R22 SYLLABUS

CSBS

Computer Science and Business Systems

B.Tech. CSE-COMPUTER SCIENCE AND BUSINESS SYSTEMS
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22MS301	Fundamentals of Management	
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22CB301	Inter-Disciplinary Project – Phase I	
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	Department Elective – 1	
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III YEAR II SEMESTER		
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22CS804	Deep Learning	
22CB803	Advanced Social Text and Media Analytics	
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FOREWORD

Department of CSE, VFSTR in association with TCS has designed a four-year B.Tech. Programme in Computer Science and Business Systems (CSBS) to address the growing needs of engineering talent with skills in digital technologies and Business. In this programme, trainers from TCS will deliver TCS designed courses. This programme aims to ensure the students, to gain the knowledge of humanities and management sciences in addition to the core topics of Computer Science. The students will also be exposed to emerging topics such as Analytics, machine Learning, Cloud Computing, Internet of Things etc., to make them industry ready at the end of four years of study.

The programme focuses on enhancing the following key attributes among graduating students:

- *Understanding Contemporary Technologies.*

- *Understanding Technology Abstraction.*

- *Knowledge of Common Business Principles.*

- *Business Discipline and Service Orientation.*

- *Innovation Ability.*

Salient Features of R 22 Curriculum:

- *Multidisciplinary holistic education with continuous learning and continuous assessment.*

- *Lateral entry and lateral exit options.*

- *Credit Earning by credit transfer.*

- *Honors/ Research Honors/ Minor/ Add-on Diploma/ Add-on Certification and Dual B.Tech.+ M.Tech./ MBA Degree of 5 Years.*

- *Semester drop option to pursue innovation, incubation, entrepreneurial and advanced exploratory activities and subsequent re-entry.*

Emphasis on continuous formative assessment with a creative summative assessment will facilitate the student to "Move away from high stake examinations – towards more continuous and comprehensive evaluation".

The Board of Studies of B.Tech. CSE-CSBS Programme consists of a right mix of eminent personalities from Academic, Research and Industry Organizations, besides experienced faculty members of the University.

External BoS Members:

1. Dr. MM Naidu, Professor (Rtd) and former Principal, SVU college of Engineering, Tirupati.
2. Mr. Magesh, Regional head, TCS.
3. Dr MVP Chandra Sekhara Rao, Professor & Head, Department of CSBS & DS, RVR & JC college of Engineering.

I thank all the BOS members, Academic Council Members and University authorities for their continuous support and encouragement towards design of this innovative curriculum for CSE-CSBS.

Dr. Venkatesulu Dondeti
Head, Department of ACSE
VFSTR Deemed to be University

VISION

To evolve into a Centre of Excellence in Science & Technology through creative and innovative practices in teaching – learning, towards promoting academic achievement and research excellence to produce internationally accepted, competitive and world class professionals who are psychologically strong & emotionally balanced, imbued with social consciousness & ethical values.

MISSION

To provide high quality academic programmes, training activities, research facilities and opportunities supported by continuous industry - institute interaction aimed at promoting employability, entrepreneurship, leadership and research aptitude among students andcontribute to the economic and technological development of the region, state and nation.

Department of
COMPUTER SCIENCE AND BUSINESS SYSTEMS

VISION of the department

To evolve as a centre of high repute in Computer Science & Business Systems and create computer software professionals trained on problem solving skills imbued with ethics to serve the ever evolving and emerging requirements of IT Industry and society at large.

MISSION of the department

M_1: Imparting quality education through well designed curriculum, innovative teaching and learning methodologies integrated with professional skill development activities to meet the challenges in the career.

M_2: Nurture research and consultancy activities amongst students and faculty by providing State-of-art facilities and Industry-Institute Interaction.

M_3: Developing capacity to learn new technologies and apply to solve social and industrial problems to become an entrepreneur.

B.Tech in Computer Science and Business Systems

Program Educational Objectives (PEOs)

Program Educational Objectives (PEOs) are established through a consultation process. PEOs are broad statements that describe the career and professional accomplishments that the graduates should achieve within three to five years after their graduation.

Graduates of the UG-CSE-CSBS program will be able to

PEO1: Pursue a successful professional career in IT and IT-enabled industries.

PEO2: Pursue lifelong learning in generating innovative engineering solutions using research and complex problem-solving skills.

PEO3: Demonstrate professionalism, ethics, inter-personal skills and continuous learning to develop leadership qualities..

Program Specific Outcomes (PSOs)

The students will be able to

PSO1: **Explore Security Essentials:** Gain in-depth knowledge on cyber security landscape with its evolving threats and vulnerabilities.

PSO2: **Development of Security Solutions:** Design and development of cyber security solutions using standard tools and practices.

Program Outcomes (POs)

Program Outcomes (POs), are attributes acquired by the student at the time of graduation. The POs given in below, ensure that the POs are aligned to the Graduate Attributes (GAs) specified by National Board of Accreditation (NBA). These attributes are measured at the time of Graduation.

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team-work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

R22 B.Tech.

4 YEAR

COURSE STRUCTURE - R22

I Year I Semester

Course Code	Course Title	L	T	P	C	Course category
22MT104	Discrete Mathematics	2	2	0	3	Basic Sciences
22ST101	Introductory Topics in Statistics, Probability and Calculus	2	0	2	3	Basic Sciences
22PY103	Fundamentals of Physics	3	0	2	4	Basic Engineering
22CS102	Fundamentals of Computer Science – I	2	0	2	3	Basic Engineering
22EE104	Principles of Electrical Engineering	3	0	2	4	Basic Engineering
22TP102	Constitution of India	0	2	0	0	Binary Grade
22SA101	Physical Fitness, Sports and Games – I	0	0	3	1	Binary Grade
22CT102	Environmental Science	2	0	0	0	Basic Sciences
22EN101	Business Communication & Value Science – I	0	0	2	1	Basic Sciences
22SA101	Physical Fitness, Sports & Games – I	0	0	3	1	Humanities
	Total	**14**	**4**	**13**	**19**	
		31 Hrs			**19**	

I Year II Semester

Course Code	Course Title	L	T	P	C	Course category
22MT108	Linear Algebra	2	2	0	3	Basic Sciences
22ST102	Statistical Methods	3	0	2	4	Basic Sciences
22EC103	Principles of Electronics Engineering	2	0	2	3	Basic Engineering
22CS106	Fundamentals of Computer Science – II	2	0	2	3	Basic Engineering
22MS101	Fundamentals of Economics	3	0	0	3	Management
22CS104	Python Programming	2	0	2	3	Professional Core
22SA102	Orientation Session	0	0	6	3	Binary Grade
22EN103	Business Communication & Value Science – II	0	0	2	1	Basic Sciences
22SA103	Physical Fitness, Sports and Games – II	0	0	3	1	Binary Grade
	Total	**14**	**2**	**19**	**24**	
		35 Hrs			**24**	

COURSE STRUCTURE - R22

R22 B.Tech.
4 YEAR
DEGREE PROGRAMME

II Year I Semester

Course Code	Course Title	L	T	P	C	Course category
22ST205	Computational Statistics	2	0	2	3	Basic Sciences
22TP201	Data Structures	2	2	2	4	Professional core
22CB201	Computer Organization and Architecture	2	2	0	3	Professional core
22CB204	Object Oriented Programming	2	2	2	4	Professional Core
22CB203	Formal Languages & Automata Theory	2	2	0	3	Professional Core
22CB202	Database Management Systems	2	2	2	4	Professional Core
22MS202	Ethics and Human Values	2	0	0	0	Humanities
22SA201	Life Skills – I	0	0	2	1	Binary Grade
	NCC/ NSS/ SAC/ E-cell/ Student Mentoring/ Social activities/ Publication.	0	0	0	1	Binary Grade
Total		**14**	**10**	**10**	**23**	
		34 Hrs			**23**	

II Year II Semester

Course Code	Course Title	L	T	P	C	Course category
22MT201	Operations Research	2	2	0	3	Basic Sciences
22CB206	Design and Analysis of Algorithms	3	0	2	4	Professional Core
22CB208	Operating Systems	2	0	2	3	Professional Core
22CB209	Software Engineering	2	2	0	3	Professional Core
22MS204	Design Thinking	1	2	0	2	Basic Engineering
22EN201	Business Communication & Value Science – III	0	0	2	1	Basic Sciences
22SA202	Life Skills – II	0	0	2	1	Binary Grade
	Open Elective – 1	2	2	0	3	Open Elective
Total		**12**	**8**	**8**	**20**	
	Minor / Honours - 1	3	0	2	4	
Total		**15**	**8**	**10**	**24**	
		33 Hrs			**24**	

R22 B.Tech.
4 YEAR

COURSE STRUCTURE - R22

III Year I Semester

Course Code	Course Title	L	T	P	C	Course category
22TP301	Soft Skills Laboratory	0	0	2	1	Humanities
22MS301	Fundamentals of Management	2	2	0	3	Professional Core
22CB304	Data Mining and Analytics	3	0	2	4	Professional Core
22CB303	Mobile Application Development	2	0	2	3	Professional Core
22CB301	Inter-Disciplinary Project – Phase I	0	0	2	1	Project
22CB302	Industry Interface Course (Modular course)	1	0	0	1	Binary Grade
	Department Elective – 1	3	0	2	4	Department Elective
	Open Elective – 2	2	2	0	3	Open Elective
	NCC/ NSS/ SAC/ E-cell/ Student Mentoring/ Social activities/ Publication.	0	0	0	1	Binary Grade
	Total	**13**	**4**	**10**	**21**	
	Minor / Honours – 2	3	0	2	4	
	Total	**16**	**4**	**12**	**25**	
		32 Hrs			**25**	

III Year II Semester

Course Code	Course Title	L	T	P	C	Course category
22TP302	Quantitative Aptitude and Logical Reasoning	1	2	0	2	Humanities
22CB305	Financial and Cost Accounting	2	2	0	3	Management
22CB306	Compiler Design	2	2	0	3	Professional Core
22CY204	Computer Networks	3	0	2	4	Professional Core
22EN301	Business Communication & Value Science – IV	0	0	2	1	Basic Sciences
22CB307	Inter-Disciplinary Project – Phase II	0	0	2	1	Project
	Department Elective – 2	3	0	2	4	Department Elective
	Open Elective – 3	2	2	0	3	Open Elective
	Total	**13**	**8**	**8**	**21**	
	Minor / Honours – 3	3	0	2	4	
	Total	**16**	**8**	**10**	**25**	
		34 Hrs			**25**	

COURSE STRUCTURE - R22

IV Year I Semester

Course Code	Course Title	L	T	P	C	Course category
22CB401	Services Science and Service Operational Management	2	0	2	3	Management
22DS204	Artificial Intelligence	3	0	2	4	Professional Core
22CB402	Information Security	2	2	0	3	Professional Core
22CB403	IT Project Management	2	0	2	3	Professional Core
	Department Elective – 3	3	0	2	4	Department Elective
	Department Elective – 4	3	0	2	4	Department Elective
	Total	**15**	**2**	**10**	**21**	
	Minor / Honours – 4	3	0	2	4	
	Total	**18**	**0**	**12**	**25**	
			32 Hrs		**24**	

IV Year II Semester

Course Code	Course Title	L	T	P	C	Course category
22CB404/ 22CB405	Internship / Project Work	0	2	22	12	Project
	Total	**0**	**2**	**22**	**12**	
	Minor / Honors – 5	0	2	6	**4**	
	Total	**0**	**4**	**28**	**16**	
			32 Hrs		**16**	

R22 B.Tech.
4 YEAR

COURSE STRUCTURE - R22

Department Electives

Course Code	Course Title	L	T	P	C
22CS806	Machine Learning	3	0	2	4
22CB801	Image Processing and pattern Recognition	3	0	2	4
22CB802	Introduction to IOT	3	0	2	4
22CS804	Deep Learning	3	0	2	4
22CB803	Advanced Social Text and Media Analytics	3	0	2	4
22CB804	Block Chain Technology	3	0	2	4
22CB805	Mobile Computing	3	0	2	4
22CB806	Cryptology	3	2	0	4
22CB807	Enterprise systems	3	2	0	4
22CB808	Modern Web Applications	3	0	2	4
22CY801	Big Data Analytics	3	0	2	4
22CB809	Usability design of software applications	3	0	2	4
22CS812	Optimization Techniques	3	2	0	4
22CB810	Simulation and Modelling	3	2	0	4
22CB811	Java Programming	3	0	2	4

Open Electives for CSBS

Course Code	Course Title	L	T	P	C
22CB851	Introduction to Innovation, IP Management and Entrepreneurship	2	2	0	3
22CB852	Business Strategy	2	2	0	3
22CB853	Augmented Reality and virtual Reality	2	2	0	3
22CB854	Human Resource management	2	2	0	3
22CB855	Financial Management	2	2	0	3
22CB856	Marketing Research and Marketing Management	2	2	0	3
22CB857	Behavioral Economics	2	2	0	3
22CB858	Advance Finance	2	2	0	3
	Capstone Project	0	2	6	4

I

YEAR

B.Tech.

COMPUTER SCIENCE AND BUSINESS SYSTEMS

COURSE CONTENTS

I SEM & II SEM

22MT104 DISCRETE MATHEMATICS

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Basic of set theory, Algebra.

COURSE DESCRIPTION AND OBJECTIVES:

The course objective is to provide students with an overview of discrete mathematics. Students will learn about of group and expected to demonstrate analytical and combinatorial methods such as propositional logic , Mathematical Induction, Boolean functions, combinatorial ,recurrence relation, generating function and graph theory

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

BOOLEAN ALGEBRA AND LOGIC

Group: Group, Subgroup, Lagrange's theorem, Introduction to rings and fields.

Boolean algebra: Boolean algebra, Truth table, Basic logic gates, Postulates of Boolean algebra, Principle of duality, Propositions, Connectives, Equivalence and Normal form.

UNIT-2   **8L+8T+0P=16 Hours**

APPLICATIONS OF LOGIC & BOOLEAN ALGEBRA

Normal form: CNF, DNF, CDNF, CCNF, Conversion of CNF to DNF and vice versa. Minimization of Boolean function (Karnaugh Maps), Generalized Pigeonhole Principle.

PRACTICES:

- Determine order of an element of group.
- Determine the order of a subgroup of a finite group.
- Determine whether algebraic structure is a Ring or a Field.
- Construct Truth table of propositions.
- Check whether propositions are equivalence.
- Obtain CNF, DNF of expression.
- Draw 2 – variables, 3-variables K-map.
- Minimize the Boolean function by K-map.
- Simplify the Boolean expression using Boolean algebra laws.
- Determine the homogeneous solution and particular solution for recurrence relation.
- Switching Circuit in Boolean algebra, Combination of two switches in a Circuit

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

COMBINATORICS AND GRAPHS

Combinatorics: The basics of counting, Permutations and combinations, Discrete Numeric Functions. Recurrence relations and Generating functions.

Graph theory: Graph terminology, Special types of graphs, Connected graph, Weighed graph, Graph Isomorphism, Euler and Hamiltonian paths and circuits, Planar graphs, Bipartite graph, Tree.

UNIT-2   **8L+8T+0P=16 Hours**

APPLICATIONS OF COMBINATORICS AND GRAPHS

Graph Coloring, Chromatic number, Matrix representation of graph, DFS, BFS algorithms, Minimum spanning tree.

PRACTICES:

● Represent sequence by Generating function.
● Solve Generation function by recurrence relation.
● Find degree of digraph and undirected graph.
● Identify Isomorphic graph, Euler circuit, Hamiltonian circuit.
● Determine matrix representation of graph.
● Determine the regions of planer connected graph.
● Draw Kn, Km,n.
● Determine the chromatic number of graphs.
● Find the weight of minimum spanning tree.
● Find number of arrangements that are possible.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the concepts of mathematical logic and Boolean algebra.	Apply	1	1, 2, 9, 10, 12
2	Apply Karnaugh map to minimize.	Apply	1	1, 2, 9, 10, 12
3	Solve generating function by recurrence relations.	Apply	2	1, 2, 9, 10, 12
4	Model and solve real world problems using graphs and trees.	Apply	2	1, 2, 9, 10, 12

TEXT BOOKS:

1. Tremblay, J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", 30th Reprint, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2017.
2. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. R.P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2017.
2. S. Lipschutz and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2021.
3. T. Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2015.
4. S B Singh. "Discrete Structures", Khanna Book Publishers Co-Pvt. Ltd. 2019.

22ST101 INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Knowledge of set theory and probability.

COURSE DESCRIPTION AND OBJECTIVES:

The student who successfully completes this course will have the knowledge in the application of basic statistics in various branches. The skill to collect the data analyse the data. The ability to understand the basic principles of various probability distributions. The basic concepts of differential and integral calculus and its applications.

MODULE-1

UNIT-1   **8L+0T+8P=16 Hours**

INTRODUCTION TO STATISTCS

Definition of Statistics. Basic objectives. Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample.

DESCRIPTIVE STATISTICS: Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures – central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution.

UNIT-2   **8L+0T+8P=16 Hours**

PROBABILITY

Concept of experiments, sample space, event. Definition of Combinatorial Probability. Addition and Multiplication theorem of Probability- independent events and dependent events, Conditional Probability, Statement of Bayes Theorem and applications

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

DISCRETE AND CONTINUOUS PROBABILITY DISTRIBUTIONS

DISCRETE PROBABILITY DISTRIBUTIONS: Bernoulli, Binomial, Poisson and Geometric distributions Continuous Probability distributions: Uniform, Exponential, Normal distribution with properties and applications.

UNIT-2   **8L+0T+8P=16 Hours**

INTRODUCTION TO CALCULUS

Calculus: Basic concepts of Differential and integral calculus, application of double and triple integral.

PRACTICES:

- Use different Visualization packages in Python to draw different graphical display of data.
- Compute different statistical measures for a given data.
- Compute and plot the frequency polygon for a given data.
- Fit the various probability distributions for the appropriate data.

● Analyse the sample data to accept or reject statements regarding population parameters.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply various models to design and conduct experiments, as well as to analyse and interpret the data.	Apply	1	1, 2, 3
2	Apply the knowledge of distribution theory to both software and hardware design problems.	Analyse	2	2, 3, 4
3	Use the concept of probability and conditional probability to determine the outcomes.	Analyse	2	1,2,5
4	Get knowledge of differential and integral calculus and its applications.	Evaluate	2	1, 2, 3

TEXT BOOKS:

1. S.M. Ross, "Introduction of Probability Models", 11th Edition, Academic Press, 2014.
2. A. Goon, M. Gupta and B. Dasgupta, "Fundamentals of Statistics", Vol. I&II, World Press, 2013.
3. B. S. Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publication, Delhi, 1965

REFERENCE BOOKS:

1. A. M. Mood, F. A. Graybill and D.C. Boes, "Introduction to the Theory of Statistics", 3rd Edition, McGraw Hill Education, 2017.
2. Sheldon Ross, "A first course in Probability", 9th Edition, Pearson publications, 2013..
3. I.R. Miller, J.E. Freund and R. Johnson, "Probability and Statistics for Engineers", 8th Edition, PHI publications, 2011.
4. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, CENGAGE Learning Custom publishers, 2011.
5. Michael Greenberg, "Advanced Engineering Mathematics", 2nd Edition, Pearson Education, 2002.
6. P. N. WartikarandJ. N. Wartikar, "Applied Mathematics", Vol. I & II, Vidyarthi Prakashan.

22PY103 FUNDAMENTALS OF PHYSICS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Basics of Physics at lower level.

COURSE DESCRIPTION AND OBJECTIVES:

To learn the fundamentals of oscillations and basic idea of EM. To understand the phenomena of interference, diffraction and polarization. To know the wave particle duality, uncertainty principle etc. by learning the prerequisite quantum physics and understanding the basic concepts of crystallography. To understand fundamentals of Lasers, fiber optics and various laws of thermodynamics

MODULE–1

UNIT-1   **8L+0T+8P=16 Hours**

OSCILLATIONS & ELECTROMAGNETISM

OSCILLATIONS: Periodic motion-simple harmonic motion-characteristics of simple harmonic motion- Vibration of simple spring mass system; Damped harmonic oscillator- Heavy, critical and light damping- Energy decay in a damped harmonic oscillator, quality factor; Forced oscillator, Resonance-definition - Mechanical and electrical oscillators.

BASIC IDEA OF ELECTROMAGNETISM: Continuity equation for current densities- Maxwell's equations in vacuum and non-conducting medium.

UNIT-2   **8L+0T+8P=16 Hours**

PHYSICAL OPTICS

INTERFERENCE: Principle of Superposition-Young's experiment- Theory of interference fringes- types of interference- Fresnel's prism- Newton's rings.

Diffraction- Two kinds of diffraction- Difference between interference and diffraction- Fresnel's half period zone and zone plate- Fraunhofer diffraction at single slit- Plane diffraction grating- Polarization of light

Polarization - Brewster's law- Double refraction- Concept of production of polarized beam of light from two SHM's acting at right angle- Plane, elliptical and circularly polarized lights

PRACTICES:

- Melde's experiment- Determination of frequency of a given tuning fork.
- Magnetic field along the axis of current carrying coil - Stewart and Gee's apparatus.
- Determination of wave length of light by Newton's Ring Method.
- Determination of optical rotation using Polarimeter.

MODULE–2

UNIT-1   **12L+0T+8P=20 Hours**

QUANTUM MECHANICS, SEMICONDUCTORSS

QUANTUM MECHANICS: Introduction- Planck's quantum theory- Matter waves- de-Broglie wavelength, Heisenberg's Uncertainty principle- Time independent Schrödinger's wave equation- Physical significance of wave function- Particle in a one-dimensional potential box, Heisenberg Picture.

SEMICONDUCTOR PHYSICS: Conductor, Semiconductor and Insulator- Basic concept of Band theory

CRYSTALLOGRAPHY: Basic terms-types of crystal systems- Bravais lattices- Miller indices- d- spacing-atomic packing factor for SC, BCC- FCC and HCP structures.

