclusive growth and their Components.

Reference Books:

1. Dutt and Sundaram, “Indian Economy”, Sultan Chand, Edition 72, 2016.
2. Misra and Puri, “Indian Economy”, Himalaya Publication, Edition 34, 2016.



17BB110 BUSINESS STATISTICS

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objective:

The objective of this course is to provide the basic knowledge of the various statistical techniques useful to managers in their decision-making. Students will learn statistical tools like measures of central tendency, dispersion, Regression and Correlation analysis, sample tests and Hypothesis testing.

Course Outcomes:

The focus is on the use of statistical techniques to describe the data, thereby enabling the student to

- Define statistics, become aware of wide range of applications in statistics, types of data, tabulation of data, construct a histogram, frequency polygon, an give, pie chart,
- Apply various measures of central tendency –mean, median, mode, GM and H.M for grouped and ungrouped data. Apply various measures of variability-range, MD, QD, standard deviation, and to know percentiles, Deciles.
- Understanding the concepts of various measures of dispersion and its applications in business decisions.
- Understand the concepts of probability and its uses for making decisions in business.
- Understand the concepts of discrete and continuous probability distribution.

SKILLS:

*(*These activities are only indicative; the Faculty member can innovate*)*

- ✓ *Collect statistical information's from Magazines, Newspapers, Television, Internet etc.,*
- ✓ *Collect interesting statistical facts from various sources and paste it in your note book.*
- ✓ *Collect a primary data about the mode of transport of your school students. Classify the data and tabulate it.*
- ✓ *From the mark sheets of your class, form the frequency tables, less than and more than cumulative frequency tables.*
- ✓ *Get the previous monthly expenditure of your family and interpret it into bar diagram and pie diagram. Based on the data, propose a budget for the next month and interpreted into bar and pie diagram. Compare the two months expenditure through diagrams*
- ✓ *Measure the heights and weights of your class students. Find the mean, median, mode and compare*
- ✓ *Find the mean marks of your class students in various subjects. Analysis of data by computing standard deviation and coefficient of variation.*
- ✓ *Collect the data from magazines, newspapers, and television, and publications. Present the data in graphs and diagrams.*

UNIT - I **10HRS**

Statistics, Data classification, tabulation and presentation: Meaning of statistics, growth and development of statistics, importance and scope of statistics, Limitations of statistics, Reasons for learning data, Classification of data, organizing data using data array, tabulation of data, graphical presentation of data, types of diagrams, exploratory data analysis.

UNIT - II **10HRS**

Measures of central tendency: Introduction, measures of central tendency, mathematical averages: Simple mean, weighted mean, Geometric mean, harmonic mean, averages of position: median, mode, quartiles, deciles, percentiles, deciles.

UNIT - III **10HRS**

Measures of Dispersion: Introduction, classification of measures of dispersion, distance measures: range, interquartile range, average deviation measures: mean absolute deviation, variance and standard deviation, coefficient of variation.

UNIT - IV **10HRS**

Fundamentals of probability: Introduction. Event types, definition of probability, fundamentals rules of probability, counting rules for determining the number of outcomes, rules of probability and algebra of events, Bayes' theorem.

UNIT - V **10HRS**

Probability distributions: Introduction, discrete probability distribution: binomial probability distribution, Poisson probability distribution, Continuous probability distributions: normal probability distribution.

Text books:

1. J. K. Sharma, Business statistics problems and solutions, 1st edition, Pearson Education, 2011.
2. J. K. Sharma, Business statistics, 4th edition, Vikas publishers, 2014.

Reference books:

1. Gupta, S.P. Statistical Methods,44th edition, Sultan Chand & Sons.2012.
2. G.C.Beri, Business Statistics, 3rd ed., McGraw Hill, Mcgraw hill,2017.

17BB112 GEOGRAPHY AND ENVIRONMENTAL STUDIES

Hours Per Week :

L	T	P	To	C
4	-	-	4	4

Course Objective:

To sensitize the students on the environmental aspects of development and give basic exposure to geography. Students will learn fundamentals of geography, Sources of energy and importance of Bio-Diversity. They also learn environmental issues and their implications.

Course Outcomes:

By the end of this course it is expected that the student will be able to:

- Understand fundamentals of geography.
- Learn milestones in India's scientific and technological progress.
- Sources of energy and their importance.
- Importance of Bio-Diversity.
- Environmental issues and their implications.

SKILLS:

(These activities are only indicative, the Faculty member can innovate)

- ✓ *To study how business cycles have impacted the global economy in the past companies.*
- ✓ *To compare the monetary policies of any two economies.*
- ✓ *Do a case study of National income accounting company and underdeveloped economy with a developed area.*
- ✓ *Find out the recent changes introduced in monetary and fiscal policies.*
- ✓ *Prepare a report of Demonetization effect on economy.*
- ✓ *Find statistical trends in unemployment.*
- ✓ *List the difference between states in context of poverty, poverty alleviation programmes, literacy, population etc.*

UNIT - I **10 Hrs**

Geography: Fundamental concepts of Geography-Physical Geography of India – River systems, climate, soils, minerals, geological Strata, climatic regions, natural vegetation, Races and Physical Types of People.

UNIT - II **10 Hrs**

Scientific and Technological Development: Milestones in India's scientific and technological progress in diverse fields – space, Nuclear, IT, Defense, Agriculture and Rural technologies- Prominent scientists of India and their contribution -Recent initiatives to spread scientific temper and S & T practices.

UNIT-III **10 Hrs**

Energy Sources: Sources of Energy-availability and consumption pattern, Energy policy and pricing Issues relating to hydel power (Big Dams), Thermal Plants and Nuclear power Green Energy technologies and their importance.

UNIT-IV **10 Hrs**

Biodiversity: Meaning and importance of Bio-diversity, Sustainable Development-Ecosystems and their management -Bio-Diversity of India, Bio- spheres and Biodiversity hot spots of India Initiatives to preserve bio-diversity.

UNIT - V **10 Hrs**

Environmental issues: Magnitude, causes and consequences of environmental pollution in India - Factors that led to global warming and climate change -Recent international protocols to tackle climate change, Carbon trading and its implications -Concerns of Developing Countries.

Reference Books:

1. Bio & Environmental Geog. Biosphere A Geography of Life
   By Dr. Thomas and K. Siddhartha.
2. Environmental Geology –By Valdiya.1987, TMH

17BB114 ENGLISH PROFICIENCY COURSE - II

Hours Per Week :

L	T	P	To	C
-	-	4	4	2

Course Objective:

To equip the learners with Functional English by experiencing wide range of language usage in different Situations**.** To instill among the learners the significance of developing LSRW skills and to create a scaffolding to the learners to speak in real life situations. To help learners acquire adequate vocabulary which enable them communicate in day to day situations.

Course Outcomes:

By the end of 100 hours programme, the learners will be proficient in English and ready to take an Intermediate Level English Proficiency Test by an external certifying agency viz. Preliminary English Test by Cambridge English Language Assessment.

UNIT - I			**10 Hrs**
Activity-1	:	Making Requests – Accepting/Refusing Requests.	
Activity-2	:	Inviting people – Accepting/Declining Invitations.	
Activity-3	:	Making Complaints – Responding to Complaints.	
UNIT - II			**10 Hrs**
Activity-4	:	Congratulating/Praising.	
Activity-5	:	Expressing Sympathy/condolence.	
Activity-6	:	Offering help Accept/Refuse.	
UNIT - III			**10 Hrs**
Activity-7	:	Conversing over phone.	
Activity-8	:	Advising/Suggesting.	
Activity-9	:	Comparing/Contrasting.	
UNIT - IV			**10 Hrs**
Activity-10	:	Convincing/Persuading.	
Activity-11	:	Negotiating.	
Activity-12	:	Making Decisions.	
UNIT - V			**10 Hrs**
Activity-13	:	Cause and Effect	
Activity-14	:	Stating and Concluding	
Activity-15	:	Drawing Conclusions	

UNIT-I: **- 12 Hrs**

Activity-1 : Making Requests – Accepting/Refusing Requests.

Activity-2 : Inviting people – Accepting/Declining Invitations.

Activity-3 : Making Complaints – Responding to Complaints.

UNIT-II: **- 12 Hrs**

Activity-4 : Congratulating/Praising.

Activity-5 : Expressing Sympathy/condolence.

Activity-6 : Offering help Accept/Refuse.

UNIT-III: **- 12 Hrs**

Activity-7 : Conversing over phone.

Activity-8 : Advising/Suggesting.

Activity-9 : Comparing/Contrasting.

UNIT-IV: **- 12 Hrs**

Activity-10 : Convincing/Persuading.

Activity-11 : Negotiating.

Activity-12 : Making Decisions.

UNIT-V: **- 12 Hrs**

Activity-13 : Cause and Effect

Activity-14 : Stating and Concluding

Activity-15 : Drawing Conclusions

Course Code: BB201

INDIAN ECONOMY

Objective of the Course:

To give a broader perspective of the working of Indian economy. Students will learn concepts of national income, sources of revenue and classification of expenditures, LPG policies, WTO,TRIPS, TRIMS and GATT, agrarian structure and Indian economy. They also learn Industrial strategy and its impact on development, causes and measures of poverty.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand concepts of national income, sources of revenue and classification of expenditures

2. LPG policies, WTO,TRIPS, TRIMS and GATT

3. Agrarian structure and Indian economy

4. Industrial strategy and its impact on development

5. Causes and measures of poverty

UNIT-I: - 12 Hrs

National Income: Basic Concepts of National Income -Sect oral composition of National Income of India and changes there in Performance on the social front -Union Government- sources of Revenue and classification of expenditures, Fiscal indicators

UNIT-II: - 12 Hrs

LPG Policies: Transition from Centralized Planning to Indicative Planning -LPG policies, Relative roles of state and markets in pre-liberalization and post- liberalization periods -Globalisation and its discontents -WTO, TRIPS, TRIMS,GATS

UNIT-III: - 12 Hrs

Agrarian Structure: Agrarian Structure , land Reforms, Farm subsidies, Support prices and Procurement policies, Food Security, Agrarian Crisis and Farmer suicides, WTO and Indian Agriculture

UNIT-IV: - 12 Hrs

Industrial Strategy: Strategy of Industralisation, Special Economic Zones, FDI Policy- Multi-National Companies and their importance -Rise of Corporate power in India -Privatization and Dis-investment policies -Infrastructure policies

UNIT-V: - 12 Hrs

Poverty: Measures of Poverty and inequality and trends therein - Anti poverty programmmes - Public Distribution System - Wage employment programmes - Concepts of Social justice and Inclusive growth and their Components

Reference Books:

1. Dutt and Sundaram, “Indian Economy”, Sultan Chand, 2014.

2. Misra and Puri, “Indian Economy”, Himalaya Publication, 2014.

Course Code: BB203

COST ACCOUNTING

Course Description and Objective:

The objective of this subject is to familiarize students with the various concepts and elements of cost. Students will learn cost concepts and elements of cost sheet, methods of costing, cost reduction and cost control process-methods and techniques.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand cost concepts and elements of cost sheet

2. Methods of costing

3. Cost reduction and cost control process- methods and techniques

UNIT-I **- 15 Hours**

Introduction to Cost Accounting: Introduction – Meaning & Definition of Cost, Cost concepts-Classification of cost-Methods and systems of cost Accounting. Preparation of cost sheet

UNIT-II **- 15 Hours**

Methods of Costing: Unit Costing, Job Costing and Contract costing

UNIT-III **- 12 Hours**

Process Costing: Meaning, Features, Objectives –Cost Accounting Procedure and its application in Process Industry

UNIT-IV **- 10 Hours**

Standard Costing and Variance Analysis: Meaning –Importance of Standard Costing-Variance Analysis-Advantages- Limitations of Standard Costing

UNIT-V **- 15 Hours**

Cost Reduction and Cost Control Process: Introduction—Cost reduction and Cost Control Process-Short and long range cost control-cost reduction strategies-Methods and Techniques- Value Engineering Programme.

Reference Books:

1. Principles & Practice of cost accounting by N.K.Prasad.
2. Cost Accounting Principles and Practice by M.N. Arora.

Course Code: BB205

MANAGEMENT INFORMATION SYSTEMS

Course Description and Objective:

To enable the students to understand management information systems to integrate for the purposes of information requirements, the accounting, financial, and operations management functions of an organization. And how MIS facilitates managerial decision making.

Learning Outcomes:

By the end of this course it is expected that the student will be able to:

1. Understand concepts of MIS

2. Types of MIS and its application in enterprises

3. MIS development and acquisition of information

4. MIS- Software development cycle

5. Research report preparation using MIS

UNIT-I **- 12 Hrs**

Management information systems-What is MIS-Concept of MIS- MIS in business functions- major components and technologies of an information systems infrastructure.