UNIT-2   **12L+0T+8P=20 Hours**

LASER AND FIBER OPTICS:

Introduction to lasers, Properties of laser beams: mono-chromaticity, coherence:(Temporal and Spatial Coherence), directionality and brightness, laser speckles-Einstein's theory of matter- radiation interaction and A and B Coefficients-Amplification of light by population inversion, different types of lasers- Ruby Laser, CO2 Laser-Neodymium laser; applications of lasers in engineering- Fiber optics and Applications-Types of optical fibers..

THERMODYNAMICS: Zeroth law of thermodynamics- First law of thermodynamics- Brief discussion on application of 1st law, second law of thermodynamics- concept of Engine- entropy, change in entropy in reversible and irreversible processes.

PRACTICES:

- Semiconductor- Determination of Bandgap.
- Photoelectric effect- Determination of Planks constant.
- Determination of Hall coefficient of semi-conductor.
- Determination of wave length of light by Laser diffraction method.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify and illustrate physical concepts and terminology used in oscillations and Electromagnetism.	Apply	1	1,2,3, 12
2	Apply the concepts of Physical Optics in view of engineering applications.	Evaluate	1	1,2,3,10, 12
3	Illustrate the significance of wave function, role of uncertainty in quantum physics and analyze conductors and crystalline materials.	Analyze	2	1, 3, 4, 5, 12
4	Analyze the wavelengths of Laser for suitable applications in the field of industry, medicine and communication and foster the knowledge on optical fibers and thermodynamics.	Analyze	2	1, 2, 3, 4, 10, 12

TEXT BOOKS:

1. D. Halliday, R. Resnick and J. Walker, "Fundamentals of Physics", 11th Edition, Wileyplus, 2004.
2. Ajay Ghatak, "Optics", 5th Edition, Tata McGraw Hill, education 2012.
3. Jenkins and white, "Fundamentals of Optics", 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Sears & Zemansky, "University Physics", Vol, 1, 13th Edition, Addison-Wesley.
2. Jenkins and white, "Fundamentals of Optics", 3rd Edition, McGraw Hill.

22CS102 FUNDAMENTALS OF COMPUTER SCIENCE – I

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Your passion, enthusiasm and just a bit of logical skills should be enough.

COURSE DESCRIPTION AND OBJECTIVES:

- To impart adequate knowledge on the need of programming languages and problem-solving techniques.
- To develop programming skills using the fundamentals and basics of C Language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in file organization and the usage of file systems.

MODULE-1

UNIT-1   **8L+0T+8P=16 Hours**

GENERAL PROBLEM-SOLVING CONCEPTS:

Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

IMPERATIVE LANGUAGES:

Introduction to Algorithms: Introduction to imperative language; syntax and constructs of a specific language (ANSI C), Types of Operators and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation.

UNIT-2   **8L+0+8P=16 Hours**

CONTROL FLOW WITH DISCUSSION ON STRUCTURED AND UNSTRUCTURED PROGRAMMING:
Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, go to labels, structured and un- structured programming.

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

FUNCTIONS:

FUNCTIONS AND PROGRAM STRUCTURE WITH DISCUSSION ON STANDARD LIBRARY:
Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Pre-processor, Standard Library Functions and return types.

UNIT-2   **8L+0T+8P=16 Hours**

ARRAYS AND STRINGS

ARRAYS

Introduction; Types of arrays; Single dimensional array - declaration, initialization, usage, reading,

writing, accessing, memory representation, operations; Multidimensional array and Row/column major formats, Initialization of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

STRINGS

Character array, Reading string from the standard input device, Displaying strings on the standard output device, Importance of terminating a string, Standard string library functions.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	The students will be able to enhance their analysing and problem solving skills and use the same for writing programs in C..	Apply	1,2	1,2,3,12
2	To develop programs using the basic elements like control statements, Arrays and Strings.	Apply	1,2	1,2,3,12
3	To develop advanced applications using enumerated data types, function pointers and nested structures and ability to apply code reusability with user defined functions.	Apply	2	1,2,3,12
4	To learn the basics of file handling mechanism that is essential for understanding the concepts in database management systems and to understand the uses of preprocessors and various header file directives.	Understand	2	1,2,3,12

TEXT BOOKS:

1. Behrouz A. Forouzan, Richard F.Gilberg, "Programming for Problem Solving", 1st edition, Cengage publications, 2019.
2. Ajay Mittal, "Programming in C - A Practical Approach", 1st edition, Pearson Education, India, 2010.

REFERENCE BOOKS:

1. Reema Thareja, "Computer Fundamentals and Programming in C", 1st edition, Oxford University Press, India, 2013..
2. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata McGraw-Hill, 2017.
3 R G Dromey and Pearson, "How to solve it by Computer", 2nd Edition, 1998.

22EE104 PRINCIPLES OF ELECTRICAL ENGINEERING

Hours Per Week :

L	T	P	C
3	0	2	4

Source: https://vita. vision.org.in/emerging- technologies-in-electrical- engineering/

PREREQUISITE KNOWLEDGE: Basics of physics and mathematics.

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 basic concepts of electric circuits, magnetic circuits and to identify the types of sensors and measure quantities in AC and DC systems.

MODULE–1

UNIT-1   **12L+0T+8P=20 Hours**

FUNDAMENTALS OF ELECTRIC CIRCUITS

Electric Circuits: Concept of Potential difference, voltage, current, Fundamental linear passive and active elements to their functional current-voltage relation, Terminology and symbols in order to describe electric networks, voltage source and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Concept of work, power, energy, and conversion of energy.

UNIT-2   **12L+0T+8P=20 Hours**

DC CIRCUITS

Current-voltage relations of the electric network by mathematical equations to analyze the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem) Simplifications of networks using series-parallel, Star/Delta transformation. Super position theorem

PRACTICES:

- Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits.
- Determination of resistance temperature coefficient.
- Verification of Superposition Theorem.
- Verification of Thevenin's Theorem.
- Verification of Norton's Theorem.
- Verification of Maximum Power Transfer Theorem.

MODULE–2

UNIT-1   **12L+0T+8P=20 Hours**

AC CIRCUITS, ELECTROSTATICS AND ELECTRO-MECHANICS

AC Circuits: AC waveform definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3 phase Balanced AC Circuits

ELECTROSTATICS AND ELECTRO-MECHANICS: Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitor composite, dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors, Electricity and Magnetism, magnetic field and Faraday's law, self and mutual inductance, Ampere's law, Magnetic circuit, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, Electro mechanical energy conversion.

UNIT-2   **12L+0T+8P=20 Hours**

ELECTRICAL MEASUREMENTS, WIRING, EARTHING AND STORAGE

Measurements: Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems (Current & Single-phase power).

ELECTRICAL WIRING: Electrical Wiring and Illumination system: Basic layout of the distribution system, Types of Wiring System &Wiring Accessories.

EARTHING: Necessity of earthing, Types of earthing, Safety devices &system.

BATTERIES: Principle of batteries, types, construction and application.

PRACTICES:

● Simulation of R-L-C series circuits for XL>XC , XL< XC.
● Simulation of Time response of RC circuit.
● Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
● Demonstration of measurement of electrical quantities in DC and AC systems.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply basic laws to find the response of the resistive circuits.	Apply	1	1,2,36,9,12
2	Analyze the DC circuit using various network theorems.	Analyze	1	1,2,3,9,12
3	Analysis of AC circuits with R, L, C elements and three phase systems.	Analyze	2	1,2,3,9,12
4	Categorize the protection systems in different electrical equipment.	Analyze	2	1,2,3,9,12
5	Design a simple wiring system using Wiring Accessories.	Analyze	2	1,2,3,9,12

TEXT BOOKS:

1. B L Theraja& A K Theraja, "A Textbook of Electrical Technology, (vol. I)",Chand and Company Ltd., New Delhi.2020.
2. V. K. Mehta, "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi.2012.

REFERENCE BOOKS:

1. Engineering Circuit Analysis, William H. Hayt& Jack E. Kemmerly, 9th Edition, McGraw-Hill Book Company Inc., 2020.
2. Basic of Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, 3rd Edition, Oxford University Press, 2017.
3. Introduction to Electrodynamics, D. J. Griffiths, (Fourth Edition), 4th Edition, Cambridge University Press, 2015.
4. Fundamentals of Electrical and Electronics Engineering, Smarjith Ghosh, 2nd Edition Prentice Hall (India) Pvt. Ltd, 2010.

22TP102 CONSTITUTION OF INDIA

Hours Per Week :

L	T	P	C
0	2	0	0

PREREQUISITE KNOWLEDGE: High School-level Civics and Social Studies.

COURSE DESCRIPTION AND OBJECTIVES:

To provide students with a basic understanding of Indian Polity and Constitution and make students understand the functioning of government at the center and state level besides local self-government. This course also equips students with knowledge pertaining to fundamental rights and fundamental duties of a citizen in a democracy such as India

MODULE-1

UNIT-1   **0L+4T+0P=4 Hours**

HISTORICAL BACKGROUND TO THE INDIAN CONSTITUTION

Meaning of the constitution law and constitutionalism; Historical perspective of the Constitution of India; Salient features and characteristics of the Constitution of India.

UNIT-2   **0L+4T+0P=4 Hours**

FUNDAMENTAL RIGHTS, DUTIES, DIRECTIVE PRINCIPLES, AND AMENDMENT

Scheme of the fundamental rights - scheme of the Fundamental Right to Equality; scheme of the Fundamental Right to certain Freedom under Article 19; scope of the Right to Life and Personal Liberty under Article 21; Scheme of the Fundamental Duties and its legal status; Directive Principles of State Policy – its importance and implementation; Amendment of the Constitution - Powers and Procedure.

PRACTICES:

- Enactment of Constituent Assembly debates to further understand the rationale for the provisions of the constitution.
- Fundamental Rights in our popular culture - discussion in the movie Jai Bhim.

MODULE-2

UNIT-1   **0L+4T+0P=4 H Hours**

STRUCTURE AND FORM OF GOVERNMENT

Federal structure and distribution of legislative and financial powers between the Union and the States; Parliamentary Form of Government in India – The constitution powers and status of the President of India; Emergency Provisions: National Emergency, President Rule, Financial Emergency.

UNIT-2   **0L+4T+0P=4 Hours**

LOCAL SELF GOVERNMENT

Local Self Government – Constitutional Scheme in India – 73rd and 74th Amendments.

PRACTICES:

- Debate on federalism in India.
- Collect news published in the local papers about panchayats in the nearby areas.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyse major articles and provisions of the Indian constitution.	Analyze	1	6
2	Appreciation for the constitution and safeguarding individual rights.	Apply	1	6
3	Evaluating functions of various organs of the State in a democracy.	Evaluate	2	6

TEXT BOOK:

1. PM Bhakshi, "Constitution of India", 15th edition, Universal Law Publishing, 2018.

REFERENCE BOOKS:

1. B. R. Ambedkar, "The Constitution of India" Educreation Publishing, India, 2020.
2. Subhash Kashyap, "Our Constitution" 2nd edition, National Book Trust, India, 2011.
3. Arun K. Thiruvengadam, "The Constitution of India: A Contextual Analysis", Hart Publishing India, 2017.

22CT101 ENVIRONMENTAL STUDIES

Hours Per Week :

L	T	P	C
2	0	0	0

PREREQUISITE KNOWLEDGE: General awareness regarding environmental problems and importance of environmental protection.

COURSE DESCRIPTION AND OBJECTIVES:

It is a multidisciplinary subject where different aspects of society and environment are dealt using a holistic approach. It is evolving to be the education for sustainable and ethical development both at a local and global level. It helps to prepare the next generation for planning appropriate strategies to address environmental issues. It identifies and creates solutions that conserve to manage ecosystem and biodiversity and helps to eliminate pollutants, toxicants, preserve air, water and soil quality. Environmental education recognizes impacts of global issues, enhances the public awareness and helps to take decisions towards environmentally responsible actions.

MODULE-1

UNIT-1   8L+0T+0P=8 Hours

INTRODUCTION TO ENVIRONMENT

NATURAL RESOURCES, ECOSYSTEMS AND BIODIVERSITY

Environment and sustainable development; Natural resources- forest, water, energy and land resources; Ecosystem – basic structural components, function and interactions in ecosystem, ecological succession.

UNIT-2   8L+0T+0P=8 Hours

BIODIVERSITY AND CONSERVATION

Types of biodiversity- species, genetic and ecosystem diversity; Threats to biodiversity - natural and anthropogenic, species extinctions, man wildlife conflicts; Biodiversity conservation - principles and strategies; in-situ and ex-situ conservation.

PRACTICES:

- Visit to a Biogas plant, Solar Power plant.
- Visit to a local area: river / pond / lake / forest / grassland / hill / mountain and study of different types of ecosystems, biodiversity study and documentation (herbarium sheet preparation).
- Set up an aquarium.
- Case study: Renewable energy use.

MODULE-2

UNIT-1   4L+4T+0P=8 Hours

ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE

Air, water, soil, radioactive and noise pollution; Study of different pollutants (SOx, NOx, PAN, PAH etc.); Toxicity study; Climate change - greenhouse effect, acid rain, ozone layer depletion.

UNIT-2   4L+4T+0P=8 Hours

POLLUTION CONTROL DEVICES AND WASTEWATER TREATMENT TECHNOLOGIES

Air pollution control devices - Gravitational settling chambers, cyclonic separators, electrostatic precipitators, fabric filters and bio filters, Wastewater management.

PRACTICES:

- Visit to a sewage treatment plant and wastewater analysis.
- Case study: Recycling Technologies.
- Case study: Effects of contaminants on microorganisms.
- Report writing: 12 principles of green chemistry for environmental sustainability.
- Report writing: Environmental Impact Analysis, Local Disaster Management Plan.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the basic concepts of sustainable development, natural resource utilization and ecology for the purpose of environmental protection.	Apply	1	1,6,7, 9, 10, 11, 12
2	Design remediation technologies for their abatement	Apply	2	1, 3,6,7, 9, 10, 11, 12
3	Analyze the biodiversity of different ecosystems and formulate various conservation approaches	Analyze	1	1, 7, 8, 9, 10, 11, 12
4	Analyze the presence of various environmental pollutants.	Analyze	2	1, 6,7,9, 10, 11, 12
5	Recommend various waste management approaches and their implementation strategies.	Evaluate	2	1,2, 7,8,9,10,11, 12

TEXT BOOKS:

1. A. Kaushik and C. P. Kaushik, "Perspectives in Environmental Studies", New Age International Publishers, 5th Edition, 2016.
2. Y. Anjaneyulu, "Introduction to Environmental Science", B. S. Publications, 2015.

REFERENCE BOOKS:

1. B. Joseph, "Environmental Studies", Mc Graw Hill Education, 2nd Edition, 2015.
2. S. Subash Chandra, "Environmental Science", New Central Book Agency, 2011.
3. M. Basu and S. Xavier, "Fundamentals of Environmental Studies", Cambridge University Press, 2016.
4. K. Mukkanti, "A Textbook of Environmental Studies", S. Chand Company Ltd., 2009.
5. M. Anji Reddy, "A Textbook of Environmental Science and Technology", B. S. Publications, 2008.

22EN101 BUSINESS COMMUNICATION AND VALUE SCIENCE – I LAB

Hours Per Week :

L	T	P	C
0	0	2	1

PREREQUISITE KNOWLEDGE: Basic Knowledge of high school English.

COURSE DESCRIPTION AND OBJECTIVES:

- Understand what life skills are and their importance in leading happy and well- adjusted Life.
- Motivate students to look within and create a better version of self.
- Introduce them to key concepts of values, life skills and business communication

MODULE-1

UNIT-1   **0L+0T+8P=8 Hours**

INTRODUCTION

INTRODUCING SELF: Activity on self-introduction, introducing others, SWOT analysis Overview of **Business Communication:** Newspaper report, celebrity conversations, quiz Self-awareness: Identity, body awareness, stress management.

UNIT-2   **0L+0T+8P=8 Hours**

Refresher on parts of speech, tenses, functional grammar, sentence formation, common errors.

COMMUNICATION SKILLS: Overview of communication skills, barriers of communication, effective communication, types of communication- verbal and non – verbal.

LISTENING SKILLS: Law of nature-, importance of listening skills, difference between listening and hearing, types of listening.

EXPRESSING SELF: Connecting with emotions, visualizing and experiencing purpose.

MODULE-2

UNIT-1   **0L+0T+8P=8 Hours**

VERBAL COMMUNICATION

Pronunciation, clarity of speech.

EMAIL WRITING: Formal and informal emails.

VOCABULARY ENRICHMENT: Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary – Read Economic Times, Reader's Digest, National Geographic, Toastmaster style Table Topics speech with evaluation.

WRITTEN COMMUNICATION: Summary writing, story writing.

Build your CV – start writing your comprehensive CV including every achievement in your life, no format, no page limit.

LIFE SKILL: Stress management, working with rhythm and balance, colours, and teamwork.

UNIT-2   **0L+0T+8P=8 Hours**

UNDERSTANDING LIFE SKILLS

Movie based learning, Introduction to life skills what are the critical life skills. Multiple Intelligences

Embracing diversity – Activity on appreciation of diversity.

LIFE SKILL: Community service – work with an NGO and make a presentation, Join a trek Values to be learnt: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Recognize the need for life skills and values.	Understand	2	6,7,8, 9
2	Recognize own strengths and opportunities.	Understand	1,2	6, 7, 8, 9
3	Apply the life skills to different situations.	Apply	1, 2	6, 7, 8, 9
4	Understand the basic tenets of communication.	Understand	1, 2	6, 7, 8, 9
5	Apply the basic communication practices in different types of communication.	Apply	1,2	6, 7, 8, 9

TEXT BOOK:

1. There are no prescribed texts for Semester1.

REFERENCE BOOKS:

1. English vocabulary in use–Alan Mc'carthy and O'dell.
2. APAART:SpeakWell1 (English language and communication).
3. APAART:SpeakWell2(Soft Skills).
4. Business Communication–Dr. Saroj Hiremath.

WEBREFERENCES:

1. Trainyourmindtoperformunderpressure-Simonsinekhttps://curiosity.com/videos/simon- sinek-on-training-your-mind-to-perform-underpressure-capture-your-flag/Brilliant way one CEO rallied his team in the middle of lay offs.

   https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people- beforenumbers.html.

2. WillSmith'sTopTenrulesforsuccesshttps://www.youtube.com/watch?v=bBsT9omTeh0.

ONLINERESOURCES:

1. https://www.coursera.org/learn/learning-how-to-learn https://www.coursera.org/specializations/effective-business-communication.

22MT108 LINEAR ALGEBRA

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Basics of matrices, relations and functions.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to build a grasp of the fundamental concepts of matrices and rank of a matrix using Echelon form, Normal forms. The methods for solving the system of linear equations using Cramer's rule, Gauss Elimination method and Gauss-Jordan method. To find the Eigen values and Eigen vectors of a square matrices and applications on it. To discuss vector space and its properties, Basis and Dimension and their applications.

MODULE-1

UNIT-1   8L+8T+0P=16 Hours

MATRICES

Rank of a matrix, Echelon from, Normal form, Inverse of a matrix using ad-joint method and Gauss-Jordan method, LU Decomposition, Consistency of System of linear equations.

UNIT-2   8L+8T+0P=16 Hours

APPLICATIONS OF MATRICES

Solution of linear equations using Cramer's rule, Gauss Elimination method, Gauss-Jordan method, Eigen values and Eigen vectors, Properties (without proofs), Cayley-Hamilton theorem (without proof), powers of a matrix, inverse of a matrix.

PRACTICES:

- Determine the rank of a matrix using the definition.
- Determine the rank of a matrix using Echelon form and Normal form.
- To find the solution of system of linear equations using Cramer's rule and Gauss Elimination method.
- To find the solution of system of linear equations (Homogeneous and Non-homogeneous) using Gauss-Jordan method.
- Determine the Eigen values and Eigen vectors of a square matrix (which are either diagonal matrix or triangular matrix or else).
- Verification of Cayley-Hamilton theorem for square matrices.
- Use Cayley-Hamilton theorem to find the powers of a matrix.

MODULE-2

UNIT-1   8L+8T+0P=16 Hours
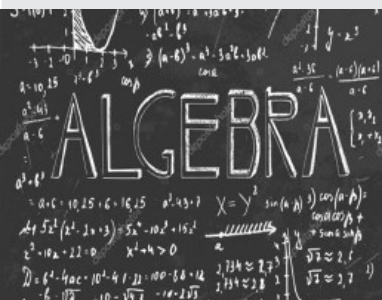
VECTOR SPACES

Introduction to vector space, subspace, linear combination of vectors, linear span, Bases. Finite dimensional vector space: Dimension of a vector space and dimension theorems. Linear transformations: Definition and Examples, Definiteness.

UNIT-2   8L+8T+0P=16 Hours

APPLICATIONS OF VECTOR SPACES

INNER PRODUCT SPACE: Introduction to Inner Product Space, Orthogonality, orthonormality and orthonormal basis, Gram-Schmidt Orthogonal Process, QR Decomposition.

APPLICATIONS: Singular Value Decomposition, Principal Component Analysis. Introduction to their applications in Image Processing and Machine learning.

PRACTICES:

- Verify the given set of vectors is linearly dependent or not?
- Verify the given set of vectors is a basis or not?
- Examine the given transformation is a linear transformation or not?
- To verify Rank-Nullity theorem for given set problems?
- To discuss the applications of Orthogonal vectors and linearly independent.
- Find the Ortho-normal basis to the given set of vectors using Gram-Schmidt Orthogo-nalization process?
- To discuss the Quadratic forms?
- Determine the nature of the Quadratic form.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the concepts of matrices and solve the system of equations	Apply	1	1, 2, 4, 5, 9, 10, 12
2	Apply the Caley Hamilton theorem to evaluate inverse and power of a matrix.	Apply	1	1, 2, 5, 9, 10, 12
3	Apply the concepts of vector spaces to determine the dimension and rank of a transformation.	Apply	2	1, 2, 3, 5, 9,10, 12.
4	Analyze the properties of inner product spaces and determine orthogonality in inner product spaces.	Analyse	2	1, 2, 5, 9, 10, 12

TEXT BOOKS:

1. V. Krishnamurthy, V. P. Mainra, J.l. Arora, An introduction to linear algebra, 3rd Edition, 2014.
2. Gilbert Strang, Linear Algebra, Wellesley-Cambridge Press, 5th edition, 2016.