UNIT-II **- 12 Hrs**

MIS-Types of MIS- Application of MIS in enterprises- Information gathering-business blue print-Realization-Configuration-Documentation of business process- Final preparation for implementation of software packages.

UNIT-III **- 12 Hrs**

MIS- development and acquisition of information systems and technologies, assess the value of information systems investments, and formulate a business case for a new information system with estimation of both costs and benefits—to gain business intelligence, support decision making, create competitive advantages, or meet a competitive necessity.

UNIT-IV **- 12 Hrs**

MIS- Software Development Life Cycle (SDLC) -Accounting techniques and reports- Design and analyze business processing by utilizing advanced spreadsheet functionality including formulas, bar graphs, pie charts, and pivot tables.

UNIT-V **- 12 Hrs**

Prepare a research report on a current topic involving an information systems industry, strategy, or technology and synthesize this research with information presented in class.

Text Books:

1. C.S.V.Murthy, 2011, Management Information System, Himalaya Publications.
2. Goyal, D.P. “Management Information Systems”, MC Millan India.

Reference Books:

1. Murdic Rass, e.elagett, “Information System for Management”, Tata McGraw Hill, India.
2. W S Tawadekar, “Management Information System”, 2nd ed., TMH, Newdelhi, 2002.
3. James o’Brien, 2011, Management Information System, Golgotha Publications.
4. Davis and Olson, 2011, Management Information System, Tata Mc GrawHill.

Course Code: BB207

BUSINESS LAW

Course Description and Objective:

The main objective of the course is to make the students know the legal framework for carrying out a business. Issues related to drafting contracts, partnerships, company management & consumer protection laws will be discussed.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Learn essential elements of a valid contract
2. Partnership Act-1932 and Negotiable instrument Act
3. Company law and company management
4. Consumer protection Act and its importance in the present context

UNIT-I **- 10 Hrs**

Contract Law: The Indian Contract Act, 1872 - Nature of contract - Essential elements of valid contract – Performance of contract – Discharge of contracts - Remedies for breach of contract.

UNIT-II **- 10 Hrs**

Partnership Act & NI Act: The Indian Partnership Act–1932: Constitution of partnership - Rights of Partners – Duties of Partners - Dissolution of partnership.

The Negotiable Instruments Act – 1881: Characteristics of Negotiable Instruments – Promissory Note, Bills of Exchange, & Cheque, and their definitions and characteristics – Discharge of Parties.

UNIT-III **- 10 Hrs**

Company Law: The Companies Act, 1956 - Definition & its Characteristics – Company distinguished from partnership – Kinds of companies - Steps and procedure for incorporation of the company – Directors: Appointment, Duties, Powers, Liabilities.

UNIT-IV **- 10 Hrs**

Company Management: Meetings: Kinds of Meetings – Requisites of valid meeting, Proxies - Resolutions - Winding-up of a Company: By Tribunal – Duties of Liquidator - Powers of Liquidator – Voluntary winding up: By Members – By Creditors.

UNIT-V **- 10 Hrs**

Special Acts: The Consumer Protection Act, 1986: Consumer Protection councils – Redressal Machinery – The Air (Prevention and Control of Pollution) Act, 1981 - The Water (Prevention and Control of Pollution) Act, 1974 - The Environment (Protection) Act, 1986.

NOTE: Few case studies be discussed in the class

Text Books:

1. N.D.Kapoor, Mercantile Law, Sultan Chand & Sons, 2006.
2. C.L.Bansal, Business and Corporate Laws, 1/e, Excel Books, 2006.

Reference Books:

1. S.S. Gulshan, Mercantile Law, 2/e, Excel Books, 2004.
2. Akhileshwar Pathak, Legal Aspects of Business, 3/e, Tata McGraw-Hill, 2007.

Course Code: BB209

ORGANIZATIONAL BEHAVIOUR

Course Description and Objective:

The course provides a basic knowledge of various dimensions of human behavior. This will form the foundation to study and to understand the behavior of the human beings working in organizations. Students will learn nature and scope of OB, Perceptual process, important aspects of personality and attitude, group dynamics and effects of stress and issues of conflict management.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand nature and scope of OB
2. Perceptual process
3. Important aspects of personality and attitude
4. Group dynamics and effects of stress
5. Issues of conflict management

UNIT-I - 12 Hrs

Nature of OB: Nature and scope of OB - contributing disciplines to OB - Environmental and Organizational context of Organizational Behaviour.

UNIT-II - 12 Hrs

Perception - Process: Individual and Organizational factors that influence perceptional process. Role of perception in managerial activities and organizational processes.

UNIT-III - 12 Hrs

Personality and Attitudes: Personality as continuum – Meaning of Personality – Johari window and Transactional Analysis Nature and Dimension of Attitudes.

UNIT-IV - 12 Hrs

Group Dynamics: The Nature of groups. Kinds of groups – Stages of Group Development – Factors Contributing to Groups Cohesiveness - Meaning & types of stress – Effect of Stress – Strategies of cope with stress

UNIT-V **- 12 Hrs**

Conflict Management: Nature of conflict – Dynamics of Conflict – Conflict resolution modes – approaches to conflict management – sources of conflict in organization.

Text Books:

1. Luthans, Fred," Organizational Behaviour", 10/e, THM, 2007.
2. Robbins, P Stephen, Timotny A judge, "Organization Behaviour", 12/e, PHI, New Delhi, 2007.

Reference Books:

1. Organisation Behaviour by Nelson
2. Schermerhorn: Organisation Behaviour, Wiley, 9/e, 2005.
3. Organisational Behaviour by Aswathappa

Course Code: BB211

Soft Skills Laboratory

Course Description and Objective:

The Soft Skills Laboratory course is aimed at training undergraduate students and enabling them to acquire employability skills. Designed to impart work related skills, the course will help trainees develop interpersonal communication, leadership and team skills. It will give them the required competence and confidence to handle professional tasks.

Training Methodology:

The training methodology is designed to bring about changes in attitudes through experience-based learning. Activities in simulated environments such as role plays, group discussions, micro-presentations, audio-video clippings, case studies, psychometric tests etc., will provide students insights into their strengths and weaknesses.

Learning Outcome:

The Soft Skills course will help students develop professional and non-personal ways of approaching people and work through the correct use of language and speech in a workplace environment along with the ability to think critically on issues demanding attention. This includes enhancing self-awareness and a sense of self-worth in the students in order to improve their productivity and performance at the workplace.

Course Contents:

UNIT-I: **- 12 Hrs**

a) Role of language in Personality – How language reflects, impacts personality – Using gender-neutral language in MNCs – being culturally sensitive.

Activity – Appraising each other – Worksheets related to the above

b) Career Planning- job vs. career- goal setting- SWOT analysis- planning and prioritization - four quadrant time management system - time management – self-management – stress-management.

Activity: Setting a SMART goal - SWOT analysis of the self – Writing a Statement of Purpose (SOP).

c) Effective Resume-Writing: structure and presentation - planning and defining the career objective - projecting one's strengths and skill-sets – summarizing - formats and styles - covering letter.

Activity: Resume preparation –writing a covering letter.

UNIT-II: - 12 Hrs

A) Functional English - Formal/informal context – purpose - interpersonal dynamics - ideation –content organization - initiating a conversation –responding appropriately - right body language.

Activity - Role play in different situations, - self-introduction - social background (family, home town etc.,) - role model - my future - likes/dislikes (movies, persons, places, food, music etc.,) - a mini project on functional English.

b) Vocabulary-Building: Etymology of words - word roots - prefixes & suffixes - synonyms & antonyms- collocations - one-word substitutes – analogies - idioms and phrases - contextual guessing of unfamiliar words – task-oriented learning (100 words).

Activity: Flash cards (200 words) – vocabulary exercises with hand-outs.

UNIT-III: - 12 Hrs

a) Group Discussion: Articulation and flow of oral presentation - dynamics of group discussion – intervention – summarizing - voice modulation – content generation – Key Word Approach (KWA) – Social, Political, Economic, Legal and Technical Approach (SPELT) – View Point of Affected Part (VAP) - language relevance - fluency and coherence.

Activity: Mock sessions on four types of GD topics.

b) Facing Interviews: Interview process - understanding employer expectations - pre-interview planning - opening strategies - answering strategies – stress-based interviews - tele-interviews, video interviews- frequently asked questions (FAQs).

Activity: Writing responses to FAQs - mock interviews.

UNIT-IV: - 12 Hrs

a) Reading Comprehension: Reading as a skill- techniques for speed reading- skimming- scanning- appreciating stylistics - impediments for speed reading - eye fixation - sub-vocalisation - critical reading - reading based on purpose - reading for information - reading for inference -understanding tone.

Activity: Reading comprehension exercises with texts drawn from subject areas. (Hand-outs)

b) Listening Comprehension: Listening as skill - different types of listening - hidden data of communication - active listening - top-down approach - bottom-up approach.

Activity: Following different accents (Indian, British, American) listening comprehension exercises with audio and video excerpts.

UNIT-V: **- 12 Hrs**

a) Data Commentary: Deductive & inductive reasoning - data interpretation - tables & charts - bar charts - pie charts - line graphs - ratios & proportions – percentages - coding and decoding - reasoning by analogy - artificial language etc.,

b) Analytical Thinking: Statement and Conclusion - Data Sufficiency - Statement and Argument - Statement and Assumption - Logical Deduction - Logical Problems.

Activity: Exercises with handouts.

Reference Books:

1. Edward Holffman, Ace the Corporate Personality, McGraw Hill,2001
2. Adrian Furnham, Personality and Intelligence at Work, Psychology Press, 2008.
3. John Adair Kegan Page, “Leadership for Innovation” 1st edition, Kogan, 2007.
4. M.Ashraf Rizvi, “Effective Technical Communication”, 1st edition, Tata McGraw Hill, 2005.
5. Krishna Mohan & NP Singh , “Speaking English Effectively” 1st edition, Macmillan, 2008.
6. Soft Skills Material of Infosys Under the Academic Initiative of Campus Connect
7. K.R. Lakshminarayana & T. Murugavel, “Managing Soft Skills”, Scitech Publications. 2009
8. Dr. S.P. Dhanvel, English and Soft Skills, Orient Blackswan, 2011
9. Rajiv K. Mishra, Personality Development-, Rupa & Co. 2004.
10. R.S.Agarwal, Quantitative Aptitude, S. Chand& Co. Latest edition.
11. R.S.Agarwal, Verbal & Non-verbal Reasoning, S. Chand& Co. Latest edition.

Course Code: BB202

FINANCIAL MANAGEMENT

Course Description and Objective:

To enable the students understand the fundamental concepts of financial management and various financial decisions of a firm. Students will learn importance of Investment decisions in FM, issues of management of working capital, Financing decisions and Dividend decisions.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand fundamentals of Financial Management
2. Importance of Investment decisions in FM
3. Issues of management of working capital
4. Financing decisions

5. Dividend decisions

UNIT-I **- 12 Hrs**

Financial Management- Meaning, importance, scope and objectives- Conflicts in profit versus value maximization principle- Role of Chief Financial Officer.

Time Value of Money-Compounding and discounting techniques – concepts of annuity and perpetuity.

UNIT-II **- 12 Hrs**

Investment Decisions- Purpose, objective, process- Techniques of decision making: payback period method, accounting rate of return, net present value, internal rate of return, modified internal rate of return, discounted payback period and profitability index.

UNIT-III **- 12 Hrs**

Management of working capital-Working capital policies - Inventory management- Receivables management- Payables management- Management of cash and marketable securities- Financing of working capital.

UNIT-IV **- 12 Hrs**

Financing Decisions- Cost of Capital – weighted average cost of capital and marginal cost of capital - Capital Structure decisions – capital structure patterns, designing optimum capital structure, constraints, various capital structure theories- Business risk and financial risk – operating and financial leverage, trading on equity.

UNIT-V **- 12 Hrs**

Dividend decisions: Forms of dividend, Theories of dividend – Walter model, Gordon model, MM hypothesis, concept of cash and bonus shares.

Text Books:

1. I.M. Pandey, Financial Management.
2. V.K. Bhalla, Financial Management.

Reference Books:

1. Dr. S.N. Maheswari & Dr. C.B. Gupta, Financial Management.
2. Prasanna Chandra, Financial Management & Practice.
3. Preeti Singh, Investment Management Security Analysis and Portfolio Management.