REFERENCE BOOKS:

1. N. P. Bali, K. L. Sai Prasad, A Textbook of Engineering Mathematics I, II, III, Universal Science Press, New Delhi, 2018, 2nd Edition.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2018.
3. Advanced Engineering Mathematics, 10th Edition, Erwin Kreyszig, John Wiley and Sons, Inc, ISBN: 9780470458365.
4. H. K. Dass and Er. RajanishVerma, Higher Engineering Mathematics, S. Chand and Co., 3rd revised Edition, 2015.

SKILLS:

✓ *To discuss the solution of system of linear equations using other methods.*

✓ *Check the ability of students to find a solution of Eigen Values and Eigen Vectors.*

✓ *Apply transformation to real-world problems involving linear transformations.*

✓ *Analyze Quadratic forms and its applications*

22ST102 STATISTICAL METHODS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Basics of Integration, Differentiation and Probability.

COURSE DESCRIPTION AND OBJECTIVES:

The student who successfully completes this course will have the knowledge in various sampling techniques and to find the relationship between the bivariate data sets. Further the student will have the skills to adapt analysis of variance and predict the future behaviour based on times series data. The basic concepts of testing of hypothesis and its applications for non-parametric data.

MODULE-1

UNIT-1   **12L+0T+8P=20 Hours**

SAMPLING TECHNIQUES

Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling.

UNIT-2   **12L+0T+8P=20 Hours**

ESTIMATION

Definitions of population, sample, parameter, statistic, Point estimation- criteria for good estimator (un-biasedness, consistency, efficiency and efficiency) with simple examples, Method of estimation including maximum likelihood estimation for Binomial, Poisson and Normal distributions, confidence limits.

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

TESTING OF HYPOTHESIS

Testing large samples-one mean, two means, one proportion and two proportions. Testing small samples-one mean, two means (independent and paired samples), ANOVA: Analysis of Variance (one-way classification), Analysis of Variance (two-way classification).

UNIT-2   **12L+0T+8P=20 Hours**

NON-PARAMETRIC INFERENCE

Comparison with parametric inference, two samples- Sign test, Wilcoxon signed rank test, Mann- Whitney test, Run test, Kolmogorov-Large and small samples.

PRACTICES:

Using R package draw different graphical representation of data

- Compute different statistical measures for a given data.
- Compute and plot the frequency polygon for a given data.
- Fit the various probability distributions for the appropriate data.
- Analyse the sample data to accept or reject statements regarding population parameters and non- parametric methods.
- Carryout analysis of variance for a given experimental data.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply various sampling techniques to collect the data.	Apply	1	1,2
2	Solve the problems based on estimation theory.	Apply	1	1,3,2
3	Testing of hypothesis by non-parametric methods.	Analyze	2	1,2
4	Design and conduct experiments in ANOVA.	Create	2	3,4,5

TEXT BOOKS:

1. Sheldon M. Ross, An Introduction to Probability and Statistics for Engineers and Scientists, 3rd Edition, Academic Press, Elsevier.
2. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 2012.

REFERENCE BOOKS:

1. P. R. Vittal, "Mathematical Statistics", Margham Publications, Chennai, 2018.
2. S. C. Gupta and V. K. Kapoor, "Fundamentals of Applied Statistics", Sultan Chand & Sons, 4th Edition, 2007. A. Singaravelu, "Probability and Statistics", 22nd Edition, Meenakshi Agency, 2015.

SKILLS:

✓ Draw different Graphical display of the data

✓ Choose the various probability distributions to fit for the appropriate data.

✓ Apply tests of significance to accept or reject statements regarding population parameters.

✓ Analyse the abnormalities present in the data.

✓ Choose the desired sampling frequency for a given application.

✓ Testing statistical statements in Non parametric methods

22EC103 PRINCIPLES OF ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Engineering Physics, Basic Electrical and Electronics Engineering.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to introduce the fundamental concepts in electronics to know the operation electronic devices and circuits and also the implementation Digital Circuits, realization of digital components of circuit level.

MODULE-1

UNIT-1   **10L+0T+6P=16 Hours**

SEMICONDUCTORS

Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: Intrinsic & extrinsic, energy band diagram, P-type and N-type semiconductors, drift & diffusion carriers. Diodes and Diode Circuits: Formation of P-N junction, Energy band diagram, forward and reverse biased P-N junction, Formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency.

UNIT-2   **14L+0T+10P=24 Hours**

BIPOLAR JUNCTION TRANSISTOR

Bipolar Junction Transistor: Formation of PNP/NPN junctions, CE, CB, CC configuration, Transistor characteristics: cut-off active and saturation mode, current amplification factor for CB, CE, and CC modes.

Field Effect Transistor: Concept of Field Effect Transistor, Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, Depletion and enhancement types; CMOS: Basic Principals.

PRACTICES:

- P-N Junction diode characteristics.
- Zener diode characteristics and Zener diode as Voltage regulator.
- Verification of UJT Characteristics
- Transistor CB characteristics (Input and Output).
- Transistor CE characteristics (Input and Output).
- Transistor CC characteristics (Input and Output).
- MOSFET characteristics.

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

FEED BACK AMPLIFIER

Feed Back Amplifier, Oscillator sand Operational Amplifiers: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier: Inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, comparator, Integrator, Differentiator.

UNIT-2   **12L+0T+8P=20 Hours**

DIGITAL ELECTRONICS FUNDAMENTALS

Digital Electronics Fundamentals: Difference between analog and digital signals, Logic ICs, half and full adder/sub-tractor, multiplexers, de-multiplexer, flip-flop, shift registers, counters.

PRACTICES:

- Design an integrator and a differentiator using 741 Op-Amp IC.
- Design an inverting summing amplifier for a given equation.
- Design an instrumentation amplifier using 741 Op-Amp IC.
- Design a low pass filter and a high pass filter with certain cutoff frequency using 741 Op-Amp IC.
- Verify the working of Schmitt trigger using 741 IC.
- Basic Logic Gates.
- Adders: Half Adder, Full Adder, Ripple carry adder, Adder/Subtractor, BCD adder
- Subtractors: Half Subtractors, Full Subtractors.
- Encoder & Decoder.
- Multiplexer & De-Multiplexer.
- Flip Flops: SR, JK, D, T.
- Registers.
- Counters.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand the behavior of Semi-Conductors with respect to current carrying capability and the operation of diode, diode circuits and recti-fiers.	Under-standing	1	1, 2, 12
2	Analyzing the models of BJT, JFET and MOS-FET as well as amplifier circuits.	Analyze	1	1, 2, 5, 1
3	Understand the concepts of feedback and its advantages and disadvantages and to know the operation of operational amplifier	Apply	2	1, 2, 3, 5, 12
4	Understand the difference between analog and digital signals and implementation details of basic digital elements at circuit level.	Apply	2	1, 2, 12

TEXT BOOKS:

1. William Stallings, "Computer Organization & Architecture: Designing for Performance", 11th Edition, Pearson, 2019.
2. John D.Carpinelli, "Computer Systems Organization and Architecture", Pearson, 1st Edition, 2001.

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory, RobertL. Boylestad, Louis Nashelsky..
2. SolidStateElectronicDevices,6th Edition, Ben Street man, Sanjay Banerjee
3. Electronic Principle, Albert Paul Malvino.
4. Electronics Circuits: Discrete &Integrated, D Schilling C Belove TApelewicz RSaccardi.
5. Micro electronics, Jacob Milliman, Arvin Grabel.
6. ElectronicsDevices&Circuits,S.Salivahanan,N.SureshKumar,A.Vallavaraj

SKILLS:

- ✓ Identify a Semiconductor Diode for a specific application.
- ✓ Implement a RPS for a specific Application.
- ✓ Design an amplifier for a specific application.
- ✓ Construct basic op-amp circuits.
- ✓ Design basic digital building blocks.

22CS106 FUNDAMENTALS OF COMPUTER SCIENCE - II

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Fundamentals of Computer Science - I.

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed to impart knowledge on some advanced concepts of C programming language and problem-solving. It covers pointers, structures, unions, and file manipulations. At the end of this course, students will be able to design, implement, test, and debug complex problems using features of C.

MODULE-1

UNIT-1   **8L+0T+8P=16 Hours**

POINTERS

Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multidimensional array, and Row/column major formats.

Problem-solving on a Global Coding Platform using Data types and operators; Control statements; and functions

UNIT-2   **8L+0T+8P=16 Hours**

POINTERS

Initialization of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

STRUCTURES, UNIONS & FILES

Structures: Defining a structure, Declaring structure variable, Operations on structures, Pointers to structure - declaring pointer to a structure, accessing structure members using pointer; Array of structures, Nested structures, Passing structures to functions - passing each member of a structure as a separate argument, passing structure variable by value, passing structure variable by reference/address; Typedef and structures.

UNIT-2   **8L+0T+8P=16 Hours**

INPUT AND OUTPUT

Standard I/O, Formatted Output–printf, Formatted Input–scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

UNIX SYSTEM INTERFACE: File Descriptor, Low level I/O – read and write, open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator.

PROGRAMMING METHOD: Debugging, Macro, User Defined Header, User Defined Library Function, make file utility.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify suitable data types for operands and design of expressions having the right precedence.	Apply	1,2	1
2	Apply decision-making and iterative features of C Programming language effectively.	Apply	1,2	1
3	Select problem-specific data structures and suitable accessing methods.	Analyse	1,2	1, 2
4	Design and develop non-recursive and recursive functions and their usage to build large modular programs and able to design string manipulation functions.	Create	1,2	3
5	Develop C programs that are understandable, debuggable, maintainable, and more likely to work correctly in the first attempt.	Evaluate	1,2	3, 4

TEXT BOOKS:

1. Behrouz A. Forouzan, Richard F.Gilberg, "Programming for Problem Solving", 1st edition, Cengage publications, 2019.
2. Ajay Mittal, "Programming in C - A Practical Approach", 1st edition, Pearson Education, India, 2010.

REFERENCE BOOKS:

1. Reema Thareja, "Computer Fundamentals and Programming in C", 1st edition, Oxford University Press, India, 2013.
2. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata McGraw-Hill, 2017.
3. R G Dromey and Pearson, "How to solve it by Computer", 2nd Edition, 1998.

SKILLS:

✓ *Analysis of the problem to be solved.*

✓ *Application of various file operations effectively in solving real world problems.*

✓ *Develop C programs that are understandable, debuggable, maintainable and more likely to work correctly in the first attempt.*

22MS101 FUNDAMENTALS OF ECONOMICS

Hours Per Week :

L	T	P	C
3	0	0	3

PREREQUISITE KNOWLEDGE: Micro Economics.

COURSE DESCRIPTION AND OBJECTIVES:

After successful completion of the course, the students are able to explain, analyze and predict consumer behavior, market demand for goods and supply, welfare measures such as consumer surplus, taxes, subsidies and social welfare. To calculate the minimal cost input factor quantities for a firm and different market structures. To recognize the key issues in macro economic analysis, in particular, howmacro economic shocks affects businesses. To discuss and explain the role of the government in the economy, analyze and predict the effect of government measures (policies etc.) on market prices for sustainable development.

MODULE-1

UNIT-1   **12L+0T+0P=12 Hours**

MICROECONOMICS

Principles of Demand and Supply – Supply Curves of Firms – Elasticity of Supply; Demand Curves of Households – Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve); Welfare Analysis – Consumers' and Producers' Surplus – Price Ceilings and Price Floors; Consumer Behaviour– Axioms of Choice – Budget Constraints and Indifference Curves; Consumer's Equilibrium – Effects of a Price Change, Income and Substitution Effects – Derivation of a Demand Curve; Applications – Tax and Subsidies – Inter temporal Consumption – Suppliers' Income Effect.

UNIT-2   **12L+0T+0P=12 Hours**

THEORY OF PRODUCTION

Production Function and Iso-quants – Cost Minimization; Cost Curves – Total, Average and Marginal Costs – Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly, Oligopoly and Monopolistic Competition.

PRACTICES:

- Prepare the list of economic principles and their role in decision making.
- Collect the factors influencing the demand for a product.
- Identify the various types of cost concepts.
- Identify various types of market structures prevailing in the real world.

MODULE-2

UNIT-1   **12L+0T+0P=12 Hours**

MACROECONOMICS

National Income and its Components – GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector – Taxes and Subsidies; External Sector – Exports and Imports.

UNIT-2   **12L+0T+0P=12 Hours**

MONEY – Definitions; Demand for Money – Transactionary and Speculative Demand; Supply of Money –Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets – IS, LM Model; Business Cycles and Stabilization – Monetary and Fiscal Policy – Central Bank and the Government; The Classical Paradigm – Price and Wage Rigidities – Voluntary and Involuntary Unemployment.

PRACTICES:

- Case study on Exports and Reports.
- Latest report on Monetary and Fiscal Policy.
- Short presentation on Voluntary and Involuntary unemployment

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Appraisethe determinants of Demand and forecasting techniques.	Apply	1	3, 2
2	the different costs of production and how they affect short and long run decisions.	Apply	1	2, 1
3	Examine the concepts of national income, sources of revenue and classification of expenditures.	Analyze	2	4, 3
4	the issues related to money supply and Inflation.	Apply	2	3, 2

TEXT BOOKS:

1. Microeconomics, Pindyck, Robert S., and DanielL.Rubinfeld.
2. Macroeconomics, Dornbusch, Fischer and Startz.
3. Economics, Paul Anthony Samuelson, William D. Nordhaus.

REFERENCE BOOKS:

1. Intermediate Microeconomics: AModern Approach, HalR,Varian.
2. Principles of Macroeconomics, N.Gregory Mankiw.

SKILLS:

✓ *Group assignments on demand and supply.*

✓ *Collect different pricing methods followed by any private organization.*

✓ *Collect the latest information on Taxes and Subsidies.*

✓ *Preparing Mini project on money supply in India.*

22CS104 PYTHON PROGRAMMING

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Prior knowledge of any programming language and object-oriented concepts is helpful but not mandatory.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers sufficient knowledge required to understand the fundamental concepts of Python programming language. This course enables students to choose appropriate data structures (lists, dictionaries, tuples, sets, strings) for the given problem. In addition, the students will be able to create reliable, modular and reusable applications using Object- Oriented Programming approaches. At the end they will get an idea of how to access database using python programming, develop web applications, and using web Services using python Programming.

MODULE-1

UNIT-1   6L+0T+6P=12 Hours

INTRODUCTION

Introduction to python, Variables, Assignment, Keywords, Built-in functions, Indentation, Comments, Basic data types - integers, float, complex, Boolean, strings; Python program development, running python using REPL shell, Python scripts.

Operators and Expressions: Operators- arithmetic operators, comparison (relational) operators, assignment operators, logical operators, bitwise operators, membership operators, identity operators; Expressions and order of evaluations.

Control Structures: Conditional control structures - if, elif, else; Loop control structures - for, while, for... else, while…else, nested loops, break, continue, pass.

UNIT-2   10L+0T+10P=20 Hours

PYTHON DATA STRUCTURES AND FUNCTIONS

Data Structures: Lists, Tuples, Sets, Strings, Dictionary - creation, accessing, basic operators and methods; List comprehensions.

Functions: Defining functions, calling functions, Passing arguments - keyword arguments, default arguments, positional arguments, variable-length arguments; Types of functions- anonymous functions, fruitful function, recursive functions; Scope of the variables- global and local variables, Development of recursive and non-recursive functions.

PRACTICES:

- A. Given an integer N, write a program to find its 1's complement.
- B. Given two integers N1 and N2, write a program to find their product without using multiplication ('*') operator and loops.
- C. Given two integers N1 and N2 having same value, write a program to check whether N1 and N2 points to the same object or not.
- A. Given an Integer N, write a program to check whether given number is even or odd without using modulus operator.
- Given a number N, number of bits K and starting position P, write a program to extract K bits from a position P (from right) in the binary representation of N. Convert the extracted bits in decimal number.

- Given coordinates of centre of a circle, radius and a point coordinate, write a program to check whether the given point lies inside or on the circle, or outside the circle.
- Write a program to find the sum of digits in a given integer.

  Given an integer N as an input, decides the geometrical figure for which the area has to be calculated, for example N=1 for circle, N=2 for rectangle, and N=3 for triangle. Write a program to display the area of the respective figure.
- A semi prime number is an integer which can be expressed as a product of two distinct primes. For example, 15 = 3*5 is a semi prime number but 9 = 3*3 is not.

  For a Given an integer number N, write a program to find whether it can be expressed as a sum of two semi-primes or not (not necessarily distinct).
- Given an integer amount X, write a program to find the minimum number of currency notes $ (500, 100, 50, 20, 10, 5, 2, 1) required for the given amount.

  Input:

  575

  Where input is the amount for which we have to calculate the number of currency notes.

  Output: 4

  Explanation: Total amount = 1(500 dollar note) + 1(50 dollar note) + 1(20 dollar note) + 1(5 dollar note) = 575, hence the minimum number of notes required is 4.
- For a given a string S and width W, write a program to wrap the string S into a paragraph of width W.

  Example:

  Input:

  ABCDEFGHIJKLIMNOQRSTUVWXYZ

  4

  Output:

  ABCD   EFGH   IJKL   IMNO   QRST   UVWX   Ɏ
- Write a program to Measure the required time to access the first element, nth element and n/2 element stored in list and tuple data structure.

  Given a list L of N numbers (integers), Write a program to find the sum of the elements of given list L with the corresponding elements of the reverse of list L. If list L has elements [1,2,3], then reverse of the list L will be [3,2,1] and the resultant list should be [4,4,4].
- Given a positive integer number n. Write a program to generates a dictionary d which contains (i, i*i*i) such that i is the key and i*i*i is its value, where i is from 1 to n (both included). Print the content of the dictionary d.
- Write a program to create a data structure to store student information such as regd no, name, percentage of marks, phone number and display the student details based on the order of percentage of marks.
- For a Given a string, design and implement functions to perform the following:

  a) remove vowels in the given string.

  b) count number of uppercase and lowercase letters.

  c) remove all special characters.

  d) check whether it is a palindrome or not.

  e) swap case of each letter.
- Create a function that receives 3 numbers and returns the median, i.e. the number that is not the min and not the max, but the one in between.
- Given two lists of integer numbers, write a function to perform the following operations.

  a. print elements that are common in both the lists. (Print without duplicates).

  b. print elements that are present in the first list and not present in second list.

  c. print elements that contain the first element of the first list and last element of the second list.

  d. print elements that contain sum of elements of first list and sum of elements of second list.

  e. print largest number of both the lists.

  f. print smallest number of both the lists.

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

MODULES

Creating modules, Import Statement, From...Import Statement, Name Spacing, Creating user defined modules.

Standard Modules: sys, math, date, time, os, random and itertools modules.

Packages: Numpy, Pandas, Matplotlib, Requests, Nltk.

File Processing: Reading and writing files -creating a new file, writing to a file, reading text files, opening and closing files, reading, writing, tell (), seek (), rename ().

UNIT-2   **8L+0T+8P=16 Hours**

ERRORS AND EXCEPTIONS

Introduction to Exceptions, Handling Exception, Try Except Else and Finally Block, Raising Exceptions.

Simple Graphics and Image Processing: Overview of Turtle Graphics, Two Dimensional Shapes, Colours and RBG System and Image Processing

PRACTICES:

- Given a string 'S', find all possible permutations of the string S in lexicographic sorted order. Each Permutation size is "2" or "3".
  Sample Input:
  HACK
  Expected Output: AC AH AK CA CH CK HA HC HK KA KC KH

- Write a program that finds area of the pentagon when length from center of a pentagon to vertex are given, the formula for computing the area of pentagon is $\sqrt[3]{3}/2$ s2, where s is the length of the side, the side can be computed using formula s= 2r sin⬚⟦(π/5)⟧, where r is the length from the center of a pentagon to vertex.
  Given X as a date. Write a program to find what the day is on that date.
  Sample Input: 08 05 2015
  Expected Output: Wednesday

- Arun is working in an office which is N blocks away from his house. He wants to minimize the time it takes him to go from his house to the office. He can either take the office cab or he can walk to the office. Arun's velocity is V1 m/s when he is walking. The cab moves with velocity V2 m/s but whenever he calls for the cab, it always starts from the office, covers N blocks, collects Arun and goes back to the office. The cab crosses a total distance of N meters when going from office to Arun's house and vice versa, whereas Arun covers a distance of (2–√*N)(2*N) while walking. Help Arun to find whether he should walk or take a cab to minimize the time.
  Input Format:
  A single line containing three integer numbers N, V1, and V2 separated by a space.
  Example-1:
  Input:
  5 10 15
  Output:
  Cab

- Create a binary NumPy array (containing only 0s and 1s) and convert a binary NumPy array in to to a Boolean NumPy array Convert the first column of a Data Frame as a Series by using suitable packages.
  Sample Input:
  Original Data Frame

col1 col2 col3

0   1   4   7

1   2   5   5

2   3   6   8

3   4   9   12

4   7   5   1

5   11   0   11

Sample Output:

0   1

1   2

2   3

3   4

4   7

11

- Create two text files and read data from two text files. Display a line from first file followed by the corresponding line from the second file.
- Define the following functions that are more robust to erroneous input data

    a) To divide two numbers (To handle Zero Division Error).

    b) To read two integer numbers and display them (To handle Value Error).

    c) To display elements of a list (To handle Index Error).

    d) To open a file and display file contents (To handle File Not Found Error).

- Write a   python program to handle multiple exceptions using raise keyword.
- Draw the spiral hexagon, where we use turtle to create a spiral structure. The final shape is a hexagon and there are various colors used in producing the sides of the hexagon.
- Implement a program to print it in a counterclockwise spiral form for a given square matrix.

    Sample Input:

    4

    25 1 29 7

    24 20 4 32

    16 38 29 1

    48 25 21 19

    Sample Output:

    25 24 16 48 25 21 19 1 32 7 29 1 20 38 29 4
- Write a function that finds the nearest prime number of a given number.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze various features of programming language and their application in problem solving in computer programming to write, compile, and debug programs in python language.	Analyze	1	1, 2
2	Make use of different data types to design programs involving decisions, loops, and functions.	Apply	1	1, 2, 5
3	Analyze the usage of different data structures for practical and contemporary applications for a given problem.	Analyze	1	1, 2, 3, 5
4	Develop functional, reliable and User-friendly Python programs for given problem statement and constraints.	Apply	2	1, 2, 3,5
5	Installing the python environment and related packages that are required for practical and contemporary applications.	Apply	2	1, 2,3,5

TEXT BOOKS:

1. Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning, 2011.
2. Mark Lutz, "Learning Python", 5th edition, Orielly Publishers, 2013.

REFERENCE BOOKS:

1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
2. James Payne, "Beginning Python using Python 2.6 and Python 3", Wrox publishing.
3. Paul Gries, "Practical Programming: An Introduction to Computer Science using Python 3", The Pragmatic Bookshelf, 2nd edition, 4 Oct. 2013.
4. Allen B. Downey, "Think Python", 1st edition, Orielly publishing.

22EN103 BUSINESS COMMUNICATION & VALUE SCIENCE-II LAB

Hours Per Week :

L	T	P	C
0	0	2	1

PREREQUISITE KNOWLEDGE: Basic Knowledge of high school English.

COURSE DESCRIPTION AND OBJECTIVES:

• Develop effective writing, reading, presentation and group discussion skills.

• Help students identify personality traits and evolve as a better team player.

• Introduce them to key concepts of Morality, Behaviour and beliefs, Diversity Inclusion.

MODULE-1

UNIT-1   **0L+0T+8P=8 Hours**

WRITTEN COMMUNICATION

Understand tools of structured written communication, research & report on social issue identified, create communication material to share concepts and ideas, create the magazine, launching an E Magazine.

UNIT-2   **0L+0T+8P=20 Hours**

FORMING AN NGO

Identify a social cause, Create Vision, Mission, Value statement, tagline and design and logo.

PRESENTATION SKILLS: Basics of presentation, techniques to make presentations, ORAI, assess presentation based on given criteria, use electronic/social media to share concepts and ideas, prepare and publish the second episode of the E Magazine

SPEED READING: Introduction to skimming and scanning, SATORI – Join the dots

MODULE-2

UNIT-1   **0L+0T+8P=8 Hours**

BRAIN STORMING

Ad campaign discusses and explores, articulate & amplify a social issue Communication: Design a skit, enact & promote a play, capture likes & reviews prepare and publish the third episode of the E Magazine.

TEAM WORK: Intro of Dr. Meredith Belbin's research on team work, Belbin's 8 Team Roles and Lindgren's Big 5 personality traits, Team Falcon practical

UNIT-2   **0L+0T+8P=8 Hours**

MORALITY AND DIVERSITY

Short film on diversity, Touch the target (Blind man) - Debriefing of the Practical, Film: "The fish and I'' by BabakHabibifar".

COMMUNICATION MATERIAL TO SHARE CONCEPTS: Narrate a story, feedback, research on a book, write a review in a blog, video record interviews of people Debate on the topic of diversity, prepare and publish the final episode of the E Magazine, SATORI, GD, revisit your resume, a day with the NGO.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand tools of structured written communication.	Understand	1, 2	6, 7, 8, 9
2	Use tools of structured written communication.	Apply	1, 2	6, 7, 8, 9
3	Use electronic/social media to share concepts and ideas.	Apply	1, 2	6, 7, 8, 9
4	Develop materials for an organization dedicated to a social cause.	Create	1, 2	6, 7, 8, 9
5	Understand the basics of presentation.	Understand	1, 2	6, 7, 8, 9
6	Apply effective techniques to make presentations.	Apply	1, 2	6, 7, 8
7	Assess presentations based on given criteria.	Analyse	1, 2	6, 7
8	Understand tools for quick reading.	Understand	1, 2	6, 7, 8
9	Apply the basic concept of speed reading, skimming and scanning.	Apply	2	6, 7, 9
10	Identify individual personality types and role in a team.	Analyse	2	7, 9
11	Recognize the concepts of outward behavior and internal behavior.	Analyse	2	7, 8, 9
12	Understand the basic concepts of Morality and Diversity.	Understand	2	6, 7, 8, 9
13	Create communication material to share concepts and ideas.	Create	1	6, 7
14	Argue on a topic based on morality and diversity.	Apply	2	5, 7, 8, 9
15	Articulate opinions on a topic with the objective of influencing others.	Apply	1, 2	6, 7, 8, 9
16	Organize an event to generate awareness and get support for a cause.	Apply	2	7, 8, 9

TEXT BOOKS:

There are no prescribed texts for Semester 2 – there will be handouts and reference.

REFERENCE BOOKS:

1. Guiding Souls: Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam; Publishing Year- 2005; Co-author—ArunTiwari.
2. The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Co-author: Acharya Mahapragya.
3. The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P. J Abdul Kalam; Publishing year: 2011; Co-author-Y.S.Rajan.
4. Forge Your Future: Candid, Forthright, Inspiring; Dr. A.P.J Abdul Kalam; Publishing year: 2014.
5. Abundance: The Future is Better Than You Think; Peter H. Diamand is and Steven Kotler; Published: 21 Feb, 2012; Publisher: Free Press.

II

YEAR

COMPUTER SCIENCE AND BUSINESS SYSTEMS

B.Tech.

COURSE CONTENTS
I SEM & II SEM

22ST205 COMPUTATIONAL STATISTICS

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Advanced knowledge in statistics and mathematics.

COURSE DESCRIPTION AND OBJECTIVES:

The aim of this course is to give graduate students a solid foundation of computational statistics, which they will use in other courses and their research. This course introduces some computational methods in statistics with emphasis on multivariate normal distribution, discriminant analysis, PCA, Factor analysis and cluster analysis.

MODULE-1

UNIT-1   8L+0T+8P=16 Hours

MULTIVARIATE NORMAL DISTRIBUTION

Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

UNIT-2   8L+0T+8P=16 Hours

DISCRIMINANT ANALYSIS

Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

PRACTICES:

- Multivariate normal distribution.
- Applications of MVN.
- Conditional distribution.
- Relation to regression models.
- Properties of MVN.
- Linear discriminant analysis.
- Linear discriminant function.
- Properties of LDF.

MODULE-2

UNIT-1   8L+0T+8P=16 Hours

PRINCIPAL COMPONENT ANALYSIS AND FACTOR ANALYSIS

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Factor Analysis: Factor analysis model, extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores

UNIT-2   8L+0T+8P = 16 Hours

CLUSTER ANALYSIS

Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering Profiling and Interpreting Clusters.

SKILLS:

✓ *Collect the data from data.gov.in and analyse the data using PCA.*

✓ *Develop the linear discriminant function, based on the data collected from newspapers ormagazines or any other resource.*

✓ *Collect the data and test the Multivariate Normality*

PRACTICES:

- Algorithm for PCA.
- Applications of PCA.
- Types of Clustering.
- Partitioning methods.
- Hierarchical clustering.
- K-means clustering.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Applications of PCA and their estimation of PCA function	Apply	2	1, 2, 3
2	Applications of Factor analysis and analyzing the results.	Apply	2	1, 2, 3, 4
3	Applications of clustering techniques and various types of clustering techniques.	Analyze	2	1, 2, 3, 4
4	Analyse the Multivariate Normal and Conditional distributions.	Analyze	1	1, 2
5	Analyse the Discriminant analysis and how to estimate the discriminant function.	Analyze	1	1, 2, 5

TEXT BOOKS:

1. T.W. Anderson, "An Introduction to Multivariate Statistical Analysis", Wiley, 3rd Edition,2003. 2. Richard.
2. A. Johnson and Dean. W. Wichern "Applied Multivariate Statistical Analysis" PearsonPrentice Hall, 6th Edition, 2007.

REFERENCE BOOKS:

1. J.D. Jobson, "Applied Multivariate Data Analysis", Vol I & II, Springer, 2012.
2. H. Kris. "Statistical Tests for Multivariate Analysis".
3. Regression Diagnostics, Identifying Influential Data and Sources of Collinearety, D.A. Belsey, E. Kuh and R.E. Welsch.
4. Applied Linear Regression Models, J. Neter, W. Wasserman and M.H. Kutner.

22TP201 DATA STRUCTURES

Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Programming in C.

COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed at offering fundamentals concepts of data structures and explains 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.

MODULE-1

UNIT-1   **8L+8T+8P =24 Hours**

DATA STRUCTURES BASICS

Basic Terminology – data, information, datatype; Data Structures – Introduction, storage structures-sequential and linked storage representations; classification of data structures; Applications of data structures.
Sorting: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort and Merge Sort.
Searching: Linear Search and Binary Search.

UNIT-2   **8L+8T+8P =24 Hours**

LINKED LISTS AND STACKS, QUEUES

Linked List: Introduction, Types of linked list – Singly linked list, doubly linked list and circular linked list, representation of linked list, Operations of linked list: Traverse forward/ reverse order, searching, insertion and deletion; Applications of linked lists.

Stack – Introduction, array and linked representations, implementation and their applications; Queue – Introduction, array and linked representations, implementation; Types – Linear, circular and doubly ended queues – operations; Applications of Queues.

PRACTICES:

- Find the product of 2 numbers using recursion.
- Find the sum of natural numbers using recursion.
- Find the factorial of a number using recursion.
- Find the Nth term of Fibonacci series using recursion.
- Calculate the power using recursion.
- Write a recursive program for checking if a given number is a prime number.
- Given two integers write a function to sum the numbers without using any arithmetic operators.
- Convert a decimal to binary using recursion.
- Print all factors using recursion.
- Find the maximum product of digits among numbers less than or equal to N.

Problems Recursion – Level 2

- Implement insertion sort recursively.
- Write a program to find the numbers less than N that are product of exactly 2 distinct prime numbers - using recursion.
- Implement selection sort recursively.

- Find the middle of a singly linked list using recursion.
- Find the sum of even numbers of an array using recursion.
- Check if a given array is in sorted order using recursion.
- Print alternate nodes of a linked list using recursion.
- Reverse a doubly linked list using recursion.
- Write a recursive function that returns all permutations of a given list.
- Implement bubble sort recursively.

Problems on Sorting and Searching – Level 1

- Implement the insertion sort function.
- Implement the bubble sort function.
- Implement the quick sort function.
- Implement the merge sort function.
- Implement the selection sort function.
- Implement linear search function.
- Implement binary search function.

Problems on SLL – Level 1
- Implement the insert function to insert nodes into a singly linked list (ascending order).
- Implement the insert function to insert nodes into a singly linked list (descending order).
- Implement the search node function.
- Implement the delete node function.
- Display forwards function.
- Display backwards function.
- Count the number of nodes in a singly linked list.
- Swap alternate nodes of a singly linked list.
- Move last node to the front of the linked list.
- Move first node to the last of the linked list.

Problems on Stacks – Level 1
- Implement two stacks using a single array.
- Given an array replace every element with nearest greater element on the right.
- Given a stack reverse the elements using only push and pop functions.
- Postfix evaluation using stack.
- Balance symbols.
- Find middle element in a stack.
- Remove middle element from a stack.
- Implement push and pop using linked list.
- Given an array of characters with the middle marked by X, check if the string is a palindrome.
- Maximum sum in sliding window.

Problems on Queues – Level 1
- Write a program to accept two numbers as input check if they are equal.
- Write a program to accept two characters as input and check if they are equal.
- Write a program to accept two numbers as input and print the greater of the 2 numbers.
- Write a program to accept two numbers as input and print the lesser of the 2 numbers.
- Write a program to accept 3 numbers as input and print the maximum of the 3.
- Write a program to accept 3 numbers as input and print the minimum of the 3.
- Write a program to accept a number as input and print EVEN if it is an even number and ODD if it is an odd number.
- Write a program to accept a number as input and check if it is divisible by 3. If it is divisible by 3 print YES else print NO.
- Write a program to accept a number as input and check if it is divisible by both 3 & 5. If it is

divisible print YES else print NO.

● Write a program to accept a number as input and check if it is positive, negative or zero.

Problems on DLL – Level 1

● Implement insert function.
● Implement display forward function.
● Implement display backward function.
● Implement search function.
● Implement delete function.
● Reverse a doubly linked list from M to N.
● Find the sum of the odd and even nodes.
● Count odd keys of the linked list.
● Merge two sorted lists.
● Delete adjacent duplicate nodes.

Problems on CLL – Level 1

● Insert function (circular doubly linked list).
● Search function.
● Display forward.
● Display backward.
● Delete node (circular doubly linked list).
● Print the middle N nodes of a circular singly linked list.
● Move the last node of a circular singly linked list to the beginning.
● Delete adjacent duplicate nodes of a circular singly linked list.
● Delete nodes greater than a value from a circular doubly linked list.
● Find the sum of the nodes of a circular linked list.

Problems on Linked List – Level 2

● Given 2 sorted linked lists, print the common elements.
● Reverse a list (using Stack).
● Given a pointer to a node (not the last node), delete the node.
● Reverse a list (Recursive).
● Reverse a list (Iterative).
● Reverse a singly linked list in pairs (recursive).
● Reverse a singly linked list in pairs (iterative).
● Check if a singly linked list is a palindrome or not.
● Remove the loop if exists.
● Given 2 linked lists with data in the ascending order, merge them into a single list.

MODULE-2

UNIT-1   **8L+8T+8P=24 Hours**

TREES:

Trees: Basic Terminology, Types of Trees, Binary Tree – Introduction, properties, array and linked representations; Tree traversals and their implementation; Expression trees; BST – definition and operations, AVL trees – definition and construction; Applications of binary trees.

UNIT-2   **8L+8T+8P=24 Hours**

Graphs: Basic Terminology, Types of Graphs, Graphs representations – adjacency matric, adjacency list; Traversals - breath first search and depth first search; Applications of graphs.

Hashing: Introduction, Different hash functions, collision: avoidance and handling methods.

PRACTICES:

Problems on BST – Level 1

- Insert function.
- Insert function (recursive).
- Search function.
- Pre order traversal.
- Post order traversal.
- In order traversal.
- Level order traversal.
- Delete child node.
- Delete parent node.
- Delete nodes greater than a value from a circular doubly linked list.

Problems on Priority Queues – Level 1

- Meeting rooms problem.
- Ugly number.
- Find median from data stream.
- Find the top K frequent elements.
- Find K Pairs with smallest sums.
- Find the Kth smallest element in a sorted matrix.
- Trapping Rain Water.
- Rearrange String k distance apart.
- Sort characters by frequency.
- Solve the maze problem.

Problems on Graphs – Level 1

- Implement Graph data structure.
- Implement BFS - iterative solution.
- Implement BFS - recursive solution.
- Implement DFS - iterative solution.
- Implement DFS - recursive solution.
- Check if given graph is strongly connected or not.
- Check if given graph is strongly connected or not - using DFS.
- Given a graph find the arrival and departure time of its vertices in DFS. Arrival time is the time when the vertex was explored for the first time, and departure time is the time at which all the neighbours are explored and are ready to backtrack.
- Given a directed acyclic graph and a source vertex, find the cost of the shortest path from source vertex to all other vertices present in the graph. If a vertex cannot be reached from given source vertex that distance may be printed as infinite.
- Given an undirected graph, check if the graph is 2 edge connected or not.

Problems on Hashing – Level 1

- Print a binary tree in vertical order.
- Find whether an array is subset of another array.
- Given an array A [] and a number x, check for pair in A [] with sum as x.
- Minimum operation to make all elements equal in array.
- Maximum distance between two occurrences of same element in array.
- Check if a given array contains duplicate elements within k distance from each other.
- Find duplicates in a given array when elements are not limited to a range.
- Most frequent element in an array.
- Smallest subarray with all occurrences of a most frequent element.

- First element occurring k times in an array.

Problems on Graphs – Level 2

- Find the shortest graph distances between every pair vertex in a given path. Assume that the graph does not have any negative edges.
- Find the shortest graph distances between every pair of vertices in a given path. The graph can have negative edges.
- Detect cycle in DFS.
- Count the number of connected components of a graph represented in the adjacent matrix.
- Count the number of connected components of a graph represented in the adjacent matrix - using DFS.
- Find a spanning tree - not necessarily a minimum spanning tree.
- Detect cycle in an undirected graph.
- Given an undirected graph, find its depth.
- Determine if a directed graph has a unique topological ordering.
- Given a directed acyclic graph and two vertices v and w, find the lowest common ancestor.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Explore the organization of several ADTs and the manipulation (searching, insertion, deletion, traversing) of data stored in various data structures.	Apply	1,2	1
2	Apply different data structures to solve a given problem.	Apply	1,2	1
3	Analyze the efficiency of using different data structures and choose the efficient data structure for solving a given problem.	Analyze	1,2	2
4	Develop new algorithms to solve various problems.	Create	1,2	3,4

TEXT BOOKS:

1. Reema Thareja, "Data Structures Using C", 2nd Edition, Oxford University Press, 2014.
2. Seymour Lipschutz, "Data Structures with C", 1st Edition, McGraw Hill Education, 2017.

REFERENCE BOOKS:

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures", illustrated edition, Computer Science Press, 2006.
2. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", 2nd Edition, CENAGE Learning, 2005.
3. R G Dromey and Pearson, "How to solve it by Computer", 2nd edition, Impression edition, 1998.

22CB201 COMPUTER ORGANIZATION AND ARCHITECTURE
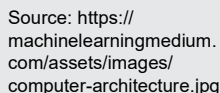
Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Digital logic design.

COURSE DESCRIPTION AND OBJECTIVES:

This course covers the basics of modern Computer Organization and Architecture. The emphasis is on understanding the design of computer and its components. The student will learn the concepts of data representation, micro-operations, memory organizations and input output organization.

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

INTRODUCTION, RTL, DATA REPRESENTATION AND COMPUTER ARITHMETIC

Introduction, Register Transfer language & Data Representation: Organization and Architecture, Register Transfer, Bus and Memory Transfers, Data Representation-Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Fixed point arithmetic operations such as Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT-2   **8L+8T+0P=16 Hours**

MICRO OPERATIONS AND BASIC COMPUTER ORGANIZATION AND DESIGN

Micro operations: Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Register Reference Instructions, Input –Output and Interrupt.

PRACTICES:

- Design a Common bus system for eight registers with eight bits each using multiplexers.
- Design a Common bus system for four registers with four bits each using three state gate buffers.
- A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers.

  How many selection inputs are there in each multiplexer?

  What size of the multiplexers are needed?

  How many multiplexers are there in the bus?
- Perform arithmetic operations (+42) + (-13) and (-42) – (-13) in binary using signed 2's complement   representation for negative numbers.
- Find the product using Booth Multiplication Algorithm.
- a. (9) X (13)   b. (9) X (-13)   c. (-9) X (13)   d. (-9) X (-13)
- Perform the division of 27 and 4 using Division algorithm.
- Design a 4- bit combinational circuit decrementer using 4 full adder circuits.
- Register A holds the 8-bit binary 11011001. Determine the B operand and the logic micro operation to be performed in order to change the value in A to :

  a) 01101101   b) 11111101

- An 8-bit register contains the binary value 10011100. What is the register value after an arithmetic shift right? Starting from the initial number 10011 100, determine the register value after an arithmetic shift left, and state whether there is an overflow.
- Starting from an initial value of R =11011101, determine the sequence of binary values in R after a logical shift-left, followed by a circular shift-right, followed by a logical shift-right and a circular shift-left.
- Design arithmetic logic shift unit that performs different operations on 4 bits.

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

CPU AND MEMORY ORGANIZATION

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory.

UNIT-2   **8L+8T+0P=16 Hours**

I/O ORGANIZATION

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

PRACTICES:

- The content of PC in the basic computer is 3AF (all numbers are in hexadecimal). The content of AC is 7EC3. The content of memory at address 3AF is 932E. The content of memory at address 32E is 09AC. The content of memory at address 9AC is 8B9F.

  What is the instruction that will be fetched and executed next?

  Show the binary operation that will be performed in the AC when the instruction is executed.

  Give the contents of registers PC, AR, DR, AC, and IR in hexadecimal and the values of E, I, and the sequence counter SC in binary at the end of the instruction cycle.

- Implement the given expressions into different addressing architectures.
  Y=(A-B)/(C*D + E)   b. Y=A-B+C*(D *E+F)

- How many 128 x 8RAM chips are needed to provide a memory capacity of 2048 byte?

- How many lines of the address bus must be used to address 2048 bytes of memory? How many of these lines will be common to all chips?

- How many lines must be decoded for chip select and design the size of the decoders.

- A computer uses RAM chips or 1024 x 1 capacity.

  How many chips are needed, and show the connection of memory capacity 1024 bytes?

  How many chips are needed to provide a memory capacity or 16K bytes? Explain in words how the chips are to be connected to the address bus.

- How many characters per second can be transmitted over a 1200-baud line in each of the following modes? (Assume a character code of eight bits.)

  Synchronous serial transmission.

  Asynchronous serial transmission with two stop bits.

  Asynchronous serial transmission with one stop bit.

- Information is inserted into a FIFO buffer at a rate of m bytes per second. The information is deleted at a rate of n byte per second. The maximum capacity of the buffer is k bytes.

  How long does it take for an empty buffer to fill up when m >n?

  How long does it take for a full buffer to empty when m <n?

  Is the FIFO buffer needed if m = n?

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze Computer Organization and Computer Architecture, different arithmetic operations.	Analyze	1	1, 2, 12
2	Design different digital circuits required to perform the micro operations.	Apply	1	1, 2, 3, 12
3	Design interface circuits for memory and peripheral, DMA and communication devices. Compare various modes of transfer.	Analyze	2	1, 2, 3, 4, 12
4	Evaluate the performance of a processor and memory in terms of speed, size and cost.	Evaluate	2	1, 2, 12

TEXT BOOKS:

1. M. Morris Mano, "Computer System Architecture", 3rd Edition update, Pearson, 2017.
2. William Stallings, "Computer Organization & Architecture: Designing for Performance", 11th Edition, Pearson, 2019.

REFERENCE BOOKS:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, McGraw Hill, 2002.
2. Vincent P. Heuring and Harry F Jordan, " Computer Systems Design and Architecture ", 2nd edition , Pearson/ Prentice Hall India 2004.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design-The Hardware/ Software Interface", ARM Edition, 5th Edition, Elsevier, 2009.

22CB204 OBJECT-ORIENTED PROGRAMMING

Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Classes, Objects and Inheritance.