Course Code: BB204

MARKETING MANAGEMENT

Course Description and Objective:

The course aims at making students understand concepts, philosophies, processes and techniques of managing the marketing operations of a firm. Students will learn importance of STP in Marketing management, marketing mix decisions, PLC and New product development process, important aspects of Service marketing.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand fundamentals of marketing

2. Understand importance of STP in Marketing management

3. Marketing mix decisions

4. PLC and New product development process

5. Important aspects of Service marketing

UNIT-I **- 10 Hrs**

Introduction: Definition, Importance and Scope of Marketing, Core marketing concepts, Elements of Marketing - Needs, Wants, Demands, Consumer, Markets and Marketers; Marketing Vs Selling, Consumer Markets and Industrial Markets. Concept of Marketing Management, developing marketing plans and strategies. Marketing Environment, Factors Affecting Marketing Environment, Marketing Information System and Marketing Research and demand forecasting ,Buyer behavior and influencing factors, Buying decision process

UNIT-II **- 10Hrs**

Market Segmentation: Segmenting the Market, Benefits, of Market Segmentations, Market Segmentation Procedure, Basis for Consumer/Industrial Market Segmentation. Market Targeting – Introduction, Procedure. Product Positioning - Introduction, Objectives, Usefulness, Differentiating the Product, Product Positioning Strategy.

UNIT-III **- 10 Hrs**

Marketing: Mix Decisions, Product Decisions, New Product Development-Concept and Necessity for Product Development, Failure of New Products, New Product Planning and Development Process, Product-Mix, Branding and Packaging Decisions, Product Life cycle - Stages and Strategies for Different Stages of PLC.

UNIT-IV **- 14 Hrs**

Pricing, Distribution, and Promotion Decision: Pricing Decisions, Pricing Objectives, Policies Methods of Setting Price, Pricing Strategies, Channels of Distribution for Consumer/ industrial Products, Factors Affecting Channel Distribution, Management of Channels, channel conflicts:. **Marketing Communication:** The communication process, Communication mix, Managing advertising sales promotion, Public relations and Direct Marketing. Sales force Objectives, Sales force structure and size, Sales force Compensation

UNIT-V **- 6 Hrs**

Service Marketing Aspect: A Brief Account of Marketing of Services, Social Marketing, Online Marketing.

Text Books:

1. Rajan Saxena: Marketing Management, 4/e, TMH, 2009.
2. V.S.Ramaswamy , S.Namakumari: Marketing Management, 4/e, Macmillan, 2009

Reference Books:

1. Phillip Kotler: Maketing Management, 11/e, Pearson Publishers, 2011.
2. Stanton William J., Fundamentals of Marketing, McGraw Hill, N. Delhi 10th Ed.
3. Czinkota and Kotabe: Marketing Management, 2/e, Thomson,2007

Course Code: BB206

HUMAN RESOURCE MANAGEMENT

Course Description and Objective:

The objective of the course is to provide basic knowledge of functional areas of Human Resource Management. This course will be a prerequisite for students to take any electives offered in the third and fourth semesters in any subject on HRM stream.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand nature, scope and importance of HRM
2. Elements of job analysis and design
3. Recruitment and selection process
4. Training and development process and methods
5. Performance appraisal methods and compensation

UNIT-I - 10 Hrs

Introduction to HRM: Meaning – nature and scope of HRM – functions – objectives of HRM – challenges of HRM – HR Planning process – HR information system.

UNIT-II - 12 Hrs

Job Analysis and Design: Basic prerequisites – job analysis – job description – job specification and job evaluation – job performance standards – elements of job design: job – restructuring – job rotation – job enlargement and job enrichment.

UNIT-III - 14 Hrs

Recruitment and Selection: The recruitment process – methods of recruiting – challenges of recruitment – the selection process – types of tests – basic features of interviews – types of interviews – designing and conducting the effective interview – induction and placement.

UNIT-IV **- 10 Hrs**

Training & Development: Introduction to training – the training process – training methods – management development – evaluation of training and development.

UNIT-V **- 14 Hrs**

Performance Appraisal and Compensation: The appraisal process, methods – the appraisal interviews – the feedback interview – career planning and development.

Compensation: Objectives of compensation – job evaluation system – benefits and services – safety and health.

Text Books:

1. Aswathappa.K, "Human Resource Management-Text & Cases", TMH, 2/e, 2008.
2. Gary Dessler, "Human Resource Management", PHI, 3/e, 2007.

Reference Books:

1. Mirza S.Saiyadain, "Human Resource Management", TMH, 3/e, 2001.
2. Decenza Robbins, "Human Resource Management", John Willey, 3/e, 1998.
3. Biswajeet Patnayak, "Human Resource Management", PHI, 2/e, 2002.
4. Jon M.Werner & Desmone, "Human Resource Development-Foundation Frame work and Application", Cengage Publishers, 2/e, 2008.

Course Code: BB208

OPERATIONS MANAGEMENT

Course Description and Objective:

The Objective of the course is to enable students to learn the Basics of Operations Management, which will help them in understanding actual business process. Students will learn concepts of production system, factors effecting productivity, issues of purchasing and inventory management.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand basic concepts of production systems
2. Elements of production management
3. Factors effecting productivity
4. Issues of purchasing and inventory management

5. Quality management and TQM

UNIT-I **- 12 Hrs**

Production systems: Systems concept of Production, Types of production Systems, Flow, Shop, Batch, Cellular, flexible Manufacturing. Group Technology. Computer Integrated manufacturing, Mass Production Vs Product variety. Maintainability.

UNIT-II **- 10 Hrs**

Production Management: Production Planning and control activities, Aggregate planning, MRP, MRP II, Simple problems. Supply Chain.

UNIT-III **- 14 Hrs**

Productivity Improvement: Factors affecting productivity and their measurement, Total productivity, tools and techniques for improving productivity. Facilities Layout – Types of layout – Process, product, Cellular, fixed position, mixed; Applicability, advantages and disadvantages. Work Study – Method Study, Micromotion Study, Stop watch Time Study, Work Sampling.

UNIT-IV **- 12 Hrs**

Purchasing and Inventory Management: Purchase function, Procedures. Economic Order quantity, Wilson's Lot size formula, assumptions in the equation, Ordering with lead time, safety stock and its effect on EOQ. Inventory analysis Methods – ABC, VED, XYZ methods – their utility. Inventory Valuation Methods: Periodic and perpetual systems; FIFO, LIFO, Average cost and Weighted Average Cost Methods.

UNIT-V **- 12 Hrs**

Quality Management: Inspection, Quality, Total Quality – Deming, Juran concepts. Quality as Cost and Quality as Profit. Total Quality Management. Statistical Quality Control – Control Charts – exercises. Concept of Quality Assurance. Principles of ISO and BIS. ISO standards and Certification process.

Text Books:

1. R.Paannerselvam, "Production and Operations Management", 2nd ed., PHI 2006.
2. K.Aswathappa, K.Sridhara Bhat, "Production and Operations Management", 2nd ed., HPH, 2010.

Reference Books:

1. S. N. Chary, "Production and Operations Management", 6th ed., TMH 2006.
2. Buffa, "Modern Production Operation Management", 6th ed., Willey 2008.
3. Joseph S Matrinich, "Production and Operations Management", 8th ed., Willey 2008.

Course Code: BB210

BUSINESS ENVIRONMENT

Course Description and Objective:

To familiarize the students with issues influencing business environment. Students also learn dimensions of business environment, policy framework- Industrial and trade policies, regulatory environment, role of regulatory institutions in Indian financial system, business ethics and corporate governance.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand dimensions of business environment
2. Policy framework- Industrial and trade policies
3. Regulatory environment
4. Role of regulatory institutions in Indian financial system
5. Business ethics and corporate governance

UNIT-I - 12 Hrs

Business Environment- Meaning- Different dimensions: Social, Cultural, Political, and Legal Environments and their Importance, Business Cycles and their impact

UNIT-II - 12 Hrs

Policy framework and business environment: Industrial policies, Trade Policies, Monetary and Fiscal policies – Liberalisation, Privatisation and Globalisation and business opportunities – Disinvestment Policies

UNIT-III - 12 Hrs

Regulatory Environment: Clearances and permissions for establishing industry and businesses – Environmental acts, Patents, IPRs, - Pollution and Waste management practices - Government Business Interface- Governance Reforms

UNIT-IV - 12 Hrs

Role of regulatory institutions in Indian financial system – RBI, SEBI, IRDA, AMFI – Prudential and Disclosure norms for accountability- Regulation of Foreign Trade – FDI Policy

UNIT V - 12 Hrs

Business Ethics, Corporate Governance, Corporate Social Responsibility of business enterprises,

Suggested Readings:

1. Dutt and Sundaram , Indian Economy, S. Chand, New Delhi, 2007.
2. K.Aswathappa, Essentials of Business Environment, 9/e Himalaya, 2007.

3. Justin Paul: Business Environment, 1e 2006, TMH
4. Misra and Puri: Indian Economy,, Himalaya, 2007.
5. Shaikh & Saleem - Business Environment (Pearson, 2nd Edition)
6. Francis Cherunilam – Business Environment, Text and Cases (Himalaya Publishing House, 8th Edition).

Course Code: BB212

Professional Communication Laboratory

Course Description and Objective:

The Professional Communication course is aimed at improving written communication skills of undergraduate students and preparing them to meet professional challenges in the work spheres. Writing and Personality are not two exclusive spheres of influence and this course will work on the relationship between professional writing and a personality that is able to meet the goals of an organization in creative and innovative ways. The course will expose students to conventions of corporate communication and documentation procedures involved in the day-to-day functioning of the business world.

Training Methodology:

The methodology is designed to give hands-on practice to students in formal and informal report writing, structure and format of letters as well as other organization related work.

Learning outcomes:

After going through the course, students will acquire competency to write logical sentences and paragraphs, use appropriate diction, grammar and punctuation. They will be able to compose clear and concise messages and produce business documents for mailing to external recipients or intra-organizational circulation.

UNIT-I: - 12 Hrs

- Elements of Technical Writing : Sentence structure - reducing verbosity - arranging ideas logically – building coherence - paragraph level and document level - topic sentence - cohesive devices – transitionals – paraphrasing – précis-writing.
- Mechanics of Writing: Stylistic elements – the rapporteur- the purpose- the reader (audience) - elementary rules of grammar- choice of diction - elementary principles of composition - matters of form – punctuation - conventions of business communication -language and tone - weak links in business correspondence - ethical concerns in business writing

UNIT-II: - 12 Hrs

- Parts of the Report: Writing an abstract - features of a good abstract – approach - compare and contrast - cause and effect.
- Types of Technical Reports : Drafting a technical proposal - formal and informal proposals - factual reports, feasibility reports, survey reports – parts of a report - title page –declaration –

acknowledgements – table of contents - abstract – introduction – conclusion – citations – references - appendices - oral reports and presentations

UNIT-III: **- 12 Hrs**

- Letter-Writing - Formal and informal letters - structure of formal letters - expressions of salutations, introductory and concluding paragraphs - different types of letters - sales letter - complaint letter - adjustment letter - letter to the editor - covering letter - claim letter – letter of condolence.

UNIT-IV: **- 12 Hrs**

- Business Correspondence : E-mail – nature and scope - e-mail etiquette – Common Errors in composing e-mails – Quotations - Inviting quotations - sending quotations –placing orders Office Communication - agenda - notice – circular
- Effective Resume-Writing: Structure and presentation - defining career objective - projecting one's strengths and skill-sets
- Summarizing - formats and styles - covering letter.

UNIT-V: **- 12 Hrs**

- Business Proposals: Drafting business proposals - calculating profit and loss-averages - ratios and proportions – partnership - simple interest - compound interest - calculating volumes and areas
- Course of action - cause and effect- theme detection - making judgments - logical deductions - analyzing arguments – syllogisms - Venn diagrams- 2 matching definitions -verbal reasoning - numerical reasoning - working out justifications.

Reference Books:

1. Strunk , William, Jr.The Elements of Style, Fourth Edition,
2. Rozakis, Laurie, Ph.D, (2003). English Grammar for the Utterly Confused, McGraw-Hill
3. Sharma. C. (1978) Business Correspondence & Report Writing, Tata McGraw-Hill
4. Kirkman, John. Good Style: Writing for science & technology, Routledge Study Guides, second edition.
5. Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11th Reprint.Tata McGraw-Hill. New Delhi

Course Code: BB301

INDIAN BANKING AND INSURANCE

Course Description and Objective:

acknowledgements – table of contents - abstract – introduction – conclusion – citations – references - appendices - oral reports and presentations

UNIT-III: - 12 Hrs

- Letter-Writing - Formal and informal letters - structure of formal letters - expressions of salutations, introductory and concluding paragraphs - different types of letters - sales letter - complaint letter - adjustment letter - letter to the editor - covering letter - claim letter – letter of condolence.