COURSE DESCRIPTION AND OBJECTIVES:

This course is about the fundamentals of Object-Oriented Programming (OOP) Concept and OOP-based software development methodology. Java as a class-based and pure OOP language is used to demonstrate and implement appropriate concepts and techniques. The students are exposed to the concepts, fundamental syntax, and the thought processes behind object- oriented programming. By end of the course, students will acquire the basic knowledge and skills necessary to implement object-oriented programming techniques in software development using Java.

MODULE-1

UNIT-1   **8L+8T+8P=24 Hours**

INTRODUCTION

History of Java, Byte code, JVM, Java buzzwords, OOP principles, Data types, Variables, Scope of variables, Operators, Control statements, Type conversion and casting, Arrays.

Concepts Of Classes and Objects: Introduction to methods, Method over loading, Constructors, Constructor overloading, Usage of static with data and method, Access control, this keyword, Garbage collection, String class, String Tokenizer.

UNIT-2   **8L+8T+8P=24 Hours**

INHERITANCE AND EXCEPTIONS

Inheritance: Types of inheritance, Member access rules, Usage of super keyword, Method overriding, Usage of final keyword, Abstract classes, Interfaces - differences between abstract classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Packages-defining, creating and accessing a package, importing packages, access control in packages.

Exception Handling: Concepts of exception handling, Types of exceptions, Usage of try, catch, throw, throws and finally keywords, Built-in exceptions, User defined exception.

PRACTICES:

- There is a telecommunication company called "Powered Air" who have approached you to build their Interactive Voice Response (IVR) system. write a Java program and be able to provide the following menu (given below):

  Note: User should provide an input for each menu display. Welcome to Powered Air service. What would you like to do?

  a. Know my balance.

  b. Know my validity date

  c. Know number of free calls available.

  d. More

  1. Prepaid Bill Request

  2. Customer Preferences

  3. GPRS activation

  4. Special Message Offers

5. Special GPRS Offers

6. 3G Activation

7. Go back to Previous menu

You are free to display your own messages in this IVR.

- Create a class Rectangle. The class has attributes length and width. It should have methods that calculate the perimeter and area of the rectangle. It should have read Attributes method to read length and width from user.

  Hint: Area of rectangle = length * width, Perimeter of rectangle = 2*(length+width).

- Implement a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (use StringTokenizer class).

- Implement a java program to print all tokens of a string on the bases of multiple separators (use StringTokenizer class).

- Using inheritance, one class can acquire the properties of others. Consider a class Animal that has only one method "walk". Next, create a Bird class that also has a fly method. Finally, create a bird object that can both fly and walk.

- Using inheritance, Write the following code in your editor :

  1. A class named Arithmetic with a method named "add" that takes integers as parameters and returns an integer denoting their sum.

  2. A class named Adder that inherits from a superclass named Arithmetic.

  Note: Your classes should not be Public.

- When a subclass inherits from a superclass, it also inherits its methods; however, it can also override the superclass methods (as well as declare and implement new ones). Consider the Sports class having methods getName()[which returns name of sport] and getNumberOf TeamMembers()[which returns noof team members] create a Soccer class that inherits from the Sports class. We can override the get Name method and return a different subclass-specific string and override getNumberOfTeamMembers method and return noof team members

- Implement a java program to create an abstract class named Shape that contains an empty method named number Of Sides ( ).Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number Of Sides ( ) that shows the number of sides in the given geometrical figures.

- You are given an interface Advanced Arithmetic which contains a method signature int divisor_ sum(int n). You need to write a class called My Calculator which implements the interface. divisor_sum function just takes an integer as input and return the sum of all its divisors. For example divisors of 6 are 1, 2, 3 and 6, so divisor_sum should return 12. The value of n will be at most 1000.

- Implement a Java program for the following

  a) Creation of simple package.

  b) Accessing a package.

- Implement a Java program to read two numbers a,b from user and perform division a/b,if the user passes b value as zero, handle the exception using try and catch otherwise display the result.

- Create a class called Customer with data members account_number, balance (initialize with 10000), and member functions print(), deposit(), and withdraw(). Print method display account number and balance. If withdraw amount is less than current balance while withdrawing, throw an exception "In Sufficient Funds". If the input is 1 do print. If the input is 2 withdraw (). If the input is 3 deposit. If the input is 4 terminate program.

- Implement a Java program which accepts age as input from the user and throws an exception "Not Eligible to Vote" when age is <=18 otherwise print "Eligible to Vote".

MODULE-2

UNIT-1   **8L+8T+8P=24 Hours**

MULTI THREDING AND FRAMEWORK

Multithreading: Concepts of multi threading, Differences between process and thread, Thread life cycle, Creating multiple threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter thread communication.

Collection Framework: Collections Overview, Collection Interfaces - List, Set, Map, List – Array List, Linked List, Vector, Set - HashSet, TreeSet, Map - HashTable, HashMap, accessing a collection via an Iterator, comparator, comparable.

UNIT-2   **8L+8T+8P=24 Hours**

SWINGS

GUI Programming With Swing: Delegation event model-Events, Event sources, Event Listeners, Event classes, handling mouse and keyboard events.

Exploring Swing Controls: JLabel and Image Icon, JText Field, JButton, JCheckBox, JRadioButton, JTabbed Pane, JList, JCombo Box.

PRACTICES:

- Print in Order

  Suppose we have a class:

  public class Foo {

  public void first() { print("first"); }

  public void second() { print("second"); }

  public void third() { print("third"); }

  }

  The same instance of Foo will be passed to three different threads. Thread A will call first(), thread B will call second(), and thread C will call third(). Design a mechanism and modify the program to ensure that second() is executed after first(), and third() is executed after second().

  Note: We do not know how the threads will be scheduled in the operating system, even though the numbers in the input seem to imply the ordering. The input format you see is mainly to ensure our tests' comprehensiveness.

  Example 1:

  Input: nums = [1,2,3]   Output: "firstsecondthird"

  Explanation: There are three threads being fired asynchronously. The input [1,2,3] means thread A calls first(), thread B calls second(), and thread C calls third(). "firstsecondthird" is the correct output.

  Example 2:

  Input: nums = [1,3,2]   Output: "firstsecondthird"

  Explanation: The input [1,3,2] means thread A calls first(), thread B calls third(), and thread C calls second(). "firstsecondthird" is the correct output.

- **Flood Fill:**

  An image is represented by an m x n integer grid image where image[i][j] represents the pixel value of the image.

  You are also given three integers sr, sc, and color. You should perform a flood fill on the image starting from the pixel image[sr][sc].

  To perform a flood fill, consider the starting pixel, plus any pixels connected 4-directionally to the

starting pixel of the same color as the starting pixel, plus any pixels connected 4-directionally to those pixels (also with the same color), and so on. Replace the color of all of the aforementioned pixels with color.

Return the modified image after performing the flood fill.

1	1	1
1	1	0
1	0	1

➔

2	2	2
2	2	0
2	0	1

Example 1:

Input: image = [[1,1,1],[1,1,0],[1,0,1]], sr = 1, sc = 1, color = 2
Output: [[2,2,2],[2,2,0],[2,0,1]]
Explanation: From the centre of the image with position (sr, sc) = (1, 1) (i.e., the red pixel), all pixels connected by a path of the same color as the starting pixel (i.e., the blue pixels) are colored with the new color.

Note the bottom corner is not coloured 2, because it is not 4-directionally connected to the starting pixel.

Example 2:
Input: image = [[0,0,0],[0,0,0]], sr = 0, sc = 0, color = 0
Output: [[0,0,0],[0,0,0]]

Explanation: The starting pixel is already colored 0, so no changes are made to the image.

- Count words in a given string

  The input parameter is a list of strings representing lines of text.

  Count how often the word occurs in the text.

  If the word "kitten" occurred in a text 23 times, then its entry would be "kitten - 23\n". Return statistics as a String containing all the entries.

  Omit all words which contain less than 4 letters and appear less than 10 (the words which are too small or to rare) The entries in the resulting String should be also sorted by their amount and then in alphabetical order if it is needed.

- Implement a Java program for handling mouse events when the mouse entered, exited, clicked, pressed, released, dragged and moved in the client area.

- Implement a Java program for handling key events when the key board is pressed, released, typed.

- Implement a Java swing program that reads two numbers from two separate text fields and display sum of two numbers in third text field when button "add" is pressed.

- Implement a Java program to design student registration form using Swing Controls. The form which having the following fields and button "save". Form Fields are: Name, RNO, Mail id, Gender, Branch, and Address.

- Implement a java program using swings to design a multiple choice question having three options (use radio button) ,display the message using dialog box "Your answer is wrong" if the user selects wrong option otherwise display ,"Your answer is correct."

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply object oriented concepts on real time scenarios.	Apply	1	1,2
2	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes	Apply	1, 2	1,2
3	Design and develop Java applications to solve real world problems by using modern tools and collection framework	Create	2	3,5
4	Design and develop GUI based applications using swings for internet and system based applications.	Create	2	3,5

TEXT BOOKS:

1. Herbert Schildt, "Java the complete reference", 12th Edition, McGraw Hill, Education, 2021.
2. M.T. Somashekara, D. S. Guru, K.S. Manjunatha, "Object-Oriented Programming with Java", 1st Edition, PHI Learning, 2017.

REFERENCE BOOKS:

1. E. Balagurusamy, "Programming with Java", 6th Edition, McGraw Hill, 2019.
2. Mark Lassoff," Java Programming for Beginners: Learn the fundamentals of programming with Java", 1st Edition, Packt Publishing Limited,2017.
3. Philip Conrod, Lou Tylee," Learn Java GUI Applications : A JFC Swing Tutorial", 11th Edition, Kidware Software, 2019.

Source: https://sameer9247.wordpress.com/2016/11/15/theory-of-computation/

22CB203 FORMAL LANGUAGES AND AUTOMATA THEORY

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Knowledge of graphs, trees and logic.

COURSE DESCRIPTION AND OBJECTIVES:

This course aims to teach the student to identify different formal language classes and their relationships, strong theoretical foundation for designing compilers. In addition to this the student will be able to learn the techniques for information processing, design different grammars, automata and recognizers for different formal languages.

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

INTRODUCTION

Alphabets, Strings and languages, Automata and Grammars, Regular languages, Chomsky hierarchy of 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, FA with output - Moore and Mealy machine, Equivalence of Moore and Mealy machine, Applications and Limitation of FA.

UNIT-2   **8L+8T+0P=16 Hours**
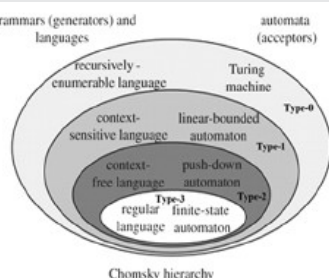
REGULAR EXPRESSIONS

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 (proofs not Required), Application of pumping lemma, Closure properties of regular languages, Decision properties of regular languages.

Grammar Formalism: Regular Grammars-Right linear and left linear grammars, Equivalence between regular linear grammar and FA;

PRACTICES:

● Design DFA and NFA which accepts the following languages over the alphabet {0,1}. And also covert NFA to DFA. Give separate Automata for each and also write RE for the obtained automata.

  a) The set of all strings ends with 00.

  b) With three consecutive 0's.

  c) With 011 as a substring.

  d) Either begin or ends with 01.

  e) Strings whose fourth symbol from the right end is 1.

  f) Even number of 0's.

  g) number of 1 's are divisible by three.

● Design NFA to recognize the following set of strings.

  a) abc, abd, and aacd: Assume the alphabet is {a,b,c,d}.

  b) 0101,101 and 011: Assume the alphabet is {0,1}.

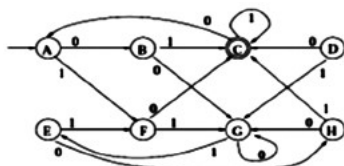 c) ab,bc and ca: Assume the alphabet is {a,b,c}.

- Convert epsilon NFA to DFA.
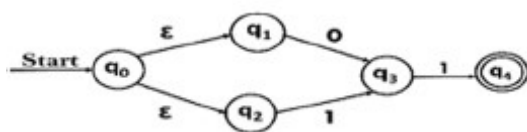
- Minimize the following DFA.

- Construct Mealy and Moore Machines and equivalent them for the residue (remainder) mod 3 of binary input.
- Construct Finite Automata for the following Regular Expressions.

  a) RE=ab(a+b)*

  b) RE=(a+ab)(ab+ab)*

- Prove that the following languages are nor Regular.

  a) L={a^p | p is a prime number}

  b) L={b^n | n=i^2 and i>1}

  c) L={ WW^R | W is (a,b)*}

  d) L={$a^n b^n$+1 |n≥1}

MODULE-2

UNIT-1   8L+8T+0P=16 Hours

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, CFLs; Closure properties of Decision properties of CFLs-Emptiness, Finiteness and membership, pumping lemma for CFLs (proofs not Required), Application of pumping lemma.

UNIT-2   8L+8T+0P=16 Hours

PDA AND TM

Push Down PDA AND TM 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.

Turing Machines (TM): Basic model, Definition and representation, Instantaneous Description, Language acceptance by TM, Computable functions, Types of Turing Machines, Universal TM, Recursive and Recursively Enumerable Languages, undecidability, Church Turing Thesis, Universal Turing Machine, The universal and diagonalization languages, Reduction between languages and Rice's Theorem.

PRACTICES:

- Construct CFG for the following:

  a) L={$a^n b^n$|n>1}

  b) L={WW^R | W is (a,b)*}

  c) L={a^p | p is a prime}

- Derive the strings 10001 using left most derivation and right most derivation and parse tree by using the following grammar. And show that grammar is ambiguous.

  S-> T000T

  T->0T|1T| $\in$

- Convert the following CFG to CNF.

  S->ABC|Aa

  A->a

  B->d| $\in$

  C-> Aab|a

- Convert the following CFG to GNF.

  S->AA | 0

  A->SS | 1

- Prove that the following are not CFL.

  e) L={a^p | p is a prime number}

  f) L={b^n | $n=i^2$ and i>1}

  g) L={ WW^R | W is (a,b)*}

  h) L={$a^n b^{n+1}$ |n≥1}

- Convert the following language or PDA to CFG.

  a) L={$a^n b^n$|n≥1} and

  b) δ(q,0,z)={(q,xz)}

  c) δ(q,0,x)={(q,xx)}

  d) δ(q,1,x)={(q,x)}

  e) δ(q, $\in$, x)={(p, $\in$)}

  f) δ(p,1,x)={(p,xx)}

  g) δ(p, $\in$, x)={(p, $\in$)}

  h) δ(p, 1,z)={(p, $\in$)}

- Construct PDA for the following Languages.

  a) L={$0^n 1m$ | n≥m}

  b) L={$a^n b^n$|n≥1}

  c) L= L={w\w $\in$ {a, b}*

  d) L={w| $n_a(w)$ >$n_b(w)$}

  e) L={$0^n 1^{2n}$ | n>0}

  f) L=Where w^R is reverse of w

  g) L= Where w^R is reverse of w

  h) L= $\left\{ wcw^R \mid w \in \{a,b\} * \right\}$ Where w^R is reverse of w

- Construct PDA for the following Languages.

  a) L= {$a^n b^n c^n$ | n >1}

  b) L={$a^n b^m a^m b^n$ | n,m≥1}

- Construct Turing Machine for the following Languages.

  a) L={$a^n b^n$ | n ≥ 1}

  b) L={$0^{2n} 1^n$ |n >0 }

  c) L={ww^r | w is (0+1)*}

  d) L={$a^n b^n c^n$|n≥1}.

  e) Well balanced Parenthesis for example: ()()

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Design abstract models of computing, including Deterministic Finite Automata (DFA), non-deterministic Finite. Automata (NFA), Push Down Automata (PDA) and Turing Machine (TM) models and their power to recognize the languages.	Analyze	1,2	1,2,3
2	Design different finite state machines to perform various operations.	Apply	1,2	1,2,3
3	Analyze the given language is regular or not regular, CFL or not, Ambiguous unambiguous, Recursive and Recursive Enumerable.	Analyze	1,2	2
4	Design Regular grammar and context free grammars for a language.	Apply	1,2	1,3

TEXT BOOK:

1. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", 2nd Edition, Pearson/ Prentice Hall India, 2007.

REFERENCE BOOKS:

1. Zed A Shaw, Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C), Addison Wesley, 2015.
2. Christoph Dürr, Sorbonne University, Jill-Jênn Vie, Inria, Competitive programming in Python, Cambridge University Press, 2020.
3. Michael Sipser, "Introduction to Theory of Computation", 3rd Edition, Course Technology, 2012.

22CB202 DATABASE MANAGEMENT SYSTEMS

Hours Per Week :

L	T	P	C
2	2	2	4

PREREQUISITE KNOWLEDGE: Discrete Mathematical Structures.

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 from a relational database. It also focuses on requirements gathering and conceptual, logical, physical database design. The objective of the course is to enable the student to understand database design, expressing queries using SQL, query optimization and transaction processing.

MODULE-1

UNIT–1   10L+6T+4P=20 Hours

DATABASE SYSTEM CONCEPTS

Databases And Database Users: Introduction; Characteristics of the database approach; Actors on the scene; Advantages of using DBMS approach.

Database System Concepts and Architecture: 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 DBMS.

Conceptual Data Modeling and Database Design: Entity types, Entity sets, Attributes and keys; Relationship types, Relationship sets, Roles and structural constraints; Weak entity types; Relationship types.

UNIT–2   6L+10T+12P=28 Hours

RELATIONAL DATABASE DESIGN

Relational Database Design by ER–To-Relational Mapping: Relational Database design using ER-to-Relational mapping.

The Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and Relational database schemas.

Relational Algebra: Unary relational operations - SELECT and PROJECT; Relational algebra operations from set theory; Binary relational operations - JOIN and DIVISION.

SQL: SQL data definition and data types; specifying constraints in SQL, Basic retrieval queries in SQL; INSERT, DELETE, and UPDATE statements in SQL.

PRACTICES:

- Design ER Model for various real time database applications.
- Development of Relational Database schemas for Company/Student/Sailors/ using DDL constructs of SQL.
- Apply various DML Commands such as select, insert, update etc. of SQL on Relational Database.
- Design of Relational Database schemas by specifying different types of Constraints.
- Apply various Relational Database operators (Arithmetic, Logical &comparison) and string-matching constructs of SQL.
- Expressing queries using Aggregate Functions of SQL on Relational Database.
- Queries on Relational Database using GROUP BY, HAVING and ORDER BY clauses of SQL.

MODULE-2

UNIT–1   **8L+8T+12P=28 Hours**

NORMALIZATION

Complex Queries, Triggers, Views: More complex SQL retrieval queries; Specifying constraints as assertions and actions as triggers; Views (virtual tables) in Pl/SQL.

Basics of Functional Dependencies and Normalization for Relational Databases: Informal design guidelines for relation schemas; Functional dependencies-inference rules, equivalence and minimal cover; Normal forms based on primary keys; Boyce-Codd normal form; Properties of relational decompositions, multi valued dependency, join dependencies.

UNIT–2   **8L+8T+4P=20 Hours**

TRANSACTION PROCESSING

Introduction To Transaction Processing Concepts and Theory: Introduction to transaction processing; Transaction and system concepts; Desirable properties of transactions; Characterizing schedules based on serializability.

Concurrency Control Techniques: Two-phase locking techniques for concurrency control, concurrency control based on timestamp ordering.

Database Recovery Techniques: Recovery concepts; Shadow paging; The ARIES recovery algorithm.

Indexing Structures for Files and Physical Database Design: Single level and multi-Level indexing; Dynamic multi-level indexing using B-trees and B+ trees.

PRACTICES:

- Design and Development of company database and expressing Nested queries using SQL.
- Design and Development of student database and specifying queries using set operations.
- Design and Development of sailor's database and specifying queries using different types of JOINs.
- Implementation of PL/SQL programs with Control Structures.
- Implementation of PL/SQL programs with Procedures.
- Implementation of PL/SQL programs with Function.
- Implementation of PL/SQL programs with Triggers.
- Creation and dropping of VIEWS.
- Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. F = {CH -> G, A -> BC, B -> CFH, E -> A, F -> EG} is a set of functional dependencies (FDs) so that F+ is exactly the set of FDs that hold for R. How many candidate keys does the relation R have?
- Apply various DCL and TCL constructs of SQL on Relational Database.

SKILLS:
- ✓ *Develop E-R model for real life applications.*
- ✓ *Design of relational databases for real world applications.*
- ✓ *Devise queries using relational algebra and SQL.*
- ✓ *Analyze transaction processing, concurrency control and recovery techniques*

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Develop an E-R model for real life applications.	Apply	1	1,10
2	Design and normalize databases for real time applications.	Create	1	1,3
3	Devise queries using Relational Algebra and SQL.	Analyze	2	2
4	Express queries using database tools like Oracle, DB2, MYSQL.	Apply	2	5,10

TEXT BOOKS:

1. Ramez, Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2016.
2. Raghu Rama Krishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition, Tata McGraw Hill, 2013.

REFERENCE BOOKS:

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", 7th edition, Tata Mc Graw Hill,2019.
2. Allen G. Taylor "Database Development for Dummies" 1st Edition, 2011
3. C. J. Date "Introduction to Database Systems" 7th Edition, Addison Wesley, 2003.

22MS202 ETHICS AND HUMAN VALUES

Hours Per Week :

L	T	P	C
2	0	0	0

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

- To create awareness to specific set of morals, values and ethics the professional must knowand abide by, including work ethics, integrity and commitment etc.

- To realize the importance of moral autonomy, professional ideals and Ethical theories.

- To study safety/risk aspects, welfare of the public and about employee rights.

- Know about the global issues and code of ethics of professional bodies.

MODULE-1

UNIT-1   8L+0T+0P=8 Hours

HUMAN VALUES

Morals, Values and Ethics – Integrity- Work Ethics- Service Learning – Civic Virtue Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time –Co Operation – Commitment – Empathy – Self-Confidence – Stress Management-Character – Spirituality.

UNIT-2   8L+0T+0P=8 Hours

ENGINEERING ETHICS

Senses of Engineering Ethics- Variety of Moral Issues – Types of Inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg& Gillian-s Theory – Consensus and Controversy. Professions and Professionalism: The nature and characteristics of Professions, Professionalism, the foundation and norms of Professional ethics, the need for separate code of conduct for Professionals, Professional Rights, Theories about Right Action, Uses of Ethical Theories. Case studies like The Space Shuttle Challenger, Bhopal gas tragedy, Chernobyl disaster etc.

MODULE-2

UNIT-1   8L+0T+0P=8 Hours

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as Responsible Experimenters Safety. Responsibilities and Rights: Safety and Risk – Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk. Collegiality and Loyalty – Respect for Authority –Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT-2   8L+T+0P=8 Hours

Multinational Corporations – Environmental Ethics – Computer Ethics – Business ethics – Engineers As Managers – Consulting Engineers – Engineers As Expert Witnesses and Advisors – Codes Of Ethics – Sample Code Of Ethics Like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management Etc.,.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Have basic understanding of how a prospective engineer should behave in his chosen field and society.	Apply	1	6, 7
2	Realize the importance of moral autonomy, professional ideals and Ethical theories.	Apply	1	8
3	Know about the safety/ risk, welfare of the public and employee rights.	Analyze	2	6, 7
4	Gain exposure to global issues and codes of some professional bodies.	Analyze	2	6, 9

TEXT BOOKS:

1. Mike martin and Ronald Schinzinger, & quot; Ethics in Engineering & quot; McGraw-Hill,New York1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V.S., & quot; Engineering Ethics & quot;, PHI,New Delhi.
3. Bayles. M. D, Professional ethics, California, Wards worth publishing company,1981.
4. Koehn. D, The ground of Professional Ethics, Routledges,1995.

REFERENCE BOOKS:

1. Charles D, Fleddermann, & quot; Engineering Ethics & quot;, Pearson / PHI, New Jersey 2004 (Indian Reprint).
2. Charles Eharris, Michael S.Protchard and Michael J Rabins, & quot; Engineering Ethics-Concepts and Cases & quot; Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatwright, & quot; Ethics and the conduct of business " Pearson, New Delhi,2003.
4. Edmund G.Seebauer and Robert L Barry, " Fundamentals of Ethics for Scientists and Engineers & quot; Oxford University Press, Oxford, 2001.

22MT201 OPERATION RESEARCH

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Plotting graphs, Basic matrix operations, solving simple linear equations.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to build a grasp of the concepts of linear programming problem, transportation, assignment problems and to apply these concepts to real time situations that require optimization of the outcome of a process through simplex, Modi and Hungarian algorithms.

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

LINEAR PROGRAMMING

Introduction to Linear Programming Problem (LPP): Introduction to Operation Research, Scope of Operation Research,

Linear Programming: Introduction, Concept of Linear Programming Model, Development of LP Models, The essence of the simplex method; Setting up the simplex method; Types of variables, Algebra of the simplex method; the simplex method in tabular form; Tie breaking in the simplex method; Duality, Formulation of Dual Problem, Sensitivity Analysis

UNIT-2   **8L+8T+0P=16 Hours**

APPLICATIONS OF LINEAR PROGRAMMING

Relevant methods of solving LPP in Agricultural sectors, Military Applications, Production Management, Financial Management, Marketing Management, Personnel Management, Engineering Applications, Efficient Manufacturing, Energy Industry and other Commercial Sectors.

PRACTICES:

- Develop an LPP that represents a given situation with appropriate decision variables.
- Plot graphical solutions to given LP Problems involving two decision variables.
- Apply simplex method to solve given LPP.
- Analyse a given LPP for Duality.

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

TRANSPORTATION AND ASSIGNMENT PROBLEMS

Introduction to Transportation Problems, Mathematical Model for a Transportation Problems, Types of Transportation Problems, Method of solving Transportation Problems: Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI).

Assignment Problem: Zero-One Programming Model for Assignment Problem, Types of Assignment Problem, Hungarian algorithm for the assignment problem. Branch and Bound Technique.

UNIT-2   **8L+8T+0P=16 Hours**

APPLICATIONS OF TRANSPORTATION AND ASSIGNMENT PROBLEMS

Suitable methods to solve Personnel Assignment Problems, Travelling Salesman Problems, Transportation Problems, Problems connected with Engineering, Management and other Commercial Sectors.

PRACTICES:

- Develop a transportation situation into a Transportation problem.
- Compute IBFS for a given TP through different methods.
- Analyze a transportation problem for Optimal solution.
- Develop a given situation into an assignment problem.
- Apply Hungarian method to solve a given assignment problem

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Model a given situation into LPP.	Apply	1	1, 2, 4, 5, 9,10, 12
2	Apply simplex method to solve LPP.	Apply	1	1, 2, 5, 9, 10
3	Apply MODI method to solve transportation proble.	Apply	2	1, 2, 3, 5, 9,10
4	Apply Hungarian method to solve assignment problem.	Apply	2	1, 2, 5, 9, 10, 12

TEXT BOOKS:

1. Taha Hamdy, "Operations Research – An Introduction", Prentice-Hall, 7th Edition.
2. Paneerselvam, "Operations Research", PHI learning, 6th Edition, 2016.

REFERENCE BOOKS:

1. Sharma J K, "Operations Research", Pearson, 3rd Edition.
2. Sharma S D, "Operations Research (Theory Methods & Applications)", Kedar Nath Ram Nath Publications, 2020th Edition.
3. Hiller and Lieberman, "Introduction to Operations Research", McGraw Hill.

22CB206 DESIGN AND ANALYSIS OF ALGORITHMS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Programming for problem solving, Discrete Mathematical Structures, Data Structures.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers the basic knowledge required to analyze the asymptotic performance of algorithms. In addition, this course provides the knowledge required to solve different problems using suitable design strategies such as the greedy method, divide and conquer, dynamic programming, backtracking and branch & bound. This course helps to understand the impact of the choice of data structures and algorithm design strategies on the performance. This course also provides the understanding of advanced graph applications and throws light on tractable and intractable problems.

MODULE-1

UNIT-1   12L+0T+8P=20 Hours

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; Analysis of recursive algorithms through recurrence relations- substitution method, Recursion tree method, Masters Theorem.

Disjoint sets: Disjoint set operations, Union and find algorithms.

UNIT-2   12L+0T+8P=20 Hours

DIVIDE & CONQUER AND GREEDY METHOD

Divide and Conquer: General method, Applications - Binary search, Quick sort, Merge sort and Strassen's matrix multiplication.

Greedy Method: Applications - job sequencing with deadlines, Knapsack problem, Minimum cost spanning trees.

PRACTICES:

- Sort a given set of elements using the following methods and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n inputs. The elements can be read from a file or can be generated using the random number generator.
  a. Quick sort   b. Merge sort

- Search for a given set of elements using the following methods and determine the time required to search the given element. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus no. of elements. The elements can be read from a file or can be generated using the random number generator.
  a. Linear Search   b. Binary Search

- Implement the following using divide and conquer approach.
  To multiply two given square matrices.

  To multiply two given square matrices using Strassen's matrix multiplication.

- Design the Algorithm to solve Job sequencing with deadlines problem and Analyze its time complexity. Implement the above algorithm using Greedy method.

● Design the Algorithm to solve fractional Knapsack problem using Greedy method. Analyze the time complexity and implement the above algorithm.

● Design the Algorithm to find minimum spanning tree and its cost for an undirected graph. Analyze the time complexity and implement the above algorithm.

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

DYNAMIC PROGRAMMING AND BACKTRACKING

Dynamic Programming: General method, Applications - optimal binary search trees, Matrix chain multiplication, 0/1knapsackproblem, All pairs shortest path problem, Travelling sales person problem.

Backtracking: General method, Applications - N-Queen problem, Sum of subsets problem, Graph colouring and Hamiltonian cycles.

UNIT-2   **12L+0T+8P=20 Hours**

BRANCH & BOUND AND P, NP, NP - HARD AND NP-COMPLETE

Branch and Bound: General method, Applications- Travelling sales person problem, 0/1 knapsack problem using LC branch and bound solution and FIFO branch and bound solution.

P, NP, NP - HARD and NP-Complete: Basic Concepts - Non-Deterministic Algorithms - The Classes NP-Hard and NP Complete- NP Hard Problems- Clique Decision Problem-Cook's Theorem.

PRACTICES:
● Design the Algorithm to find all pairs shortest path problem by using dynamic programming approach. Analyze its time complexity and implement the above algorithm.

● Design the Algorithm to find optimal binary search tree and its cost by using dynamic programming approach. Analyze its time complexity and implement the above algorithm.

● Design the Algorithm to find optimal order of matrix chain multiplication and its cost using dynamic programming approach. Analyze its time complexity and implement the above algorithm.

● Design the Algorithm to find optimal route for travelling sales person problem and its cost by using dynamic Programming approach. Analyze its time complexity and implement the above algorithm.

● Design the Algorithm to solve N-queens problem by using backtracking approach and Analyze its time complexity. Implement the above algorithm.

● Design the Algorithm to solve sum of subsets problem using backtracking approach and Analyze its time complexity. Implement the above algorithm.

● Design the Algorithm to solve 0/1 Knapsack problem using Branch and Bound method. Analyze the time complexity and Implement the above algorithm.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the efficiency of a given algorithm using time and space complexity theory. Understanding algorithmic design strategy like divide and conquer approach.	Analyze	1	1, 2, 12
2	Apply greedy algorithm Strategy for suit able problems and argue the correctness of such algorithms with respect to the global optimization.	Apply	1	1, 2,3, 5, 12
3	Apply the dynamic programming paradigm and identify the kind of problem best suited to solve using dynamic programming.	Apply	2	1, 2, 3, 5, 12
4	Compare and contrast the design principles of branch and bound with backtracking strategy.	Apply	2	1, 2,3,5, 12
5	Investigate computational complexity of different class of problems.	Analyze	2	1, 2,4,12

TEXT BOOKS:

1. Ellis Horowitz, SatrajSahni and Rajasekharan, "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia publications, 2006.
2. Thomas H. Coremen, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithm", 2nd Edition, MIT press Ltd., 2014.

REFERENCE BOOKS:

1. Anony Levitin, "Introduction to Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2016.
2. Donald E. Knuth, "The Art of Computer Programming", 2nd Edition, Addison Wesley Publishing Company, 1998.
3. Ronald L. Graham, Donald E. Knuth and Oren Patashnik, "Concrete Mathematics", 2nd Edition, Addison wesley Publishing Company,1998.
4. Dasgupta, Papadimitriou and Vazirani,"Algorithms", 1st Edition, McGraw-Hill publishers, 2008.
5. Weiss, "Data Structures and Algorithm Analysis", 1st Edition, Addison-Wesley Publishing Company, 2016.

22CB208 OPERATING SYSTEMS

Source: https://www.123rf.com/stock-photo/operating_system.html

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Knowledge of computers fundamentals, Computer organization & Digital logic and its design.

COURSE DESCRIPTION AND OBJECTIVES:

This course aims at concepts and principles of Operating Systems, its overall responsibility inacting as an interface between the system's hardware components and the user. Further, it also helps students to understand the different scheduling policies, process synchronization mechanisms, deadlock handling mechanisms and memory management techniques.

MODULE-1

UNIT-1   8L+0T+8P=16 Hours

LINUX FILE SYSTEM & PROCESS SCHEDULING

Introduction to LINUX File System: The LINUX file System, File System Hierarchy, File system Commands, File Attributes, File Permissions.

Filters: cmp, comm, diff, head, tail, find, cut, paste, sort, uniq.

Regular Expressions: grep, egrep, fgrep, Sed- line addressing, context addressing, text editing, substitution.

Introduction to Operating System: What Operating System do; Operating System Structure; Process concept-overview, Process Scheduling, Operations on Process; Inter Process Communication; Threads;

Process (CPU) Scheduling-Scheduling Criteria, Scheduling Algorithms; Multiple-Processor scheduling;

UNIT-2   8L+0T+8P=16 Hours

PROCESS SYNCHRONIZATION AND DEADLOCKS

Process Synchronization: The critical-section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

Deadlocks: Deadlock characterization; Methods of handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery.

PRACTICES:

- Use the cat command to create a file containing the following data. Call it mytable.txt usetabsto separate the fields.

1425	ravi	15.65
4320	ramu	26.27
6830	sita	36.15
1450	raju	21.86

  a. Use the cat command to display the file, mytable.txt.

  b. Use the vicomm and to correct any errors in the file, mytable.txt.

  c. Use the sort command to sort the file mytable.txt according to the first field.

  d. Call thesortedfilemytable.txt (same name)

  e. Printthefilemytable.txt.

  f. Use the cut &paste commands to swap fields 2and 3mytable.Call itmytable.txt (same name)

g. Print the new file, mytable.txt.

- Write a shell script that takes a command–line argument and reports on whether it is directory, a file, or something else.
- Write a shell script that accepts one or more file name as arguments and convertsall of them to uppercase, provided they exist in the current directory.
- 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.
- Write a shell script that computes the total and average marks of a student according to the following;
- Ifaveragemarks≥69thenresultis-Distinction‖.
- Ifaveragemarks≥59and≤70thenresultis-FirstClass‖.
- Ifaveragemarks≥49and≤60thenresultis-SecondClass‖If average marks ≤50 then result is -Pass‖.
- Note that any subject marks ≤ 40then result is-Fail‖.
- Accept student name and six subject marks through the keyboard.
- 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.
- 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.
- 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.
- Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
- Implementation of new process creation and its communications.
- Implement of thread creation and deletion.
- Implementation of FCFS scheduling.
- Implementation of SJF and RR Scheduling.
- Implementation of producer consumer problem.
- Implementation of Banker's algorithm for Dead lock avoidance.

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

MEMORY MANAGEMENT

Memory Management: Basic concept tofmemory management, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management: Demand Paging, Page Replacement: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU), Least Recently used (LRU), Allocation of Frames.

UNIT-2   **8L+0T+8P=16 Hours**

SECONDARY STORAGE STRUCTURE

Secondary Storage Structure: Over view of mass-storage structure, disk structure, disk scheduling;

File System Interface - File concept, Access Methods, Directory & Disk Structure, File-System Mounting, File Sharing, Protection; File-system structure.

File System Implementation- Directory implementation, Allocation Methods, Free Space Management.

PRACTICES:

- Assume that you have a page-reference string for a process with m frames (initially all empty). The page-reference string has length p, and n distinct page numbers occur in it.
  a) What is a lower bound on the number of page faults?
  b) What is an upper bound on the number of page faults?
- Consider the following page-replacement algorithms. Rank these algorithms on a five-point scale from "bad" to "perfect" according to their page-fault rate. Separate those algorithms that

SKILLS:
✓ *Manage open-source operating systems like Ubuntu, Fedora etc.*
✓ *Know the concepts of Processes scheduling and File Systems.*
✓ *Identification of different disk scheduling methodologies.*

suffer from Belady's anomaly from those that do not.

a) LRU replacement.   b) FIFO replacement.

c) Optimal replacement.   d) Second-chance replacement.

- Consider the page reference string: 1, 2, 3, 4,2, 1, 5, 6, 2, 1, 2, 3,7, 6, 3, 2, 1, 2, 3, 6.
- How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, and seven frames? Remember that all frames are initially empty, so your first unique pages will cost one fault each.
- LRU replacement.
- FIFO replacement.
- Optimal replacement.
- How many page fault soccur for your algorithm for the following reference string with four page frames? 1, 2, 3,4, 5, 3, 4, 1, 6,7, 8, 7, 8, 9, 7, 8,9, 5, 4, 5,4, 2.
- What is the minimum number of page faults for an optimal page replacement strategy for thereference string above with four page frames?
- Consider a demand-paged computer system where the degree of multiprogramming is currently fixed at four. The system was recently measured to determine utilization of the CPU and the paging disk. Three alternative results are shown below. For each case, what is happening?

  a) Can the degree of multiprogramming be increased to increase the CPU utilization? Is the paging helping?

  b) CPU utilization 13 percent; disk utilization 97 percent.

  c) CPU utilization 87percent; disk utilization 3 percent.

  d) CPU utilization 13 percent; disk utilization 3 percent.
- Implementation of Disk scheduling algorithm–FCFS.
- Implementation of Disk scheduling algorithm–SSTF and SCAN.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Classify the basic concepts of operating system and explore Linux ecosystem.	Analyze	1	1
2	Apply the concepts of process scheduling algorithms and process synchronization techniques to derive the efficiency of resource utilization.	Apply	1	1, 2, 3, 5, 12
3	Analyze the requirements for attempting Operating systems principles.	Analyze	1,2	1,2,12
4	Design the various memory management schemes For a given scenario.	Create	2	3,5
5	Apply the concepts of file system interface and implementation.	Apply	1,2	2,5

TEXT BOOKS:

1. Sumitabha Das, Unix concepts and applications‖, TMH Publications, 4th Edition, July 2017.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley & SonsInc, 2013.

REFERENCE BOOKS:

1. Richard. Stevens and Stephen A Rago, "Advanced Programming in the Unix Environment", 3rd Edition, Addison-Wesley, 2013.
2. William Stallings, "Operating Systems-Internals and Design principles" PHI, 7th Edition, 2012.
3. Gary J. Nutt. Addison-Wesley, "Operating Systems: A Modern Perspective", 2nd Edition, 2001.
4. B.A. Forouzan & R.F.Giberg, - Unix and shell Programming‖, Thomson, 1st Edition, New Delhi, 2003.

22CB209 SOFTWARE ENGINEERING

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Data Base Management Systems, Oops through Java.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on the concepts of software life cycle, role of process models and methods to prepare software requirement specification document. In addition to that, it also imparts knowledge of design, development and testing of software. The objective of this course is to enable the student to develop efficient, cost effective, feasible software as per user requirements.

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

INTRODUCTION

Introduction to Software Engineering: Introduction to Software and Software engineering, Software characteristics, Software project, Software myths, Project Planning, Scheduling and Management.

Generic View of Process: Software Engineering – A layered technology, A process framework, Software Development Life Cycle (SDLC), The Capability Maturity Model Integration (CMMI).

Process Models: Conventional Model, Agile process models – Unified process model, Extreme Programming, Scrum.

UNIT-2   **8L+8T+0P=16 Hours**

REQUIREMENTS ENGINEERING

Requirements Engineering: Functional and Non-functional requirements, User requirements, System requirements, Requirement engineering tasks, formal requirements specification and verification, Feasibility Study.

Building the Analysis Model: Data modeling – Data objects, Attributes, Relationships, Cardinality and modality. Class based modeling – Identify analysis classes, specify attributes and Define operations.

Design Engineering: Design model, Design concepts. Creating an Architectural Design-Architectural styles and patterns.

Performing User Interface Design: Golden rules; User interface analysis and design.

PRACTICES:

Laboratory session of this course is designed in such a way that the student should complete three projects of the given type by performing the below experiments.

- Development of software requirements specification using Mind-Map tool.
- Project planning using Gantt charts.
- Project estimation using metrics.
- Capture Use Case Scenarios and model UML Use Case Diagrams.
- Model the UML state chart and Activity diagrams.
- Model the UML Class and Sequence diagrams.

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

TESTING

Testing Strategies: A strategic approach to software testing, Unit testing, Integration testing, Validation testing, System testing,

Testing Tactics: Black-Box and White-Box testing techniques, Art of debugging.

Product Metrics: Metrics for analysis model; Metrics for design model, Metrics for source code; Metrics for testing; Metrics for maintenance.

UNIT-2   **8L+8T+0P=16 Hours**

RISK AND QUALITY MANAGEMENT

Risk Management: Software risks, Risk identification; Risk projection; Risk refinement, Reactive vs Proactive risk strategies, RMMM.

Quality Management: Quality concepts, Formal technical reviews, Statistical Software Quality Assurance.

Computer-Aided Software Engineering (CASE): Use of appropriate CASE tools- Requirement engineering tools, Project planning tools, Testing tools.

PRACTICES:

Laboratory session of this course is designed in such a way that the student should complete three projects of the given type by performing the below experiments.

- Estimate the test coverage and Structural complexity of product using metrics.
- Develop the test cases for all the functional requirements of projects selected.
- Perform the functional testing using Selenium tool.

LIST OF PROJECTS:

Project-1: 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.

Project-2: Online Bookshop Example: Following the model of amazon.com or bn.com, design and implement an online bookstore.

Project-3: 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.

Project-4: 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.

Project-5: An Automated Community Portal: Business in the 21st Century is above all BUSY. Distractions are everywhere. The current crop of "enterprise intranet portals" is often high noise and low value, despite the large capital expenditures it takes to stand them up. Email takes up 30 – 70% of an employee's time. Chat and Instant Messaging are either in the enterprise or just around the corner. Meanwhile, management is tasked with unforeseen and unfunded leadership and change-agent roles as well as leadership development and succession management. What is needed is a simplified, repeatable process that enhances communications within an enterprise, while allowing management and peers

to self-select future leaders and easily recognize high performance team members in a dynamic way. Additionally, the system should function as a general-purpose content management, business intelligence and peer-review application. Glasscode's goal is to build that system.

Project-6: 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 the presentation, 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.

Project-7: An Auction Application: Several commerce models exist and are the basis for several companies like eBay.com, pricellne.com etc. Design and implement an auction application that provides auctioning services. It should clearly model the various auctioneers, the bidding process, auctioning etc.

Project-8: A Notes And File Management System: During one's student years and professional career one produces a 1 lot of personal notes, documents. All these documents are usually kept 1 on papers or individual files on the computer. Either way the bulk of the information is often erased corrupted and eventually lost. The goal of this 1 project is to build a distrib- VFSTR 106 III Year I Semester uted software application that addresses this problem. The system will provide an interface to create, organize and manage 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.

Project-9: 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.