UNIT-IV: - 12 Hrs

- Business Correspondence : E-mail – nature and scope - e-mail etiquette – Common Errors in composing e-mails – Quotations - Inviting quotations - sending quotations –placing orders Office Communication - agenda - notice – circular
- Effective Resume-Writing: Structure and presentation - defining career objective - projecting one's strengths and skill-sets
- Summarizing - formats and styles - covering letter.

UNIT-V: - 12 Hrs

- Business Proposals: Drafting business proposals - calculating profit and loss-averages - ratios and proportions – partnership - simple interest - compound interest - calculating volumes and areas
- Course of action - cause and effect- theme detection - making judgments - logical deductions - analyzing arguments – syllogisms - Venn diagrams- 2 matching definitions -verbal reasoning - numerical reasoning - working out justifications.

Reference Books:

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2. Rozakis, Laurie, Ph.D, (2003). English Grammar for the Utterly Confused, McGraw-Hill
3. Sharma. C. (1978) Business Correspondence & Report Writing, Tata McGraw-Hill
4. Kirkman, John. Good Style: Writing for science & technology, Routledge Study Guides, second edition.
5. Monippally, Matthukutty. M. 2001. Business Communication Strategies. 11th Reprint.Tata McGraw-Hill. New Delhi

Course Code: BB301

INDIAN BANKING AND INSURANCE

Course Description and Objective:

To familiarize the students about the Banking operations and the keen competition in the banking. Performance evaluation of Indian banks, loans & advances management in Indian banks. And also to make students understand the importance of insurance and the basic concepts of insurance.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand Indian banking structure and system
2. Performance evaluation of Indian banks
3. Loans & advances management in Indian banks
4. Important concepts of insurance and regulatory framework
5. Life insurance and general insurance industry in India

UNIT-I **- 12 Hrs**

Introduction-Indian Financial System-Need for Banking-Structure of Banking in India-Working of Commercial Banks in India-Working of Cooperative Banks in India-Types of Banks-Role Functions of Reserve Bank of India.

UNIT-II **- 12 Hrs**

Evaluation of Performance of Banks in India-Indian Banking & Global Scenario-Major Players in Indian Banking Industry-Regulatory Environment-Retail Banking Segment-Banking Performance Parameters-Growth in the Indian Banking Industry-Operation & Performance of Commercial Banks.

UNIT-III **- 12 Hrs**

Loans & Advances Management-General Rules of Sound Lending-Forms of Lending-Types of loans & Advances-Determining credit worthiness.

UNIT-IV **- 12 Hrs**

Insurance: Overview-Nature of Business Risks-Importance of Insurance-Types of Insurance Principles of Insurance-Regulatory Frame work of Insurance in India.

UNIT-V **- 12 Hrs**

Indian Life Insurance Industry-Evaluation of Life Insurance in India-Types of Insurance Contracts-Classification of Life Insurance-Provisions of Life Insurance Contacts-Insurance Companies in India-Performance of Insurance Sector.

Indian General Insurance Industry: General Insurance-Classification of General Insurance -Main Players of General Insurance-Health Insurance-Types of Insurance-Growth of General Insurance in India.

Reference Books:

1. Srinivasan, T.M.N. (2010). Principles of Insurance Law. Nagpur: Lexis Nexis Butterworths Wadhwa.
2. Guruswamy, S. (2010). Banking theory, law & practice (2nd edi). New Delhi :McGraw hill- higher publication,.

3. Gupta, S.N. (2010). Banking Law In Theory & Practice (5th edi). New Delhi:Universal Law Publishers.

4. Narayanan,H. (2008). Indian Insurance – A Profile (2nd edi). Mumbai:Jaico Publishing House.

5. Kumar, G. (2011). Hand Book of Insurance Laws. Allahabad:Law publishers.

6. Singh, B.N. (2002). New Insurance Law. Allahabad: Universal Law Agency.

Course Code: BB303

BUSINESS ETHICS AND VALUES

Course Description and Objective:

To discuss the theories of ethics and Corporate Governance and explain how they can be applied in various business situations, importance of ethics in conducting business. Corporate social responsibility and ethical dilemmas at work place and corporate governance – Codes and Laws.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand nature and objectives of ethics

2. Importance of ethics in conducting business

3. Ethical organization and its corporate code

4. Ethical issues in marketing

5. Corporate social responsibility and ethical dilemmas at work place

6. Corporate governance – Codes and Laws

UNIT-I **- 12 Hrs**

Ethics- Nature of Ethics - Objectives of Ethics – Need - Business Ethics – Nature of Business Ethics – Relationship between ethics and business - The Utilitarian view – Separatist view – Integrated view of ethics – Stages of Ethical Consciousness.

Importance of Ethics in Business – Ethical theories – Meta ethics – Normative ethical theory –Theory of Justice – Theory of Rights – Ethics of Care – Law and Ethics - Trust and ethics – Suppliers, Customers, Employees Integrative Social Contact Theory – Hyper norms.

UNIT-II **- 15 Hrs**

Ethical Organization and its corporate code – Characteristics of ethical organization - Corporate Moral Excellence – Stakeholders – Corporate Governance – Corporate Code – Implementation of Corporate Code.

Ethical issues in Marketing – Ethics in marketing strategy, Marketing Mix, Marketing Research - Ethical issues in Operations – Role of Operations Manager, Quality Control, Ethical Problems in operations - Ethical issues in Purchase – Role, Purchase Code of Ethics, Global Buyer-Supplier Relations - Ethical Issues in HRM – Principles of Ethical Hiring, Promotion, Equality of OpportUNITy, Ethics in remuneration and retrenchment – down sizing workforce - Ethical Issues in Finance – Ethics in Financial Markets – Investor protection measures – Ethical responsibility towards competitors and business partners.

UNIT-III **- 12 Hrs**

Corporate Social Responsibility – Historical perspective of CSR from Industrial Revolution to Social Activism – Stake Holders – Share Holders – Employees – Management – External Stake Holders – Consumers – Suppliers – Competitors – Creditors – CommUNITy – Corporation as a moral person – Corporate expectations of Society - Current CSR Practices of firms in India.

UNIT-IV **- 10 Hrs**

Ethical Dilemmas at work place –Ethical dilemmas in decision making – power – authority – secrecy – confidentiality – trust and loyalty - Ethical Leadership – Managerial integrity and decision making.

UNIT-V **- 10 Hrs**

Corporate Governance – Codes and Laws – Committees of Corporate Governance –Role and functions of Chairman and Managing Director – Role and functions of Committees – Audit Committee – Remuneration Committee – Nomination Committee – Cadbury committee – OECD committee – KM Birla committee on Corporate Governance.

Text Books:

1. Sadri – Business Ethics Concepts and Cases, TMH, 1998
2. Business Ethics and Corporate Governance – ICFAI Publications.
3. Business Ethics – An Indian Perspective by Francis, TMH 2010.

Reference Books:

1. R.C.Shekar - Ethical Choices in Business.
2. LaRue Tone Hosmer - The Ethics of Management , Universal books.
3. Ethics in Business & Corporate Governance by Mandat, TMH, 2010.

Course Code: BB305

ENTREPRENEURSHIP

Course Description and Objective:

This subject provides an understanding of the role of an entrepreneur, factors influencing entrepreneurship, key areas of development, financial assistance by the institutions to the small and medium entrepreneurs.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand characteristics of entrepreneurs and their role in economic development
2. Factors effecting entrepreneurship development and growth
3. Developing a business plan
4. Role of small & medium enterprises and government policy
5. Financing small & medium enterprises

UNIT-I **- 12 Hrs**

Entrepreneurship: Concept, Traits, Characteristics, Functions, Types of Entrepreneurs – Role of Entrepreneurship in Economic Development.

UNIT-II **- 12 Hrs**

Entrepreneurship Development: Factors Affecting Entrepreneurial Growth – Motivation for entrepreneurship, Entrepreneurship Development Programs – Objectives, Components & Achievements, Social Entrepreneurship.

UNIT-III **- 12 Hrs**

Development a Business Plan: Project Planning – Business Plan – Meaning & Importance, Steps in writing Business Plan, Preparing Feasibility studies – Technical Feasibility, Financial, Economic & Market Feasibility. Meaning & Types of Intellectual Property Rights & Implications of their infringements – (Patents, Trademarks & Copyrights).

UNIT-IV **- 12 Hrs**

Role of Small & Medium Enterprises: Meaning & Role, Contribution of GDP & Employment. Problems & Prospects of SMEs. Government policy for SMEs – Protection, Promotion & Diversification.

UNIT-V **- 12 Hrs**

Financing of Small & Medium Enterprises: Capital Structure, Sources of Finance, Break Even Analysis, Financial Assistance to SMEs, Latest Government Schemes relating to grants & subsidies to SMEs.

Text Books:

1. S. Khanka “Entrepreneurial Development” S. Chand & Co. Ltd. Ram Nagar New Delhi, Latest Edition 1999.
2. Hisrich R D and Peters M P., “Entrepreneurship” 6th Edition Tata McGraw – Hill, 2007.
3. Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi, Latest Edition 1998.
4. EDII “A Hand Book for New Entrepreneurs, Entrepreneurship Development Institution of India, Ahmadabad, latest Edition.
5. Prasama Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw – Hill, Latest Edition.

Course Code: BB307

OPERATIONS RESEARCH

Course Description and Objective:

The objective of the course is to introduce some of the tools that facilitate better understanding about the operations in a quantitative form and help them in taking right decision about the business through mathematical approach.

Learning outcomes

After reading this chapter student can able to understand

1. Identify situations in which linear programming techniques can be applied, guidelines on linear programming model formulation, solve an LP problem by the graphical method, interpret the solution of an LP mode, understand the meaning of the word Simplex and logic of using simplex method, converting an LP problem into its standard form by adding slack, surplus, and/or artificial variables, recognize the special cases such as degeneracy, ,multiple optimal solutions, unbounded and infeasible solutions. Formulate the dual LP problem and understand the relationship between primal and dual solutions.

2. Recognize and formulate a transportation problem, drive initial feasible solutions using several methods, optimal solution by using MODI method, handle the problem of degenerate and unbalanced transportation problem. Understand the features of Assignment problem, formulate an assignment problem as a square matrix, apply the Hungarian method to solve an assignment problem, make appropriate changes to solve unbalanced assignment problem, profit maximization assignment problem, and solve a travelling salesmen problem.

3. Understand how optimal strategies, are formulated in conflict and competitive environment, principles of two-person zero-sum games, use dominance rules to reduce the size of a game payoff matrix and compute value of the game, apply minimaxand maximin principle to compute the value of the game where there is a saddle point, make distinction between pure and mixed strategies.

4. Understand the steps of decision making process, make decision under various decision-making environments, determine the expected monetary value, expected opportunity loss, and construct decision trees for making decisions.

UNIT-I **- 12 Hrs**

Linear Programming: Introduction to Linear programming – formulation of LPP – solution of LPP - Using Graphical Methods, the Simplex Method; Justification, interpretation of Significance of All Elements In the Simplex Tableau, the Simplex Solution to A Minimizing Problem - Two-Phase and Big-M method - Definition of the Dual Problem, Primal, Dual Relationships.

UNIT-II **- 12 Hrs**

Transportation, Assignment Problems: Definition and Application of the Transportation Model, Solution of the Transportation Problem, the Assignment Model, and Travelling Salesman Problem.

UNIT-III **- 12 Hrs**

Game Theory: Introduction – Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, matrix and arithmetic methods, Graphical Solution of 2 x n and m x 2 games.

UNIT-IV - 12 Hrs

P.E.R.T. & C.P.M.: Definitions, various terms used in networking, Drawing networks – identifying critical path – probability of completing the project within given time.

UNIT-V - 12 Hrs

Decision Theory: Steps In the Decision Making, the Different environments, In which Decisions Are Made, Criteria For Decision Making Under Uncertainty, Decision Making Under conditions of Risk - Decision Trees, Graphic Displays of the Decision Making Process, Decision Making With an Active Opponent.

Text Books:

1. J.K.Sharma, "Operations Research: Theory & Applications", Macmillan India, 2007.
2. S.D.Sharma, "Operations Research", 11th ed., Kendarnath, Ramanath & Co.

Reference Books:

1. Barry Render, Ralph M.Stair,Jr. Michael E.Hanna, "Quantitative Analysis for Management", 9/e, PHI Pvt. Ltd , New Delhi, 2007.
2. Hamdy, A.Taha, "Operations Research: An Introduction", Prentice-Hall of India, New Delhi, 2007.
3. Harvey M. Wagner, "Principles Of Operations Research", PHI, New Delhi, 2003.
4. Pannerselvam.R, "Operations Research", 2nd ed., PHI.
5. Operations Research, Kranthi Swaroop, P.K.Gupta and Manmohan, 4th ed., Sultan & Sons.

Course Code: BB309

STRATEGIC MANAGEMENT

Course Description and Objective:

To develop an understanding of strategic management concepts and techniques. Students will learn strategy formulation and various types of strategies, strategy implementation issues and strategy evaluation process.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand basic concepts of strategic management
2. Internal and external environment analysis to formulate strategies
3. Strategic analysis and choice- BCG, GE matrix and port folio analysis
4. Strategy formulation and various types of strategies

5. Strategy implementation issues
6. Strategy evaluation process

UNIT-I **- 10 Hrs**

Introduction to Strategic Management: Concept of Strategy; Mintzberg's 5Ps of Strategy; Strategic Decision Making; Strategic Management Process; Strategic Intent ,Concept of Stretch, Leverage and fit; Vision &Mission, Goals and Objectives; Need for Balanced Scorecard Strategists and their roles.

UNIT-II **- 10 Hrs**

Strategic purpose, environment and resource analysis: External Environmental analysis; industry analysis; competitive analysis: porter's five forces model; internal analysis; SWOT Analysis; the value chain analysis; core competence and competitive advantage

UNIT-III **- 10 Hrs**

Strategy formulation: Strategic Analysis and Choice- Port folio analysis: BCG, GE, Directional Policy and Hofer's Matrices; corporate strategy , mergers and acquisitions, business strategy, global strategy

UNIT-IV **- 10 Hrs**

Strategy Implementation: Strategy implementation issues; Resource Allocation; Structural Considerations and Organisational Design; Strategic Leadership and Corporate Culture; Managing change; Functional and Operational Strategies; Plans and Policies

UNIT-V **- 10 Hrs**

Strategy Evaluation: Importance and Nature of Strategic Evaluation; Strategic and Operational Control; Evaluation Process for Operational Control; Evaluation Techniques for Strategic and Operational Control.

NOTE: One case study be discussed – per unit – in the class

Text Books:

1. Azar kazmi "Business Policy and Strategic Management", TMH, New Delhi, 2008.
2. Appa Rao C, Business Policy and Strategic Management,Excel publishers,2008.

Reference Books:

1. Thomposn & Strickland: Strategic Management, Concepts and Cases. Tata McGraw-Hill, 12/e, New Delhi, 2007.
2. Gregory Dess and G.T. Lumpkin, Strategic Management – Creating Competitive Advantage, McGraw Hill International, 2006.
3. Lawrence R Jauch, R. Gupta & William F. Glueck: Business Policy and Strategic Management, Frank Bros. Delhi, 2006.

Course Code: BB311

SIP REVIEW

Course Code: BB313

SEMINAR

Course Code: BB302

INDUSTRIAL LAWS

Course Description and Objective:

To provide an over view of the Legal Framework of HR Functions in India and to enable learners to effectively handle the Industrial Relations in the organizations. Students also learn salient features of Industrial Disputes Act- 1947, The Factories act- 1948, Laws of wages and payment of bonus, Labour welfare laws.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand theories of trade union movement –Nature and causes of grievances
2. Salient features of Industrial Disputes Act- 1947
3. The Factories act- 1948
4. Laws of wages and payment of bonus
5. Labour welfare laws

UNIT-I - 10 Hrs

Trade Unions and Grievance Handling: Theories of Trade Union Movement – Trade Unions in India– Union recognition - Trade Unions Act, 1926 - Grievances and Discipline Handling: Managing Employee Grievance – The Nature and Causes of Grievance - The Grievance Procedure.

UNIT-II - 10 Hrs

The Industrial Disputes Act, 1947: Salient Features towards settlement of disputes- Unfair Labour Practices – Guiding Framework for Sound Labour–Management Relations.

UNIT-III - 10 Hrs

The Factories Act, 1948: Approval, licensing and registration of factories- Inspectors.- Powers of Inspectors- Health – Safety – Penalties and Procedures.

UNIT-IV - 10 Hrs

Laws on Wages: Minimum Wages Act, 1948 - Payment of wages Act, 1936 -The Payment of Bonus Act, 1965

UNIT-V **- 10 Hrs**

Labour Welfare Laws: The Workmen's Compensation Act, 1923 - The Employees State Insurance Act, 1948 - The Employees Provident Fund and Miscellaneous Provisions Act – 1952.

NOTE: Few case studies be discussed in the class

Text Books:

1. B.D.Singh, Industrial Relations and Labour Laws, Excel Books India, 2009, ISBN - 8174466207, 9788174466204
2. Padhi P K, Labour And Industrial Laws, PHI Learning Pvt. Ltd., ISBN - 8120329856, 9788120329850.
3. Venkataratnam C. S.: Industrial Relations, Oxford University Press, 2006.

Reference Books:

1. Sinha, Industrial Relations, Trade Unions, And Labour Legislation, Pearson Education India, 2004, ISBN - 8177588133, 9788177588132.
2. Dr. H.K. Saharay, Textbook on Labour & Industrial Law, Universal Law Publishing, ISBN - 8175349468, 9788175349469.
3. Arun Monappa: Industrial Relations, TMH, New Delhi, 2003.

Course Code: BB304

MANAGEMENT ACCOUNTING

Course Description and Objective:

To impart basic knowledge of Management Accounting. Students will learn Marginal costing, its advantages and limitations, Budgetary control and its limitations, analysis and interpretation of financial statements for decision making, ratio analysis for decision making.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand essentials of Management Accounting
2. Marginal costing, its advantages and limitations
3. Budgetary control and its limitations
4. Analysis and interpretation of financial statements for decision making
5. Ratio analysis for decision making

UNIT-I **- 12 Hrs**

Management Accounting: Need, Essentials of Management Accounting, Importance, Objectives, Scope, Functions, Advantages, Limitations, Distinction between Financial Accounting and Management Accounting, Distinction between Cost Accounting and Management Accounting.

UNIT-II **- 12 Hrs**

Marginal Costing: Meaning and Definition of Marginal cost and Marginal Costing, Contribution, Profit Volume Ratio, Advantages and limitations of Marginal Costing.

UNIT-III **- 12 Hrs**

Budget and Budgetary Control: Meaning of Budget and Budgetary Control- Budget and Budgetary Control, Objective of Budget and Budgetary Control, Limitations of Budget and Budgetary Control, Types of budgets

UNIT-IV **- 12 Hrs**

Analysis and Interpretation of Financial Statements: Methods of Analysis-Comparative Statements Common Size Statement

UNIT-V **- 12 Hrs**

Ratio Analysis for decision-making: Meaning and importance of Ratio analysis-Types of Ratios-Liquidity-Solvency-Profitability and Turnover

Recommended Books:

1. R. N. Anthony, G. A. Walsh:: Management Accounting.
2. M. Y. Khan,. K. P. Jain:: Management Accounting.
3. M. Pandey::Management Accounting (Vikas).
4. J. Betty: Management Accounting.
5. Sr. K. Paul: Management Accounting.
6. S. N. Maheshwari:: Principles of Management Accounting.
7. R. K. Sharma and Shashi K. Gupta: Management Accounting.
8. Richard M. Lynch and Robert Williamson: Accounting for Management Planning and Control.
9. Horngren: Introduction to Management Accounting (Pearson).

Course Code: BB306

TAXATION

Course Description and Objective:

To acquaint students with proper knowledge about direct and indirect taxes in India. Students learn Classification of income under different heads, salient features of Central Excise Tax, types of customs duties and importance of sales tax and service tax.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand concepts and importance of direct and indirect taxes
2. Classification of income under different heads
3. Salient features of Central Excise Tax
4. Types of customs duties
5. Importance of sales tax and service tax

UNIT-I - 12 Hrs

Overview of Direct and Indirect taxes: Importance of direct and indirect taxes, Types of direct and indirect taxes, Differences between direct and Indirect Taxes.

UNIT-II - 12 Hrs

Head of Income – Computation of Income from Salaries – Income from House Property – Profits and Gains of Business or Profession – Capital Gains and Income from Other Sources.

UNIT-III - 12 Hrs

Central Excise – Importance of the Central Excise Law- Goods, Excisable goods, Manufacture and manufacturer, Classification, Valuation.

UNIT-IV - 12 Hrs

Customs Duties-Basic concepts of customs law- Types of custom duties. Import and Export Procedures, Export Promotion Schemes. EOU- Duty Drawback- Special Economic Zones.

UNIT-V - 12 Hrs

Service Tax - Importance of Service Tax- Service Provider and Service Receiver- Registration procedure- Records to be maintained-Classification of taxable services- Valuation of taxable services.

Sales Tax /VAT – Need and importance – classification of goods – sales tax/vat – returns and forms.

Text Books:

1. Bhagawath Prasad, “Direct Taxes Law and Practice”.
2. V.S. Date, “Indirect Taxes”.

1. Sareen, V.K., & Sharma, A. (nd). Indirect Tax Laws, (latest edition), Kalyanipublications.
2. Mehrothra, H.C., (nd). (latest edition), *Indirect Taxes,* Sahityabhavan publi
3. Dinakar, Pagre, “Direct Taxes”.

4. Gowr & Narang, “Income Tax”, 2011-12

Reference Books:

1. Dr.Vinod & K Singharia, “Direct Taxes, Law and Practice”.
2. S.Bhattacharya, “Indian Income Tax Law and Practice”.

Course Code: BB308

INTERNATIONAL BUSINESS

Course Description and Objective:

The purpose of this paper is to enable the students learn nature scope and structure of International Business, and understand the influence of various environmental factors on international business operations and acquainting the students with the structure and policy framework of India’s foreign trade.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand nature and scope of international business and environment
2. Global trading environment
3. Global technology and international operations
4. Salient features of Indian foreign trade policy
5. Export and Import procedures & promotions

UNIT-I **- 12 Hrs**

Introduction to International Business: Importance nature and scope of International business; modes of entry and Theories of International Business; Framework for analyzing international business environment – Political, Economical, Social, Technological, Environmental and Legal environments and their impact on international business decisions.

UNIT-II **- 12 Hrs**

Global Trading Environment: World trade in goods and services – Major trends and developments; World trade and protectionism – Tariff and non-tariff barriers; International Economic Institutions and Agreements – WTO, IMF, World Bank, and other International agreements; Regional Economic Groupings in Practice - Regionalism vs. multilateralism, Structure and functioning of EC and NAFTA; Other Regional economic cooperation’s

UNIT-III **- 7 Hrs**

Global Technology & International Operations: Global Technological Management – Technology and Business; Issues in international technology transfers; Management of International Operations – Location of production; Management of Inventory; Sourcing of Inputs ; International Logistics.

UNIT-IV **- 7 Hrs**

Indian Foreign Trade Policy: India's Foreign Trade – Trends and developments; Commodity composition and direction, India's foreign trade in global context. Recent Foreign Trade Policy – Legal frame work; Special Focus Initiatives.

UNIT-V **- 12 Hrs**

Export and Import Procedures & Promotions: Export and Import Procedures; Import Substitution and Export Promotion Policies – Export Incentives –duty exemption schemes, EPCG, duty draw backs; Role of commercial banks in foreign trade; EXIM Banks; Export credit insurance and ECGC. Infrastructure Support for Export Promotion – EPC; STO; EPZ/SEZ; EOUs; Foreign Investment Policy – Indians Joint ventures abroad, Multilateralism and Bilateralism in India's foreign trade.

NOTE: One case study be discussed – per unit – in the class

Text Books:

1. Aswathappa, 5e, International Business, TMH
2. P.Subba Rao, 3e, International Business, HPH

Reference Books:

1. John Daniels • Lee Radebaugh • Daniel Sullivan, International Business
2. Economic Survey, Govt. of India.
3. Export-import Policy and Other Documents, Govt. Of India.

Course Code: BB310

PROJECT MANAGEMENT

Course Description and Objective:

To enable the students to understand project management practices. Tools & techniques of project management, market and demand estimation, project formulation and preparation, project appraisal-Technical-Economical-Financial-Legal and social appraisal, concepts of Project financing, implementation, monitoring and Control of Projects.

Learning Outcomes

By the end of this course it is expected that the student will be able to:

1. Understand concept, Tools & techniques of project management
2. Market and demand estimation, Project formulation and preparation
3. Project appraisal- Technical-Economical-Financial-Legal and social appraisal

4. Concepts of Project financing
5. Implementation, Monitoring and Control of Projects

UNIT-I **- 12 Hrs**

Concept of Project Management: Concept - categories - project development cycle- Importance of project management-Tools & techniques of project management.