Project-10: Hospital Management System: Simulate to show and explain hospital structure, staff, and relationships with patients, and patient treatment terminology

Project-11: Draft Software Requirement Analysis for the following Problem Statement: Fuel Delivery System: An unattended petrol (gas) pump system that includes a credit card reader. The customer swipes the card through the reader and then specifies the amount of fuel required. The fuel is delivered, and the customer's account debited.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Use basic concepts of software engineering for designing software product.	Usage	1	1, 11
2	Compare different process models and identify appropriate process model based on project requirements.	Evalua-tion	1	2, 4
3	Build Software Requirement Specification (SRS) document for any software product.	Design	1	3, 5
4	Design of solutions using UML diagrams like Use case, Sequence diagrams etc,.	Apply	1	3, 4, 5
5	Create an appropriate architecture for a given project that meets all quality constraints.		2	4, 5, 11
6	Apply different testing techniques to ensure bug free software and metrics to measure the software size, complexity, and budget etc.	Apply	2	4, 5, 11

TEXT BOOK:

1. Roger S. Pressman, "Software Engineering, A practitioner's Approach", 6th Edition, McGrawHill International Edition, 2008.
2. Booch G., Rumbaugh J. and Jacobsons I, "The Unified Modeling Language User Guide", 2nd Edition, Addison Wesley, 2005.

REFERENCE BOOKS:

1. Simon Sennet, Steve McRobb and Ray Farmer, "Object Oriented Systems Analysis and Design, 2nd edition, 2004.
2. Dr. Pankaj Jalote "Software Engineering: A Precise Approach" –edition 2010.

22MS204 DESIGN THINKING

Hours Per Week :

L	T	P	C
1	2	0	2

PREREQUISITE KNOWLEDGE: Programming for problem solving, Discrete Mathematical Structures, Data Structures.

COURSE DESCRIPTION AND OBJECTIVES:

1. To create awareness of design thinking among students of engineering.
2. To teach a systematic approach for identifying and applying design thinking process.
3. To enable the use of doodling and storytelling as a means of presenting ideas and prototypes.
4. To motivate students to create value proposition statements for identified problems

MODULE-1

UNIT-1   4L+8T+0P=12 Hours

DESIGN THINKING OVERVIEW AND MOTIVATIO: Design Thinking for business–Stories, Examples and Case Studies; Design Thinking for Students; Introduction to Design Thinking – Stanford's 5-step model;

*Activities to understand Design Thinking and its applications

UNIT-2   4L+8T+0P=12 Hours

DOING DESIGN: EMPATHIZE PHASE: Empathy; Importance of Empathy; Empathy Tools; Introduction to Immersion Activity; Persona, Importance of Persona Creation; Data collection and Inferences

*Activities for Empathize Phase

DOING DESIGN: DEFINE PHASE: Problem Statements–Introduction, Definition, and Validation;

Need Analysis: Types of Users, Types of Needs; Addressable Needs and Touch points; Structuring Need Statements;

*Activities for Define Phase

MODULE-2

UNIT-1   4L+8T+0P=12 Hours

DOING DESIGN: IDEATE PHASE: Ideation tools: Six Thinking Hats; Ideate to generate solutions; Brainstorming, Doodling and Storytelling to present ideas; Ideation by SCAMPER, ideation by reconstruct and deconstruct

*Activities for Ideate Phase.

UNIT-2   4L+8T+0P=12 Hours

DOING DESIGN: PROTO TYPE PHASE: Prototype Phase

Introduction to Prototype; Methods of Prototyping; Value proposition for the solution *Activities for Prototype Phase.

Doing Design: Test Phase

Importance of testing; Feedback Collection; Documentation of Feedback; Inference from Feedback; Looping of Design Thinking; Agile and Design Thinking to deliver customer satisfaction;

*Activities for Test Phase

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify design thinking phases from an engineering perspective.	Design	1	1, 11
2	Validate problem statements through user empathization with societal and environmentalconsciousness.	Apply	1	2, 4
3	Devise visual design and documentation to communicate more effectively.	Design	2	3, 5

TEXT BOOK:

1. There are no prescribed texts for Semester 5 – there will be handouts and reference links share.

REFERENCE BOOKS:

1. NirEval, Hooked. How to Build Habit-Forming Products, Penguin Publishing Group.
2. Rod Judkins, The Art of Creative Thinking, Hodder& Stoughton.
3. Dan Senor and Saul Singer, Start-up Nation. The Story of Israel's Economic Miracle, Grand Central Publishing.
4. Simon Sinek, Start with Why. How Great Leaders Inspire Everyone to Take Action, Penguin Books Limite.

22EN201 BUSINESS COMMUNICATION & VALUE SCIENCE-III LAB

Hours Per Week :

L	T	P	C
0	0	2	1

PREREQUISITE KNOWLEDGE: Intermediate level LSRW skills and completion BC&VS lab-I and lab-II.

COURSE DESCRIPTION AND OBJECTIVES:

- To develop students' technical writing skills. To introduce students to Self-analysis techniques like SWOT&TOWS.

- To introduce students to key concepts of: Pluralism and cultural spaces.To introduce students to key concepts of Cross-cultural communication.

- To introduce students to evaluate the role of science in Nation building.

MODULE-1

UNIT-1   **0L+0T+8P=8 Hours**

INTRODUCING SWOT

SWOT analysis, basic principles, real life scenarios and application. **SWOT Vs TOWS:** The Balancing Act.

MOTIVATION: Stories, YouTube videos on Maslow's Theory, identifying and leveraging motivation.

UNIT-2   **0L+0T+8P=8 Hours**

PLURALISM

Identify pluralism in cultural spaces, differentiate and respect pluralism, differentiate between global,local and translocational culture

CROSS-CULTURAL COMMUNICATION: Implications, common mistakes, roles and relations of differentgenders.

PRACTICES:

- Analyse personal traits in SWOT matrix to prepare a notes. Later present and record thepersonal SWOT analysis.
- Use the TOWS matrix and analyse SO, ST, WO and WT of an individual and find solutions tothe academic problems.
- Evaluate Maslow's theory and narrate how you get motivated towards your professional life.
- Prepare a questionnaire to understand the cultural pluralism in your university and evaluatehow cultural pluralism is maintained on the campus.
- Find various common mistakes in cross- cultural communication
- Analyze the roles and relations of different genders in a Multi National Corporation near toyour university.

MODULE-2

UNIT-1   **0L+0T+8P=8 Hours**

ROLE OF SCIENCE IN NATION BUILDING Group findings and learning's, presentations. **TECHNICAL WRITING:** Introduction, basic rules, best practices, application in real life scenario, practice

UNIT-1   **0L+0T+8P=8 Hours**

ARTIFICIAL INTELLIGENCE AI in everyday life, voice assist and future implications, communicating with machines, recognize the importance of AI.

BEST PRACTICES OF TECHNICAL WRITING: writing in profession, technical writing in real-life scenarios, scenario-based assessment on technical writing

PRACTICES:
- Prepare a PPT to present the findings and learning's on role of science in nation building onthe topic given to you in a group.
- Write an email of job application.
- Write an email of making an enquiry /answering questions.
- Write a letter of enquiry on the availability of voice assist and it's applications to a problem inyour locality.
- Write a report on the importance of AI.

PROJECT:

Visit rural area/under privileged parts of city to address some of the local issues; if relevant,suggest a practical technology solution to the issues.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply & analyze the basic principles of SWOT & life positions.	Analysis	1	9
2	Understand, analyze& leverage the power of motivation in real life	Analysis	1	9
3	Identify & respect pluralism in cultural paces	Application	1	6
4	Understand and apply the concepts of Global, local and translocational.	Application	1	6
5	Analyze cross cultural communication.	Analysis	1	6
6	Apply the science of Nation building	Application	1	6
7	Identify the common mistakes made in cross-cultural communication	Analysis	1	6
8	Understand, apply &analyze the tools of technical writing.	Analysis	2	10
9	Recognize the roles and relations of different genders	Understanding	2	6
10	Understand Artificial intelligence & recognize its impact in daily life	Application	2	1, 6
11	Identify the best practices of technical writing	Application	2	10
12	Differentiate between the diverse culture of India	Application	2	6

ONLINE RESOURCES:
1. https://youtu.be/CsaTslhSDI
2. https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3. https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4. https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtu.be
5. https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtu.be

III YEAR

B.Tech.

COMPUTER SCIENCE AND BUSINESS SYSTEMS

COURSE CONTENTS

I SEM & II SEM

22TP301 SOFT SKILLS LABORATORY

Hours Per Week :

L	T	P	C
0	0	2	1

Source: https:// choosework.ssa.gov/ blog/2019-07-23-soft-skills-an-intro-to-effective-communication

PREREQUISITE KNOWLEDGE: Grasp on their own academic achievements.

COURSE DESCRIPTION AND OBJECTIVES:

To impart employability skills like resume preparation and facing interviews. To enable trainees to develop interpersonal and leadership skills and to train them on work place skills like making presentations, participating in group discussions etc.

MODULE-1

UNIT-1   **0L+0T+8P=8 Hours**

PERSONALITY DEVELOPMENT

Soft Skills: Need for soft skills, professionalism, employability skills; 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; Career Planning: Job vs. career, SWOT analysis.

UNIT-2   **0L+0T+8P=8 Hours**

LANGUAGE AND VOCABULARY

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; Reflection of language on Personality, Gender sensitive language in MNCs, Mind your language, Seven essential skills for a team player; attentive listening, intelligent questioning, gently persuading, respecting other's views, assisting others, sharing, participating actively.

PRACTICES:

- Self-Introduction.
- Personal and Academic SWOC.
- Johari Window.
- Giving and taking opinions of Self Vs others and assessing oneself.
- Goal setting.
- Short, Mid and Long Term goals planning the semester.
- Time management: four quadrant system.
- Stephen Covey Time Management Matrix planning a semester.
- Stress-management.
- Questionnaire to assess level of stress.
- 50 words towards resume preparation and interviews.
- Newly coined words.
- Gender sensitive words and Words acceptable in Indian context and objectionable international context.

MODULE-2

UNIT-1   **0L+0T+8P=8 Hours**

LANGUAGE IN ACTION

Functional English: Situational dialogues, Role plays (including small talk); 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 – 11th and 12th weeks; Resume preparation: Structure and presentation, defining career objective, projecting one's strengths and skill-sets, summarizing, formats and styles and covering letter-Statement of Purpose.

UNIT-2   **0L+0T+8P=8 Hours**

PREPARING FOR PRESENTATIONS AND INTERVIEWS

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 behavioral and HR questions and the aspect looked at by corporate during interviews; Presentation Skills: Selection of a topic, preparing an abstract, gathering information, organizing the information, drafting the paper, citing reference sources – writing striking introductions, discussing the methodology used, developing the argument, presentation style, language, presenting the paper and spontaneously answering audience questions.

PRACTICES:

- 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).
- Group Discussions on various topics.
- Preparing SoP and Resume.
- Mock interviews on the FAQs including feedback.
- Oral presentation with the help of technology (Preparing PPT and presenting).

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Have the ability to introspect on individual strengths and weaknesses, and emerge as a balanced personality with improved self-awareness and self-worth.	Apply	1	12
2	Observe gender sensitive language and workplace etiquette in his professional life.	Analyze	1	9
3	Be able to prepare a resume and gain the confidence to face an interview.	Create	1, 2	10
4	Possess the interpersonal skills to conduct himself/ herself effectively in everyday professional and social contexts.	Apply	2	8
5	Bring professionalism into his/her daily activities.	Create	2	8

TEXT BOOKS:

1. Adrian Furnham, "Personality and intelligence at work", Psychology Press, 2008.
2. S. P. Dhanvel, "English and Soft skills", Orient Blackswan, 2011.

REFERENCE BOOKS:

1. Edward Holffman, "Ace the corporate personality", McGraw Hill, 2001.
2. John Adair Kegan Page, "Leadership for innovation", Kogan, 2007.
3. Krishna Mohan & NP Singh, "Speaking English effectively", Macmillan, 2008.
4. Rajiv K. Mishra, "Personality Development", Rupa & Co. 2004.

22MS301 FUNDAMENTALS OF MANAGEMENT

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Your general understanding about the business environment, basic communication skill and lateral thinking must be required.

COURSE DESCRIPTION AND OBJECTIVES:

- To understand the theories, functions, and practices of management and to provide them with practical exposure to cases of success/failure in business.

- To expose with a systematic and critical understanding of organizational theory, structures, and design.

- To comprehend the conceptual knowledge relating to Organizational Behavior and to provide a basic understanding of the behavior of individuals and groups in the organizations.

- To apply business ethics and corporate social responsibility for business success and growth

MODULE-1

UNIT-1   8L+8T+0P=16 Hours

MANAGEMENT THEORIES AND MANAGEMENT FUNCTIONS

Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc., Planning, Organizing, Staffing, Directing, Controlling.

UNIT-2   8L+8T+0P=16 Hours

ORGANIZATIONAL DESIGN

Classical, Neoclassical and Contingency approaches to organizational design; Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure).

MODULE-2

UNIT-1   8L+8T+0P=16 hours

ORGANIZATION BEHAVIOR

Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity.

UNIT-2   8L+8T+0P=16 hours

LEADERSHIP AND MANAGEMENT ETHICS

Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid, Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision – making frameworks, Business and Social Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	To understand the basic theoretical concepts of management and organizational behavior.	Under-stand	1, 2	1, 2, 12
2	To develop an understanding about how organi-zation work.	Apply	1, 2	1, 2, 11,12
3	To learn how to grasp the intricacies of different areas of management such as ethical finance, ethical marketing, advertising and corporate social responsibility etc.	Apply	2	1, 2, 8, 12
4	To understand real-time management problems, analyse them, and find solutions.	Under-stand	2	1, 2, 9, 12

TEXT BOOK:

1. Understanding the Theory and Design of Organizations by Richard L. Daft, 11e, Cengage, 2020.
2. Management by James Arthur, Finch Stoner, R. Edward Freeman, and Daniel R Gilbert 6th Ed; Publisher: Pearson Education/Prentice Hall.
3. Organizational Behaviour by Stephen P. Robbins, Prentice Hall, 2013

REFERENCE BOOKS:

1. Organizational Behaviour by Fred Luthans, Mc Graw-Hill, 2013.
2. Organizational Behavior by Stephen P. Robbins, Timothy A. Judge, Neharika ohra, 16Edition, Pearson Education, 2016.
3. Business Ethics: Ethical Decision Making & Cases, by O. C. Ferrell, John Fraedrich, Linda Ferrell, 12th Edition, Cengage,2017.

22CB304 DATA MINING AND ANALYTICS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Probability and Statistics, Python Programming.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces the basic concepts, principles, methods, implementation techniques, and applications of data mining, with a focus on three major data mining functions: (1) Association rule mining (2) Classification and (3) cluster Analysis. 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.

MODULE-1

UNIT-1   **12L+0T+8P=20 Hours**

INTRODUCTION

What is Data Mining? Why data mining? What kinds of data can be mined?;What kinds of patterns can be mined?; Which technologies are used?; What kinds of applications are targeted? Major issues in data mining; Data objects and attribute types; Basic statistical descriptions of data, Data matrix versus dissimilarity matrix.

DATA PRE-PROCESSING

Overview - data quality, major tasks in data preprocessing; Data cleaning - missing values, noisy data; Data Integration - entity identification problem, redundancy and correlation analysis tuple duplication; Data value conflict detection and resolution; Data reduction - PCA, attribute subset selection, regression and log linear models; Histogram; Data transformation - data transformation by normalization; Discretization by binning;

UNIT-2   **12L+0T+8P=20 Hours**

ASSOCIATION ANALYSIS

Market basket analysis; Frequent Item sets; Closed item sets and association rules; Frequent Item set Mining Methods-apriori algorithm, generating association rules, improving apriori, FP growth method, vertical format method; Which patterns are interesting? Pattern evaluation method; Pattern Mining in multilevel multidimensional space, Pattern Mining in Multilevel, Multidimensional Space.

PRACTICES:

- Apply the following data pre-processing techniques on dataset (download from n UCI/ Kaggle/ NCBI data repository) to illustrate the need of the pre-processing in data mining.a) Data Cleaning

  b) Data Normalization

  c) Data Discretization

  d) Computation of correlation coefficient to analyze the data behavior

  e) Dimensionality reduction using PCA and Wavelets

- Construct Heat Map Table to understand the Correlation among the attributes in a given dataset.
- Extract the interesting association rules from a given dataset using A priori algorithm.
- Extract the interesting association rules from a given dataset using Frequent Pattern growth algorithm

MODULE-2

UNIT-1   **12L+0T+8P=20 hours**

CLASSIFICATION

What is classification?, General approach to classification, Decision tree induction - attribute selection measures; Tree pruning; Bayes Classification methods - Bayes theorem; Naïve Bayesian classification; Classification by back propagation - a multilayer feed forward neural network; Defining a network topology; Back propagation; K nearest neighbor classifier; Support vector machine, Linearly separable and inseparable cases, Model evaluation and selection; Techniques to improve classification accuracy; Other classification methods – KNN.

UNIT-2   **12L+0T+8P=20 Hours**

CLUSTER ANALYSIS

Partition methods - K means and K medoid; Hierarchical methods; Agglomerative and divisive method; Density based methods - DBSCAN; Optics; Grid based methods-STING; Cluster evaluation methods; Clustering high dimensional data; Problems, Challenges and major methodologies.

PRACTICES:

- Apply the following classifiers on a given dataset and analyze their performance.
  a) J48 and visualize the decision tree   b) Naive Bayes
  c) Support Vector Machine   d) Multi-Layer Perceptron
  e) K-Nearest Neighbor
- Illustrate the performance of Ensemble Classification algorithms such as Bagging and Boosting Methods.
- Evaluate the performance of partitioning clustering algorithms on a given dataset.
- Evaluate the performance of hierarchical clustering algorithms on a given dataset.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Investigate various patterns that can be extracted from different types of data.	Analyze	1, 2	1, 2
2	Apply various pre-processing techniques and classification algorithms on different domains of data.	Apply	1, 2	1, 2, 5, 6
3	Build decision making systems using data mining algorithms for a given real time data set.	Apply Create	1, 2	3, 5, 8
4	Construct models using modern tools such as WEKA, R and Python etc.	Apply Create	1, 2	1, 2, 5, 9

TEXT BOOKS:

1. Jiawei Han, Micheline Kamber and Jian Pei, "Data mining Concepts and Techniques", 3rd Edition, Morgan Kaufmann. 2012.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", 2nd Edition, Pearson, 2018.

REFERENCE BOOKS:

1. Jure Leskovec, Anand Raja raman and Jeffrey D Ullman, "Mining of Massive Datasets", 5th Edition, Stanford University, 2014.
2. GK Gupta, Introduction to Data Mining with Case Studies, Prentice Hall. 3rd Edition,2014
3. Margaret H Dunham, "Data Mining: Introductory and Advanced Topics", PEA, 2008.

22CB303 MOBILE APPLICATION DEVELOPMENT

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: OOPs through Java, DDL & DML Commands – DBMS..

COURSE DESCRIPTION AND OBJECTIVES:

This course guides the student in designing and building a mobile application using Android™. The main objective of this course is to let the student learn basic Android programming concepts while building a variety of apps, starting with basic to making use of advanced concepts.

MODULE–1

UNIT-1   **8L+0T+8P=16 Hours**

INTRODUCTION

Introduction to Mobile Application Development- Mobile Applications and Device Platforms, Alternatives for Building Mobile Apps; Introduction to Android, Android versions, Android Architecture.

Application Development Process- Developers Workflow basics, Installing the Android SDK Tools; Anatomy of an Android Application.

Basic Building blocks - Activities, Services, Broadcast Receivers & Content providers; Intents & Fragments.

View Group- Layout: Linear Layout, Relative Layout, Frame Layout, Grid Layout, constraint Layout, Table Layout, and Absolute Layout.

UNIT-2   **8L+0T+8P=16 Hours**

VIEWS

Views: Basic Views; Picker Views- Time Picker View, Data Picker View; List Views – List View, Spinner View; Scroll View.

Activities: Creating an activity, Understanding the activity life cycle using Log and Toast, applying styles and themes to an activity, and hiding the activity title.

Linking Activities using Intents: Introduction to Intents and its types with examples, passing data between activities with intents, Activity Navigation- Implement up navigation with parent activities.

Fragments: Introduction to Fragment, the life cycle of a fragment, Adding fragments dynamically, Interaction between fragments.

PRACTICES:

- Setting up Android Studio:
  a) Installing Android Studio
  b) Select an empty activity to simulate the "Welcome App" Using Android Studio.
  c) Exploring the interface of the Android Studio to understand the Project Structure.
- Develop an Android application using controls like Button, TextView, and EditText for designing a calculator having basic functionality like Addition, Subtraction, Multiplication, and Division.
- Design the HelloToast app: The HelloToast app consists of two Button elements and one Text View. When the user taps the first Button, it displays a short message (a Toast) on the screen. Tapping the second Button increases a "click" counter displayed in the TextView, which starts at zero.

MOBILE APP DEVELOPMENT

Source: https://www. tatvasoft.com.au/blog/ mobile-application-development-methodology/

- **Design Silent Model Toggle application:** This app allows the user to toggle the ringer mode on the phone by simply pressing a button.
- **Design Silent Model Toggle application:** This app allows the user to toggle the ringer mode on the phone by simply pressing a button.
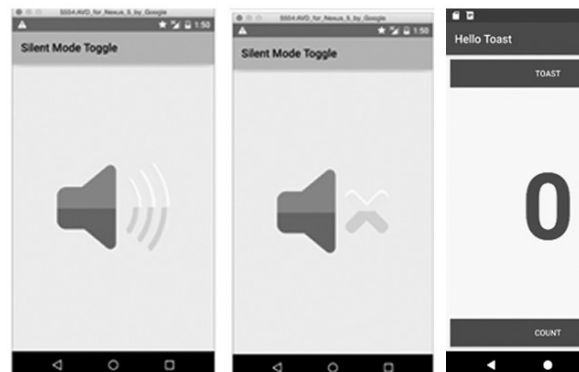
- In this assignment, students will create and build an app called Two Activities. Students will build the app in four stages.

a) In the first stage, you create an app whose main activity contains one button, Send. When the user clicks this button, your main activity uses an intent to start the second activity.

b) In the second stage, you add an EditText view to the main activity. The user enters a message and clicks Send. The main activity uses an intent to start the second activity and sends the user's message to the second activity. The second activity displays the message received.
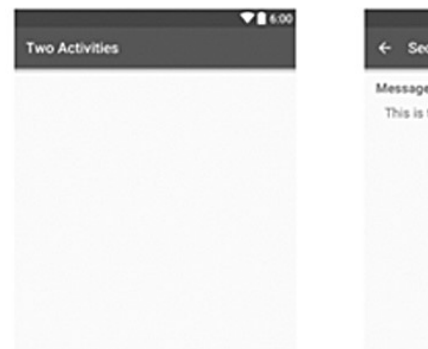
c) In the final stage of creating the Two Activities app, you add an EditText and a Reply button to the second activity. The user can now type a reply message and tap Reply, and the reply is displayed on the main activity. At this point, you use an intent to pass the reply from the second activity to the main activity.
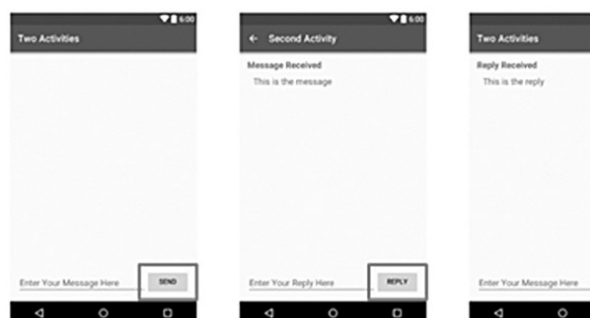
d) Implement all the Activity lifecycle call back methods to print messages to logcat when those methods are invoked. These log messages will allow you to see when the Activity lifecycle changes state, and how those lifecycle state changes affect your app as it runs.