UNIT-II **- 12 Hrs**

Project Formulation: Identification-formulation and preparation: Market and demand estimation, market survey, demand forecasting assessment of technical aspects of Project

UNIT-III **- 12 Hrs**

Project Appraisal: Technical-Economic-Financial-Legal and Social appraisal of the Industrial Projects-social cost-benefits-sensitivity analysis

UNIT-IV **- 12 Hrs**

Project Financing: Sources of finance-Role of Financial Institutions- Government Schemes

UNIT-V **- 12 Hrs**

Implementation, Monitoring and Control of Projects: Project scheduling, network techniques for resource and cost budgeting and scheduling, project management teams and coordination. Monitoring and post implementation, evaluation of the project

Text Books:

1. Chandra Prasanna-Project : Preparation ,Appraisal, Budgeting and Implementation. (TMH, 5th Ed.)
2. Mohsin M. - Project Planning and Control (Vikas)
3. Goyal BB – Project Management : A Development Perspective (Deep & Deep)
4. Chaudhary, S – Project Management (Tata Mc Graw Hill)
5. Young TL – The Hand Book of Project Management (Kogan Page)

Course Code: BB312

PROJECT WORK

Course Code: BB314

REPORT and VIVA

I

Year

B.Sc.

Semester - I

17HS001	English I
17HS002	English Proficiency and Communication Skills I
17HS003	Environmental Studies
17HS004	Fundamentals of Computer Science I
17HS004A	Fundamentals of Computer Science I Lab
17HS005	Differential Equations
17HS006	Descriptive Statistics and Probability
17HS007	Descriptive Statistics and Probability Lab
17HS008	Computer Fundamentals and Photoshop
17HS009	Computer Fundamentals and Photoshop Lab

Semester - II

17HS011	English II
17HS012	English Proficiency Communication Skills II
17HS013	General Studies I
17HS014	Fundamentals of Computer Science II
17HS015	Geometry
17HS016	Mathematical Expectations and Probability Distributions
17HS017	Mathematical Expectations and Probability Distributions Lab
17HS018	Programming in C
17HS019	Programming in C Lab

17HS001 ENGLISH –I

Course Description and Objectives:

This course aims to develop communications skills and basic language skills. This course includes all genres of literature and grammar components and that will allow learner to improve his/her knowledge in English language.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Understand the skimming and scanning skills in reading. Get the knowledge of affixes in word-formation. Practice précis writing.
2	Appreciate the rhyme and rhythm in poem. Learn relative clauses and practice paragraph writing.
3	Introduced to short story. Get introduction to phonetics. Learns synonyms and antonyms.
4	Study one act play. Learn narrative technique. Learn informal letter writing.
5	Learn different grammar components and can use in language.

Unit – I PROSE

1. A.P. J. Abdul Kalam: The Knowledge Society (from *Ignited Minds*)

2. NgugiWaThiong'o: The Language of African Literature (from *Decolonizing the Mind*)

Unit – II POETRY

1. Robert Frost: The Road Not Taken
2. Nissim Ezekiel: Night of the Scorpion

Unit – III SHORT STORY

1. Mulk Raj Anand : The Lost Child
2. Henry Lawson: The Loaded Dog

Unit – IV ONE - ACT PLAY

William Shakespeare: The Merchant of Venice (Court Scene – Act IV Scene -1)

Unit – V LANGUAGE ACTIVITY

1. Classroom and Laboratory Activities
   i. Single Sentence Answer Questions on Vocabulary (spelling), sound(pronunciation), sense (meaning), and syntax (usage)
2. Classroom Activity
   i. Exercises in Articles and Prepositions
   ii. Exercises in Tenses, Interrogatives and Question tags

17HS002 English Proficiency and Communication Skills I

Course Description and Objectives:

This course has been aimed at basic communication skills in Standard English language. Comprehensively designed syllabus allows learner to get train himself/herself in all four language skills.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Able to talk about their hobbies and likes and dislikes and can introduce oneself in acceptable English.
2	Learner can able to use appropriate vocabulary for real time situations like travelling, jobs etc.,
3	Students able to describe given picture and able speak about how they feel about something or somebody etc.,
4	Students can speak about likes and dislikes and get vocabulary use different degrees of comparison
5	Get different vocabulary of fashion and fabric and able to give brief seminar on given topic

Skills

1. Standard basic communication skills
2. Usage of appropriate vocabulary
3. Self introduction and about likes and dislikes (Speaking)

Unit-1

1. A question of sports (sports and hobbies)
2. I'm a friendly person (people)
3. What's your job (work)

Unit-2

4. Let's go out (entertainment)
5. Wheels and wings (transport)
6. What did you do at school today? (education and history)

Unit-3

7. Around town (towns and buildings)
8. Let's celebrate (special days)
9. How do you feel? (health and fitness)

Unit-4

10. I look forward to hearing from you (letters and emails)
11. Facts and figures (Geography, nationality and numbers)
12. A good read (books)

Unit-5

13. A place of my own (furniture and homes)
14. What's in fashion? (clothes)
15. Risk! (adventures)

Prescribed textbook: Louise Hashemi and Barbara Thomas, "Objective PET", South Asian Edition, Cambridge University Press, 2015.

17HS003 Environmental Studies

OBJECTIVES

- Enlighten awareness of nature and judicious use of natural resources for long term sustenance of life on this planet
- Identify and create solutions that conserve to manage ecosystem and biodiversity for the long term
- Identification of various pollutants in air, water and soil
- Recognize the impacts of climate change, ozone depletion and acid rain and follow the guidelines in all the acts to attain sustainability
- Understand how to react effectively to natural, man-made, and technological disaster

OUTCOMES

After the completion of Environmental Science subject, students able to

- Understand the importance of environment and natural resources.
- Gain the concept on Protection of biodiversity and maintain healthy environment
- Analyze the sources of pollutants and their effects on atmosphere.
- Identify the evidence of Global warming, Ozone depletion and acid rain.
- Develop a basic understanding of Prevention, Mitigation, Preparedness, Response and Recovery.

UNIT I – Introduction to Environmental Studies and Natural Resources

Environmental Studies: Definition Scope and its importance, Multidisciplinary nature of Environmental Studies, Concept of Sustainability and Sustainable development -Natural Resources: Deforestation: causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal population. Water resources: use and over exploitation of surface and ground water, floods, drought, conflicts over water (international and inter-state) Energy resources: renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case Studies- Land resources: land degradation, soil erosion and desertification

UNIT II - Ecosystems and Biodiversity

Ecosystem: Concept, Structure and functions of an ecosystem - Energy flow, Food chains, Food webs and ecological succession, Forest, Grassland and Aquatic ecosystems(Ponds, Rivers, Lakes, Streams, Ocean, Estuary). **Biodiversity**: Introduction, Bio-geographical classification Biodiversity at global, National and local levels – India as a Megadiversity- Hot-spots of biodiversity - Threats to biodiversity -Endangered and endemic species of India – Conservation of biodiversity, Ecosystem and biodiversity services: Ecological, economic, ethical, aesthetic and information value

UNIT III – Environmental Pollution

Pollution: Air pollution, Water pollution, Noise pollution, Thermal pollution, Soil pollution Control, Pollution case studies, Nuclear hazards and human health risks, Solid waste Management: control measures of urban and industrial wastes Remote sensing / GIS:

Introduction, definitions, applications of the remote sensing, . Green technology for Sustainable development

UNIT IV – Environmental Policies and Practices

Climate change, Global warming, Acid rain, Ozone layer depletion and impacts on human communities and agriculture. Environmental laws: Wildlife Protection Act – Water (pollution prevention and control) Act - Forest Conservation Act - Air (pollution prevention and control) Act. – Environmental Protection Act, International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity, Nature reserves, tribal populations and rights, and human wild life conflicts in Indian context, EIA: Introduction, definition of E.I.A and E.I.S – scope and objectives – Importance of E.I.A in proposed Projects / Industry / Developmental activity.

UNIT V – Human Communities and the Environment

Human population growth: Impacts on environment, human health and welfare -Resettlement and Rehabilitation of project affected persons: Case Studies. -Disaster Management: floods, earthquake, landslides and cyclones -Environmental movements: Chipko movement, Silent valley, Bishnois of Rajasthan-Environmental ethics: Role of Indian and other religions and cultures in environmental conservation: Environmental communication and Public awareness, case studies (C.N.G Vehicles in Delhi)

Field work/Environmental Visit: Visit to a local area to document environmental assets – river/ forest/ grassland / hill /mountain: Visit to a local polluted site - Study of local environment - common plants, insects, birds - Study of simple ecosystems –pond, river, hill slopes etc - Visit to industries/water treatment plants/effluent treatment plants.

TEXT BOOKS:

1. Anubha Kaushik- CP Kaushik – ‘Perspectives in Environmental Studies’ – V th Edition Current version – 2016
2. Benny Joseph – ‘Environmental studies’- IInd edition - 2015 – Mc Graw Hill Education
3 Text book for Environmental Studies-Erach Bharucha for University Grants Commission

REFERENCE BOOKS:

1. Sharma & Kour – ‘Environmental Pollution and Instrumentation’
2. Dr. M. Chandrasekhar, “A Text book of Environmental Studies”, HI-TECH publications, 2006
3. Dr. M. Anji Reddy, “A Text book of environmental science and Technology”, B S Publications, 2008
4. Dr. K. Mukkanti, “A Text book of Environmental Studies”, S.CHAND Company Ltd, 2009.
5. EHILRS and ST, “Text book of Municipal and Rural Sanitation”, M.S Hill, 1998.
6. C. S. Rao, Wiley Eastern Ltd, “Environmental Pollution Control Engineering”, New Age International Ltd, 2001
7. Dr. M. Anji Reddy, “Introduction to Remote Sensing”, B S Publications,2004.
8. Kurian Joseph and R.Nagendram, “Essentials of Environmental Studies”,Pearson Education Pt Ltd, Delhi, 2007.
9. H.C Perkins “Text book of Air Pollution”.

17HS004 FUNDAMENTALS OF COMPUTER SCIENCE-I

Course Description and Objectives:

This course introduces computer science through three of its major fields: hardware systems (physical components, digital logic, and computer architecture), theory and algorithms (Boolean algebra, binary arithmetic, and theory of computation), and software systems (languages, compilers, computer graphics, operating systems, and computer networks.) Programming assignments are used as means to introduce and reinforce fundamental computing concepts, as well as computer programming skills that are useful beyond this course. The course provides elements now essential to understand and effectively interact with the information technology infrastructure of today's world.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Demonstrate the use of mathematical software and solve simple mathematical problems.
2	Explain the needs of hardware and software required for a computation task.
3	State typical provisions of cyber law that govern the proper usage of Internet and computing resources.
4	Explain the working of important application software and their use to perform any engineering activity.
5	Demonstrate the use of Operating system commands and shell script.

UNIT - 1

COMPUTING SYSTEMS: Introduction to computer, Computers for individuals, Importance of computers, Parts of computer system, Memory devices, Input and output devices, Types of monitors, Types of printers, Number systems, Bits and bytes, Text codes and types of processors

UNIT - 2

OPERATING SYSTEMS: Types of operating systems, User interfaces, PC operating systems, Network operating systems, Types of software, Programming languages, Compiler and interpreter, Program control flow and algorithm.

UNIT - 3

NETWORKS AND DATABASES: Networking basics, Uses of network, Types of networks, Network hardware, Introduction to data bases and Database management systems.

UNIT - 4

INTERNET AND WWW: Internet's services, World wide web, Browser setups, Using search engine, Email and Other internet applications.

UNIT - 5

CYBER SECURITY: The need of computer security, Basic security concepts, Threats of users, Online spying tools, Threats to data, Cybercrime, Protective measures.

TEXT BOOK:

1. Peter Norton, "Introduction to Computers", 7th edition, Tata-McGrawHill, 2010.

REFERENCEBOOKS:

1. ITL Education Solution Limited, "Introduction to Computer Science", 2nd edition, Pearson Education, 2011.
2. Eric Maiwald, "Fundamentals of Network Security", 3rd edition, Tata-McGrawHill, 2004.

Student Activity:

- Prepare a report on various generations of computers and its peripherals.
- Disassembling and assembling of a personal computer system.
- Install the Linux operating system and other software required in a personal computer system.
- Connect the system to an Ethernet and configure the same.
- Prepare an MS Word Document.
- Prepare a spread sheet with various mathematical operations, charts and sorting etc.
- Make a report on power point presentation for the given topic.

17HS004A FUNDAMENTALS OF COMPUTER SCIENCE-I LAB

LIST OF EXPERIMENTS

1. Demonstrate the Personal Computer Peripherals and get a report on each peripheral.
2. Demonstrate the Personal computer assembling procedure and do the same.
3. Install wide varieties of free and open source operating systems.
4. Demonstrate Network Interface Card (NIC) configuration and any internet browsers options setup.
5. Demonstrate the Java Development Kit (JDK) installation and environmental variable (PATH) setup.
6. Demonstrate the following experiments using Office automation tools

   a. Text formatting and table.

   b. Mathematical equations.

   c. Watermarking using Analysis tool.

   d. Calculate student mark details.

   e. Create four types of charts.

   f. Import external data, sort & filter using Power Point tool.

   g. Create text and images with effects.

   h. Create animation and sound effects.
7. Demonstrate the installation of anti-virus software to detect different types of virus programs.

17HS005 DIFFERENTIAL EQUATIONS

Course Description and Objectives:

The main purpose of the course is to introduce students to the theory and methods of ordinary and partial differential equations. Students should be able to implement the methods taught in the course to work associated problems, including proving results of suitable accessibility. This course is designed to prepare students to solve problems arising from many applications such as mathematical models of physical or engineering processes.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Explore some of the basic theory of linear ODEs, recognize basic types of linear ODEs
2	Recognize ODEs, PDEs and system of considered equation concepts that are encountered in the real world, understand.
3	Defining different sets of generalized coordinates for a given mechanical system and the use of canonical transformations.
4	Identify the physical situations formulate mathematical models using pdes.
5	Students are introduced to modern concepts and methodologies.

Skills:

- ✓ Extract information from equations to interpret the reality.
- ✓ Extract information from partial differential equations to interpret the reality.
- ✓ Know the various types of methods and their limitations

UNIT – I (12 Hours), Differential Equations of first order and first degree :
Linear Differential Equations; Differential Equations Reducible to Linear Form; Exact Differential Equations; Integrating Factors; Change of Variables.

UNIT – II (12 Hours), Orthogonal Trajectories.
Differential Equations of first order but not of the first degree :
Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations that do not contain. x (or y); Equations of the first degree in x and y – Clairaut's Equation.

UNIT – III (12 Hours), Higher order linear differential equations-I :
Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.
General Solution of f(D)y=0
General Solution of f(D)y=Q when Q is a function of x.

$\frac{1}{f(D)}$ is Expressed as partial fractions.

P.I. of f(D)y = Q when Q= be^{ax}

P.I. of f(D)y = Q when Q is b sin ax or b cos ax.

UNIT – IV (12 Hours), Higher order linear differential equations-II :

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of f(D)y = Q when Q= bx^k

P.I. of f(D)y = Q when Q= $e^{ax}V$

P.I. of f(D)y = Q when Q= xV

P.I. of f(D)y = Q when Q= x^mV

UNIT –V (12 Hours), Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation.

Reference Books:

1. Differential Equations and Their Applications by Zafar Ahsan, Prentice-Hall of India Learning Pvt. Ltd. New Delhi, Second edition.
2. A text book of mathematics for BA/BSc Vol 1 by N. Krishna Murthy & others, S. Chand & Co., New Delhi.
3. Ordinary and Partial Differential Equations Raisinghania, S. Chand & Co., New Delhi.
4. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha, Universities press.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Application of Differential Equations in Real life

17HS006 Descriptive Statistics and Probability

COURSE DESCRIPTION AND OBJECTIVES

It provides the foundation to the students on elementary topics of Statistics and prepares them to describe the given data. The students try to know and measure the chance of happening different events and their occurrence numerically. Students understand how probability has been distributed to the different events and standard notions of probability distributions.

COURSE OUTCOMES

COs	Outcomes
1	Understand how to describe the data with available measures
2	Learn how to present the data with a suitable diagram
3	Apply probability in real time situations and identify randomness in experiments
4	Differentiate between types of random variables and its distributions
5	Study the standard distributions and its properties

SKILLS

- ✓ Describe the given data using different measures in statistics
- ✓ Draw suitable graph for the given data
- ✓ Able to quantify the chance of happening events
- ✓ Fit an appropriate probability distribution for a given data

Unit-I

Introduction to Statistics: Concepts of Primary and Secondary data. Methods of collection and editing of primary data, Secondary data. Designing a questionnaire and a schedule. Measures of Central Tendency - Mean, Median, Mode,Geometric Mean and Harmonic Mean.

Unit-II

Measures of dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation. Descriptive Statistics -Central and Non-Central moments and their interrelationship. Sheppard's correction for moments. Skewness and kurtosis.

Unit-III

Introduction to Probability: Basic Concepts of Probability, random experiments, trial, outcome, sample space, event, mutually exclusive and exhaustive events, equally likely and favourable outcomes. Mathematical, Statistical, axiomatic definitions of probability. Conditional Probability and independence of events,

Unit-IV

Probability theorems:Addition and multiplication theorems of probability for 2 and for n events. Boole's inequality and Baye's theorems and problems based on Baye's theorem.

Unit-V

Random variable: Definition of random variable, discrete and continuous random variables, functions of random variable. Probability mass function. Probability density function, Distribution function and its properties. Bivariate random variable - meaning, joint, marginal and conditional Distributions, independence of random variables.

Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy - Dr M.Jaganmohan Rao,Dr N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi.
3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI

Reference books:

1. Willam Feller: Introduction to Probability theory and its applications. Volume –I, Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
4. M. JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , New Delhi
6. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition. Pearson.

17HS007 Descriptive Statistics and Probability LAB

Conduct the following using excel for 1 to 4

1. Computation of mean, median and mode.
2. Computation of quartile deviation.
3. Computation of mean deviation
4. Computation of Standard deviation.
5. Non-central moments and central moments, Sheppard corrections & Skewness based on moments and Kurtosis

17HS008 Computer Fundamentals & Photoshop

Course Description and Objectives:

To explore basic knowledge on computers and Photoshop's beauty from the practical to the painterly artistic and to understand how Photoshop will help you create your own successful images

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Bridge the fundamental concepts of computers with the present level of knowledge of the students.
2	Familiarise operating systems, programming languages, peripheral devices, networking, multimedia and internet
3	Understand binary, hexadecimal and octal number systems and their arithmetic.
4	Understand how logic circuits and Boolean algebra forms as the basics of digital computer.
5	Demonstrate the building up of Sequential and combinational logic from basic gates.

UNIT-I:

Introduction to computers, characteristics and limitations of computer, Block diagram of computer, types of computers, uses of computers, computer generations. Number systems: binary, hexa and octal numbering system

UNIT-II:

Input and output devices: Keyboard and mouse, inputting data in other ways, Types of Software: system software, Application software, commercial, open source, domain and free ware software, Memories: primary, secondary and cache memory. Windows basics: desktop, start menu, icons.

Unit –III

Introduction to Adobe photoshop, Getting started with photoshop, creating and saving a document in photoshop ,page layout and back ground, photoshop program window-title bar,menu bar,option bar,image window, image title bar, status bar, ruler, palettes, tool box, screen modes,saving files,reverting files,closing files.

Unit –IV

Images: working with images, image size and resolution ,image editing,colour modes and adjustments , Zooming & Panning an Image,, , Rulers, Guides & Grids- Cropping & Straightening an Image, image backgrounds ,making selections.

Working with tool box: working with pen tool, save and load selection-working with erasers-working with text and brushes-Colour manipulations: colour modes- Levels – Curves - Seeing

Colour accurately - Patch tool – Cropping-Reading your palettes - Dust and scratches- Advanced Retouching- smoothing skin

Unit-V

Layers: Working with layers- layer styles- opacity-adjustment layers

Filters: The filter menu, Working with filters- Editing your photo shoot, presentation –how to create adds ,artstic filter,blur filter,brush store filter,distort filters,noice filters,pixelate filters,light effects,difference clouds,sharpen filters,printing.

Reference Books:

1. Fundamentals of Computers by Reema Thareja from Oxford University Press
2. Adobe Photoshop Class Room in a Book by Adobe Creative Team.
3.Photoshop: Beginner's Guide for Photoshop - Digital Photography, Photo Editing, Color Grading & Graphic...19 February 2016 by David Maxwell

Student Activity:

1. **Design a poster for technical paper presentation.**
2. **Create a digital scrap book.**

17HS009 Computer Fundamentals & Photoshop Lab

1. Create your Visiting card
2. Create Cover page for any text book
3. Create a Paper add for advertising of any commercial agency
4. Design a Passport photo
5. Create a Pamphlet for any program to be conducted by an organixation
6. Create Broacher for you college
7. Create Titles for any forthcoming film
8. Custom shapes creation
9. Create a Web template for your college
10. Convert color photo to black and white photo
11. Enhance and reduce the given Image size
12. Background changes
13. Design Box package cover
14. Design Texture and patterns
15. Filter effects & Eraser effects

17HS011 ENGLISH -II

Course Description and Objectives:

This course aims to improve language skills and basic communication skills. This course includes all genres of literature and grammar components and that will allow learner to improve his/her knowledge in language.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Learner can understand the skimming and scanning skills in reading. Get the knowledge of different word-formation in styles. Write précis writing.
2	Appreciate the rhyme and rhythm in poems. Learn different aspects of social evils.
3	Introduced to short story. Learns synonyms and antonyms.
4	Study one act play. Learn narrative technique and practice writing.
5	Learn different grammar component and use phonetics for pronunciation.

Skills

- ✓ Skimming and scanning skills in reading
- ✓ Usage of acceptable functional English

Unit – I PROSE

1. J. B.S Haldane: The Scientific Point of View
2. A.G. Gardiner : On Shaking Hands

Unit – II POETRY

1. John Keats: Ode to Autumn
2. KishwarNaheed : I am not that Woman (from *An Anthology of Commonwealth Poetry* edited by C.D. Narasimhaiah)

Unit –III SHORT STORY

1. Ruskin Bond : The Boy Who Broke the Bank
2. R. K. Narayan : Half a Rupee Worth

Unit – IV ONE ACT PLAY

Anton Chekhov: The Proposal

Unit – V LANGUAGE ACTIVITY

1. Classroom and Laboratory Activities
    i. Transformation of Sentences (Voice, Speech and Degrees)
    ii. Dialogue Practice (Oral)
    iii. Listening Comprehension

2. Classroom Activity
    i. Guided Composition
    ii. Dialogue Writing
    iii. Reading Comprehension

17HS012 English Proficiency Communication Skill II

Course Description and Objectives:

This course has been aimed at practicing communication skills in Standard English language. Inculcate the basics of functional language. Comprehensively designed syllabus allows learner to get train himself/herself in all four language skills.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Able to talk about making plans, hobbies and films.
2	Learner can able to use appropriate vocabulary for real time situations families and relations.
3	Students able to describe given picture and able speak about how they feel etc.,
4	Students can speak about unexpected events happened and friendship and friends.
5	Get different vocabulary of shopping, travelling and food and restaurant.

Skills

1. advanced communication skills
2. using appropriate vocabulary related to different fields of work
3. team presentation (speaking)

Unit-1

16. Free Time (making plans)
17. Next week's episodes (predictions)
18. Shooting a film (films)

Unit-2

19. Happy families (family life)
20. So you think you have got a talent? (Music)
21. Keep in touch! (communicating)

Unit-3

22. Strange but true? (the unexpected)
23. Best friends? (friendship)
24. I've got an idea (inventions)

Unit-4

25. Shop till you drop (shopping)

26. Persuading people (advertising and persuasion)
27. Travellers' tales (travel experiences)

Unit-5

28. What would you do? (celebrities)
29. What's on the menu? (Food and restaurants)
30. Blue for a boy and pink for a girl (boys and girls)

Prescribed textbook:

Louise Hashemi and Barbara Thomas, "Objective PET", South Asian Edition, Cambridge University Press, 2015

17HS013 General Studies I :: Polity and Governance of India

Course Description &objectives:
This course introduces basic understanding of Indian polity and constitution. The course objective is to make students to understand the functioning of government at the centre and state level besides local self government as outlined in the constitution and gives basic knowledge about the fundamental rights & duties of a citizen besides gives the knowledge about Elections and Democracy at work.

Course Outcomes:
Applies the constitution and its principles to the day to day happenings.
Inculcates the respect for the constitution and rights of others besides safeguarding one's own rights.
Analyzes functioning of executive, legislative and Judiciary.
Compares the Indian constitution with other countries

Unit -I : Overview of Indian constitution
Making of Indian constitution
Salient features
Preamble
Significant Provisions; Amendments; Basic structure

Unit – II: working of the Indian Constitution
Features of Indian Federal system
Centre-State relations- Legislative, executive, financial
Issues and concerns – coalition governments ; Administrative Reforms

Unit - III: Structure of the Government
Union Government
State Government
Local Government
VFSTR UNIVERSITY
MINORS 15

Unit – IV: Powers and Functions of Constitutional, Statutory and Non statutory bodies
Constitutional - Election Commission, UPSC, Finance Commission, CAG etc.,
Statutory - NHRC, CVC, etc.,
Non statutory – Planning Commission, National Development Council etc.,

Unit – V: Political Dynamics
Representation of Peoples' Act
Political Parties
Pressure Groups
Elections, Electoral Reforms
Transparency, Accountability and Right to Information

TEXT BOOKS:
1. D.D. Basu—Indian Constitution
2. Subhash C. Kashyap : Our Parliament, Publication Division

References:
1. P.M. Bakshi—Indian Constitution
2. Laxmikanth, Indian Polity

17HS014 FUNDAMENTAL OF COMPUTER SCIENCE-II (COMPUTER Organization)

Course Description and Objectives:

This course introduces computer science through three of its major fields: hardware systems (physical components, digital logic, and computer architecture), theory and algorithms (Boolean algebra, binary arithmetic, and theory of computation), and software systems (languages, compilers, computer graphics, operating systems, and computer networks.) Programming assignments are used as means to introduce and reinforce fundamental computing concepts, as well as computer programming skills that are useful beyond this course. The course provides elements now essential to understand and effectively interact with the information technology infrastructure of today's world.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Demonstrate the use of mathematical software and solve simple mathematical problems.
2	Understand the use of topics like number systems, Boolean algebra, logic gates.
3	Use of Register Transfer Language, Computer Arithmetic
4	Understand the Basic Computer Organization and Design.
5	understand and analyze the functions and organizations of modern digital computers.

UNIT - 1

NUMBER SYSTEMS AND BOOLEAN ALGEBRA: Number system - Binary numbers, Number base conversions, Octal and hexadecimal numbers, Complements of numbers, Signed binary numbers, Binary codes, Binary logic. Boolean Algebra - Basic definitions, Basic theorems and properties of Boolean algebra.

UNIT - 2 LOGIC GATES AND GATE-LEVEL MINIMIZATION: Boolean functions, Canonical and standard forms, Digital logic gates, The map method, Four - variable k-map, Product-of-sums simplification, Don'tcare conditions, NAND and NOR implementation, Other two-level implementations, Exclusive-or function.

UNIT - 3

INTRODUCTION &RTL: Organization and architecture, Block diagram of digital computer, Structure and function. Register Transfer language – Register Transfer Bus and memory transfers.

UNIT - 4

COMPUTER ARITHMETIC: Arithmetic micro operations, Logic micro Operations, Shift micro operations and Arithmetic logic shift unit. Addition and subtraction, Multiplication Algorithms and Division Algorithms, Floating point representation and its operations.

UNIT - 5

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer Registers, Computer instructions, Instruction cycle, Memory–Reference Instructions, Register Reference instructions, Input-Output and Interrupt, Stack organization, Instruction formats, Addressing modes, Data Transfer and manipulation, Program control, Reduced Instruction set computer.

TEXT BOOKS:

1. M.Moris Mano, “Computer Systems Architecture”, 3rd edition, Pearson/Prentice Hall India, 2007.
2. M Morris Mano and Michael D. Ciletti, “ Digital Design”, 5th edition, Pearson Education, Inc, 2013.

REFERENCE BOOKS:

1. H Taub and D Schilling, “Digital Integrated Electronics”, 2nd edition, TataMcGraw-Hill, 2004
2. William Stallings, “Computer Organization and Architecture”, 7th edition, Pearson/Prentice Hall India , 2007.

17HS015 GEOMETRY

Course Description and Objectives:

The student should be made to understand the fundamental concepts of Solid geometry. Acquire the skill of analysis and evaluate the different angles and dimensions of the shapes.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Learn about the equation of plane and its angle, angle of projections.
2	Understand the significance of line along with the plane and determine its different conditions.
3	Learn the basic conditions of sphere and its intersection along with the line, plane contact and conjunctions.
4	Understand the convergence of spheres, basic on cones and generation of cones at different conditions.
5	Learning the different concepts of cones and cylinders with its different shapes and conditions and properties of its angles.

Skills:

- ✓ Study on different aspects of geometrical positions.
- ✓ Evaluate the properties of the many shapes in geometry.
- ✓ Understanding the convergence of axis.

UNIT – I (12 hrs) : The Plane :

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT – II (12 hrs) : The Line :

Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line;

UNIT – III (12 hrs) : Sphere :

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes;

UNIT – IV (12 hrs) : Sphere &Cones :

Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified from of the equation of two spheres.

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; Enveloping cone of a sphere; Equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone; Condition that a cone may have three mutually perpendicular generators;

UNIT – V (12 hrs) Cones & Cylinders :

Intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex; Right circular cone; Equation of the right circular cone with a given vertex; axis and semi-vertical angle.

Definition of a cylinder; Equation to the cylinder whose generators intersect a given conic and are parallel to a given line; Enveloping cylinder of a sphere; The right circular cylinder; Equation of the right circular cylinder with a given axis and radius.

Reference Books:

1. Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, S. Chand & Co., 7th Edition.
2. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, S. Chand & Co., New Delhi.
3. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, Wiley Eastern Ltd., 1999.
4. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam,
G.R. Venkataraman, Tata-McGra-Hill Publishers Company Ltd., New Delhi.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Application of Solid Geometry in Engineering

17HS016 Mathematical Expectation and Probability Distributions

COURSE DESCRIPTION AND OBJECTIVES

Learn and be able to apply the properties of mathematical expectation and how it will be used to find the characteristics of the given data. To learn different alternative ways of obtaining the characteristics of data and to find the characteristics of the standard distributions in discrete and continuous random variables

COURSE OUTCOMES

After the completion of the course, the student will be able to achieve the following outcomes:

COs	Outcomes
1	Able to apply mathematical expectation in real time situations
2	Obtain Population constants for different distributions
3	Apply different methods to find the population constants for a given data
4	Can find the characteristics of the standard populations
5	Compare the different alternative methods in finding the characteristics

SKILLS

- ✓ Choose appropriate method to find the characteristics of the data
- ✓ Apply an appropriate method for industrial applications
- ✓ Fit appropriate probability distribution to the given data

Unit-I

Mathematical expectation : Mathematical expectation(ME) of a random variable and function of a random variable. Moments and covariance using mathematical expectation with examples. Addition and Multiplication theorems on expectation. Definitions of M.G.F, C.G.F, P.G.F, C.F its properties. Chebyshev and Cauchy - Schwartz inequalities.

Unit -II

Discrete Distributions : Binomial and Poisson distributions, their definitions, 1st to 4 central moments, M.G.F, C.F, C.G.F, P.G.F, mean, variance, additive property if exists. Possion approximation to Binomial distribution.

Unit - III

Negative Binomial, geometric, hyper geometric distributions - Definitions, means, variances, M.G.F, C.F, C.G.F, P.G.F, reproductive property if exists. Binomial approximation to Hyper Geometric Distribution, Poisson approximation to Negative binomial distribution.

Unit – IV

Continuous Distributions : Rectangular, Exponential, Gamma, Beta Distributions of two kinds. Other properties such as mean , variance,M.G.F, C.G.F, C.F, reproductive property.

Unit – V

Normal Distribution: Definition, Importance, Properties, M.G.F, additive properties, Interrelation between Normal and Binomial, Normal &Poisson distribution. Cauchy Distribution .

Text Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. BA/BSc I year statistics - descriptive statistics, probability distribution - Telugu Academy - Dr.M.Jaganmohan Rao,Dr N.Srinivasa Rao, Dr P.Tirupathi Rao, Smt.D.Vijayalakshmi
3. K.V.S. Sarma: Statistics Made Simple: Do it yourself on PC. PHI.

Reference books:

1. Willam Feller : Introduction to Probability theory and its applications. Volume –I, Wiley
2. Goon AM, Gupta MK, Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
3. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
4. M. JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.
5. Sanjay Arora and Bansi Lal: New Mathematical Statistics: Satya Prakashan , New Delhi
6. Hogg Tanis Rao: Probability and Statistical Inference. 7th edition Pearson.

17HS017 Mathematical Expectation and Probability Distributions Lab

Conduct the following

1. Fitting of Binomial Distribution – Recurrence relation method.

2. Fitting of Poisson Distribution - Recurrence relation method.

3. Fitting of Negative Binomial Distribution.

4. Fitting of Geometric Distribution.

5. Fitting of Normal Distribution - Areas methods.

6. Fitting of Normal Distribution - Ordinates methods.

MS-Excel methods for the above Serial Numbers 1 and 2

17HS018 PROGRAMMING IN C

Course Objectives
1. Learn how to solve common types of computing problems.
2. Learn data types and control structures of C
3. Learn to map problems to programming features of C.
4. Learn to write good portable C programs.

Course Outcomes
Upon successful completion of the course, a student will be able to:
1. Appreciate and understand the working of a digital computer
2. Analyze a given problem and develop an algorithm to solve the problem
3. Improve upon a solution to a problem
4. Use the 'C' language constructs in the right way
5. Design, develop and test programs written in 'C'

UNIT I

Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms – Some more Algorithms – Flow Charts – Pseudo code – Programming Languages – Generation of Programming Languages – Structured Programming Language- Design and Implementation of Correct, Efficient and Maintainable Programs.

Introduction to C: Introduction – Structure of C Program –Writing the first C Program – File used in C Program – Compiling and Executing C Programs – Using Comments – Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Statements in C- Operators in C- Programming Examples – Type Conversion and Type Casting

UNIT II

Decision Control and Looping Statements: Introduction to Decision Control Statements – Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement

Functions: Introduction – using functions – Function declaration/ prototype – Function definition – function call – return statement – Passing parameters – Scope of variables – Storage Classes –Recursive functions – Type of recursion – Towers of Hanoi – Recursion vs Iteration

UNIT III

Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array – Calculating the length of the Array – Operations on Array – one dimensional array for inter-function communication – Two dimensional Arrays –Operations on Two Dimensional Arrays - Two Dimensional Arrays for inter-function communication – Multidimensional Arrays – Sparse Matrices

Strings: Introduction –Suppressive Input – String Taxonomy – String Operations – Miscellaneous String and Character functions

UNIT IV

Pointers: Understanding Computer Memory – Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers – Generic Pointers - Passing Arguments to Functions using Pointer – Pointer and Arrays – Passing Array to Function – Difference between Array Name and Pointer – Pointers and Strings – Array of pointers – Pointer and 2D Arrays – Pointer and 3D Arrays – Function Pointers – Array 0f Function Pointer – Pointers to Pointers – Memory Allocation in C Programs – Memory Usage – Dynamic Memory Allocation – Drawbacks of Pointers

Structure, Union, and Enumerated Data Types: Introduction – Nested Structures – Arrays of Structures – Structures and Functions – Self referential Structures – Union – Arrays of Unions Variables – Unions inside Structures – Enumerated Data Types

UNIT V

Files: Introduction to Files – Using Files in C – Reading Data from Files – Writing Data from Files – Detecting the End-of-file – Error Handling during File Operations – Accepting Command Line Arguments – Functions for Selecting a Record Randomly - Remove() – Renaming a File – Creating a Temporary File

REFERENCE BOOKS

1. Introduction to C programming by REEMA THAREJA from OXFORD UNIVERSITY PRESS
2. E Balagurusamy: ―COMPUTING FUNDAMENTALS & C PROGRAMMING – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.
3. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.
4. Henry Mullish & Huubert L.Cooper: The Spirit of C An Introduction to modern Programming, Jaico Pub. House,1996.

Student Activity:

1. Write a program for preparing the attendance particulars of students of your college at the end of semester according to following guidelines
   a. Above 75 % promoted
   b. Above 65% condoned
   c. Below 65% detained
2. Write a program for creating timetable or your class taking work load of faculty into consideration.

17HS019 PROGRAMMING IN C LAB

1. Find out the given number is perfect number or not using c program.
2. Write a C program to check whether the given number is Armstrong or not.
3. Write a C program to find the sum of individual digits of a positive integer.
4. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to print the Fibonacci series
5. Write a C program to generate the first n terms of the Fibonacci sequence.
6. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
7. Write a C program to find both the largest and smallest number in a list of integers.
8. Write a C program that uses functions to perform the following:
    a. Addition of Two Matrices
    b. Multiplication of Two Matrices
9. Write a program to perform various string operations
10. Write C program that implements searching of given item in a given list
11. Write a C program to sort a given list of integers in ascending order