● **Design an application with implicit intents:** Create a new app with one Activity and three options for actions: open a website, open a location on a map, and share a snippet of text. All the text fields are editable (EditText) but contain default values.
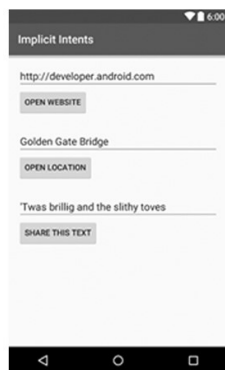
● **Design Droid Café:** In this practical, the student will create and build a new app starting with the Basic Activity template that imitates a dessert-ordering app. The user can tap an image to perform an action-in this case, display a Toast message-as shown in the figure below. The user can also tap a shopping cart button to proceed to the next Activity.

● **Experiment with the android:** inputType attribute for EditText elements. You add EditText elements for a person's name and address and use attributes to define single-line and multiple-line elements that make suggestions as you enter text. You also add an EditText that shows a numeric keypad for entering a phone number.

● Other types of input controls include interactive elements that provide user choices. You add radio buttons to Droid Cafe for choosing only one delivery option from several options. You also offer a spinner input control for selecting the label (Home, Work, Other, Custom) for the phone number..
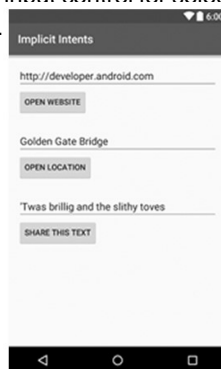
MODULE–2

UNIT-1   **8L+0T+8P=16 Hours**

CREATING A FEATURE-RICH APPLICATION

Creating a Feature-Rich Application: Display Orientation – Anchor Views, resizing and repositioning Views, Managing changes to Screen Orientation; Notifications; Action bar; Dialog box; Adapters- Array Adapters and Base Adapters; Recycler View.

UNIT-2   **8L+0T+8P=16 Hours**

SQLITE DATABASE

SQLite Database – Creating the database, Dealing with CRUD;

Firebase-Getting Started with Firebase, Add Firebase to your Android project, Firebase database-Introduction to Firebase database, set up Firebase Real-time Database for Android, Read and Write Data on Android; Publish the App in Play store.

PRACTICES:

- Design an application to keep data when the user rotates the device, and when the screen is rotated: When the user rotates the device, Android will normally destroy and re-create the current Activity. You want to keep some data across this cycle, but all the fields in your Activity are lost during it.
- Create a Splash Screen for the existing project- Droid Café from Module-1.
- Design a News App- Consider the following screen as reference:
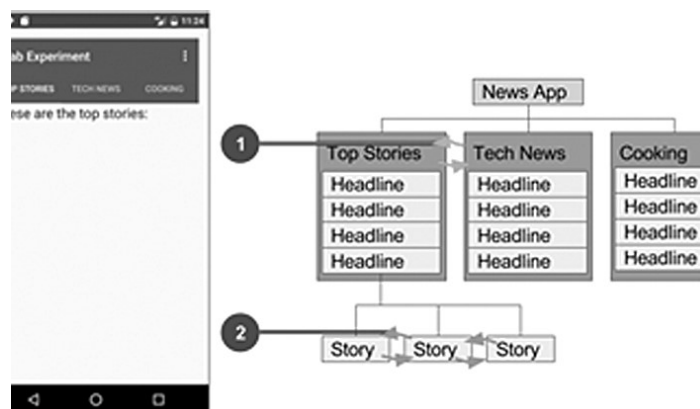
  NOTE: Use Recycle View to display the news under each category.
- Adding more features to Droid Café: In the previous assignments, you created an app called Droid Café, using the Basic Activity template. This template also provides a skeletal options menu in the app bar at the top of the screen.

  a) Update that menu option as shown in the following images:

  b) Add notification option: The app must notify the user when the user places the order.
- Provide user authentication for the Droid Café using Firebase – Authentication or SQLite.
- Save all the user preferences in the Firebase Real time Database to fetch whenever required.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply views, intents, and fragments to an existing application.	Apply	1	2
2	Evaluate an existing app to enrich it with new features.	Evaluate	2	2,3
3	Analyse methods for storing, sharing, and retrieving data in an Android app.	Analyse	2	5
4	Design and publish a mobile app in the play store with a database forgiven real-time scenarios using modern tools- Android Studio, and Firebase.	Create	2	5,10

TEXT BOOKS:

1. John Horton "Android Programming for Beginners: Build in-depth, full-featured Android apps starting from zero programming experience", 3rd Edition, 2021.
2. Wei-Meng Lee, "Beginning Android Application Development", 1st Edition, John Wiley & Sons, 2012.

REFERENCE BOOKS:

1. Michael Burton," Android App Development for Dummies ", 3rd Edition, A Wiley Brand, 2020.
2. Dawn Griffiths & David Griffiths, "Headfirst Android Development A Brain-Friendly Guide" 2nd Edition, O'Reilly, 2015.
3. https://aws.amazon.com/mobile/mobile-application-development/
4. https://google-developer-training.github.io/android-developer-fundamentals-course-concepts/.

22TP302 QUANTITATIVE APTITUDE AND LOGICAL REASONING

Hours Per Week :

L	T	P	C
1	2	0	2

PREREQUISITE KNOWLEDGE: Basic logical thinking and Problem solving ability.

COURSE DESCRIPTION AND OBJECTIVES:

The Students will be introduced to various Arithmetic and Reasoning Problems. The students will have acquaintance with various problems like Time & Work, Time & distance, Percentages, Profit & Loss etc. besides solving puzzles and Critical Reasoning.

MODULE-1

UNIT-1   **4L+8T+0P=12 Hours**

Number system, LCM & HCF of numbers, Percentage, Ratio and proportion, Profit, loss and discount, Average & Mixtures, Simple Interest & Compound interest.

UNIT-2   **4L+8T+0P=12 Hours**

Time and work, Time & distance, Problems on trains, Problems on ages, Permutation & Combinations, Probability.

PRACTICES:

● Each concept would be taught in detail in the class followed by 10 problems solved in the class.
● Students would have to solve 10 additional problems as a homework assignment in each concept.

MODULE-2

UNIT-1   **4L+8T+0P=12 Hours**

Number series, Letter series, Analogy, Odd man out, Coding and decoding, Syllogisms- Statement & Conclusions, Puzzle test.

UNIT-2   **4L+8T+0P=12 Hours**

Blood relations, Direction sense test, Order & Ranking, Seating Arrangements, Calendar & Clocks.

PRACTICES:

● Each concept would be taught in detail in the class followed by 10 problems solved in the class. Students would have to solve 10 additional problems as homework assignments in each concept.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Meet the demands of current job market besides equipping them higher studies like CAT, GMAT etc.	Apply	1	2, 5
2	Solve Arithmetic and Reasoning Problems within shortest possible time without paper work.	Apply	1	2, 5
3	Exhibit better analytical skills and aptitude skills.	Analyse	2	2, 4
4	Develop interpretational skills.	Evalua-tion	2	2, 4

TEXT BOOKS:

1. R. S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", S. CHAND Publications- Revised Edition, 2017.
2. ARIHANT, "A New Approach to Verbal & Non-Verbal Reasoning", Arihant Publication- Revised Edition, 2021.

REFERENCE BOOKS:

1. Trishna Knowledge Systems, "Quantitative Aptitude for Competitive Examinations", Pearson Publication, 2013.
2. R. S. Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", Revised Edition, S. CHAND Publications, 2018.

SKILLS:

✓ *Helps in developing and improving problem-solving skills.*

✓ *Flexing and honing logical abilities.*

✓ *Allow students to develop critical thinking skills.*

22CB305 FINANCIAL AND COST ACCOUNTING

PREREQUISITE KNOWLEDGE: Your passion, enthusiasm and just a bit of logical skills should be enough.

COURSE DESCRIPTION AND OBJECTIVES:

- To apply the basic accounting concepts & conventions and to analyse financial.
- position of business enterprise.
- To enumerate with the preparation of books of accounts and application of
- important accounting standards.
- To acquaint with the different types of costing and cost management.
- To explain about company accounts and audit reports.

MODULE-1

UNIT-1   8L+8T+0P=16 Hours

ACCOUNTING CONCEPT AND PROCESS

Introduction, Techniques and Conventions, Financial Statements- Understanding & Interpreting Financial Statements, Book Keeping and Record Maintenance, Fundamental Principles and Double Entry, Journal, Ledger, Trial Balance, Balance Sheet, Final Accounts, Cash Book and subsidiary Books, Rectification of Errors..

UNIT-2   8L+8T+0P=16 Hours

FINANCIAL STATEMENTS: Form and Contents of Financial Statements, Analyzing and Interpreting Financial Statements, Accounting Standards.

CLASS DISCUSSION: Corporate Accounting Fraud- A Case Study of Satyam.

MODULE-2

UNIT-1   8L+8T+0P = 16 Hours

CASH FLOW AND FUND FLOW TECHNIQUES: Introduction, how to prepare, Difference between them.

COMPANY ACCOUNTS AND ANNUAL REPORTS: Audit Reports and Statutory Requirements, Directors Report, Notes to Accounts, Pitfalls

UNIT-2   8L+8T+0P=16 Hours

COSTING SYSTEMS: Elements of Cost, Cost Behaviour, Cost Allocation, OH Allocation, Unit Costing, Process Costing, Job Costing, Absorption Costing, Marginal Costing, Cost Volume Profit Analysis, Budgets, ABC Analysis Class Discussion: Application of costing concepts in the Service Sector.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Create an awareness about the importance and usefulness of the accounting concepts and their managerial implications.	Under-stand	1, 2	1,2,3,11,12
2	Prepare and develop an understanding of the financial statements and the underlying principles and learn to interpret financial statements.	Under-stand	1, 2	1,2,3,11,12
3	Create an awareness about cost accounting, different types of costing and cost management.	Create	2	1,2,3,12
4	Analyse and interpret the company accounts and audit reports.	Analyze	2	1,2,11,12

TEXT BOOKS:

1. Accounting: Texts and Cases by Robert N Anthony, David Hawkins, Kenneth Marchant, 13e, McGraw-Hill, 2019.
2. Financial Management: Text, Problems and Cases by M Y Khan and P K Jain, 8th Edition, McGraw Hill Education, 2018.
3. Cost Accounting by M Y Khan and P K Jain, 2nd Edition, McGraw Hill Education, 2014.

REFERENCE BOOKS:

1. https://www.collegetutor.net/notes/Financial_Management_I_M_Pandey_Book_pdf
2. https://www.pdfdrive.com/cost-accounting-e34374053.html.
3. https://www.tcs.com/content/dam/tcs/investor-relations/financial-statements/ 2019-20/ar/annual-report-2019-2020.pdf.

22CB306 COMPILER DESIGN

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Programming for Problem Solving- I & II and Formal Languages and Automata Theory.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces the foundation for understanding the theory and practice of compilers and compiler design concepts; symbol table management, compiler parsing techniques, semantic analysis and optimized code generation. This course introduced the concepts of lexical analyzer, parser, code generation and code optimization techniques.

The objective of this course is to enable the student to acquire the knowledge of various phases of compiler such as lexical analyzer, parser, code optimization and code generation.

MODULE-1

UNIT-1   8L+8T+0P=16 Hours

INTRODUCTION

The evolution of programming languages and basic language processing system; The structure of compiler; Bootstrapping; Lexical analyser and its Role; Input buffering; Specifications and recognition of tokens; LEX;

UNIT-2   8L+8T+0P=16 Hours

SYNTAX ANALYSIS

The role of the parser; Context-free grammars; Types of parsers with examples, YACC.

Semantic Analysis: Type checking; Syntax directed definition (SDD) and translation schemes (TS); Application of SDD and TS; Translation of expressions and control flow statements

PRACTICES:

- Implement various phases of compiler in detail. Write down the output of each phase for expression Total = (b + c) + (b + c) * 50.
- Construct the symbol table for any input file with the help of LEX tool.
- Consider the context free grammar.
  S☐SS+ ,S☐©SS* , S☐a and the string aa+a*.
- Extract the interesting association rules from a given dataset using Frequent Pattern growth algorithm.
- Check whether the following grammar is a LL (1) grammar.
- S ☐iEtS | iEtSeS | a , E ☐ b.
- Construct the FIRST and FOLLOW procedures for the following grammar.
- S ☐ Aa | bAC | dc | bda , A ☐ d.
- Consider the grammar,
- E ☐ TE' , E'☐ +TE' | € , T ☐ FT' , T'☐ *FT' | € , F ☐ (E) | id.
- Construct a predictive parsing table for the grammar given above. Verify whether the input
- string id + id * id is accepted by the grammar or not.
-

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

INTERMEDIATE REPRESENTATIONS

Three address code; Syntax tree; DAG.

Run-Time Environment: Storage organization; Stack allocation - Activation Trees, Activation Records

UNIT-2 8L+8T+0P=16 Hours

OPTIMIZATION AND CODE GENERATION

The principal sources of optimization; Basic blocks and flow graphs; Local optimization; Global optimization and loop optimization.

CODE GENERATION: Issues in the design of code generator; Code-generation algorithm – register allocation and assignment and peephole optimization

PRACTICES:

- Translate the executable statements of the following C-code segment into three address code.
  int i:
  int a[10]
  i = 0;
  While (I <= 10) {
  a[i] = i + 1; i + + ;
  }
- Compute the DAG for the following three address statements. Considering this DAG as an example, explain the process of code generation from DAG.
  t1 = a + b   t2 = c + d   t3 = e – t2   t4 = t1 - t3
- What is Data flow equation? Represent the Data flow information for the following
  a = b + c; d = c * d; e = a – c; f = d + e.
- Draw a flow graph for the below code. Show the basic blocks clearly in your control flow graph?
  If (i>=0){
  sum = B[0];
  i = 0;
  L1: if (A[i]< B[i]){
          j=i;
  L2:
     if(B[i]>=0){
     sum = sum +B[j];
     }
     j = j+1
     if (j<N) goto L2;
     }
     i = i+1
     if (i<N) goto L1;
     }

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the different phases of compiler with various examples.	Apply	1	1, 12
2	Design different parsing and optimization techniques in the design of compile.	Design	1	1, 2, 12
3	Analyze the code optimization techniques.	Analyze	2	1, 2, 3, 12
4	Analyze the algorithm for compiler segments and evaluate the algorithm for optimized code generation.	Analyze	2	1, 2, 3,12

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ulman, "Compilers: Principles, Techniques and Tools", 3rd Edition, Pearson Education, 2019.
2. Thomson, "Introduction to Theory of Computation", 2nd Edition, Sipser, 2016.

REFERENCE BOOKS:

1. V. Raghavan, "Principles of Compiler Design", 2nd Edition, Mc Graw Hill, 2016.
2. John R.Levin, Tony Mason and Doug Brown, "Lex & YAAC", 2nd Edition, O Reilly, 2012.
3. Ms. Manisha Bharambe, "Compiler Construction", 2nd Edition, Nirali Prakashan, 2017.

22CY204 COMPUTER NETWORKS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: JAVA programming and UNIX commands.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on imparting knowledge about various protocols involved in LANs and WANs. In addition, it gives a good foundation on different protocols such as data link protocols, internet protocols, and transport protocols present in the respective layers of the data communication system.

MODULE - 1

UNIT-1   **12L+0T+8P=20 Hours**

INTRODUCTION TO COMPUTER NETWORKS AND INTERNET

Understanding of network and Internet, the network edge, the network core, Understanding of Delay, Loss and Throughput in the packet switching network, protocols layers and their service model, History of the computer network.

UNIT-2   **12L+0T+8P=20 Hours**

APPLICATION LAYER & TRANSPORT LAYER

Principles of computer applications, Web and HTTP, E-mail, DNS, Socket programming with TCP and UDP.

Introduction and transport layer services, Multiplexing and Demultiplexing, Connectionless transport (UDP), Principles of reliable data transfer, Connection-oriented transport (TCP), Congestion control.

PRACTICES:

Laboratory session of this course is designed in such a way that the student should complete three projects of the given type by performing the below experiments.

- Install Network Simulator 2/3. Create a wired network using dumbbell topology. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
- Create a static wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
- Create a mobile wireless network. Attach agents, generate both FTP and CBR traffic, and transmit the traffic. Vary the data rates and evaluate the performance using metric throughput, delay, jitter and packet loss.
- Implementation of one-way and two-way communication using TCP / UDP.
- Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round trip time to the neighbour. Implement Hello and Echo commands using JAVA.
-

MODULE - 2

UNIT-1   **12L+0T+8P=20 Hours**

NETWORK LAYER

Introduction to forwarding and routing, Network Service models, Virtual and Datagram networks, study of router, IP protocol and addressing in the Internet, Routing algorithms, Broadcast and Multicast routing.

UNIT–2 **12L+0T+8P=20 Hours**

THE LINK LAYER AND LOCAL AREA NETWORKS

Introduction to link layer services, error detection, and correction techniques, Multiple access protocols, addressing, Ethernet, switches, and VLANs..

PRACTICES:

- Find all the IP addresses on your network using Unicast, Multicast, and Broadcast on your network.
- Use Packet tracer software to build network topology and configure using Distance vector routing and Link State routing protocols.
- Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect two or more systems.
    a. Use a crimping tool to connect jacks.
    b. Use a LAN tester to connect the cables.
    c. Install and configure Network Devices: HUB, Switch and Routers (Consider both manageable and non-manageable switches. Perform logical configuration of the system and set the bandwidth of different ports).
    d. Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both ad-hoc and infrastructure modes of operation.
- Apply the commands such as Ping, Tracert, Ipconfig, pathping, telnet, FTP, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup to solve various problems.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Build the basic concepts of Network hardware, software and reference models.	Apply	1	1, 2, 12
2	Evaluate different physical layer media and switching methods.	Evalua-tion	1	1, 2, 5, 12
3	Implement various protocols with modern tools.	Apply	1	1, 2, 3, 5, 12
4	Apply different protocols to perform end-to-end delivery and interaction with users.	Analyze	2	1, 2, 12
5	Analyze various design issues, protocols and functionalities of network layer.	Analyze	2	1, 2, 12
6	Demonstrate various protocols involved in data link layer operations.	Apply	2	1,2, 5

TEXT BOOKS:

1. Kurose and Ross, "Computer Networking- A Top-Down approach", 6th Edition, Pearson, 2017.
2. Behrouz Forouzan, "Computer Networks- A Top-Down approach", McGraw Hill, 2014.

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, "Computer Networks", 5th edition. Pearson Education, 2014.
2. Behrouz A. Forouzan, "Data communications and Networking", 5th edition, TMH, 2017.
3. William Stallings, "Data and Computer Communications", 10th edition, Pearson Education, 2017.
4. Fred Halsall, "Computer Networking and the Internet", 5th edition, Addison Wesley, 2005.

IV

YEAR

COMPUTER SCIENCE AND BUSINESS SYSTEMS

B.Tech.

COURSE CONTENTS

I SEM & II SEM

22CB401 SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Your passion, enthusiasm and just a bit of basic computer skills should be enough..

COURSE DESCRIPTION AND OBJECTIVES:

- To understand concepts related to services, operations and goods.
- To learn about different ways to design Services and assess them using Service qualities.
- To understand various methods to operate and manage Service businesses.
- To know how innovation can be approached from Services point of view.

MODULE-1

UNIT-1   **8L+0T+8P=16 Hours**

INTRODUCTION, SERVICE STRATEGY AND COMPETITIVENESS AND NEW SERVICE DEVELOPMENT

Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector Nature of Services and Service Encounters: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic, Value Co-creation , Development of Strategic Service Vision (SSV), Data Envelopment Analysis.: NSD cycle, Service Blueprinting, Elements of service delivery system.

UNIT-2   **8L+0T+8P=16 Hours**

SERVICE DESIGN AND SERVICE QUALITY

Customer Journey and Service Design, Design Thinking methods to aid Service Design Locating Facilities and Designing Their Layout: models of facility locations (Huff's retail model), Role of service-scape in layout design SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools Service Guarantee & Service Recovery: How to provide Service guarantee? How to recover from Service failure?

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

FORECASTING DEMAND FOR SERVICES, MANAGING CAPACITY AND DEMAND

A review of different types of forecasting methods for demand forecasting. Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

UNIT-2   **8L+0T+8P=16 Hours**

MANAGING FACILITATING GOODS AND VEHICLE ROUTING PROBLEM

Review of inventory models, Role of inventory in services.

Managing Service Supply Relationship: Understanding the supply chain/hub of service, Strategies

for managing suppliers of service. Managing after sales service, Understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes.

PRACTICES:

- Design a new super market in a cosmopolitan city (Identify important attributes, specify attribute levels, experimental design, presentation of alternatives to respondents and estimation of choice model) Application of suitable control statements for decision making.
- Choose any service organization and present it from the perspective of nature of service, classification of service, blueprint or service design analysis, and service quality.
- Prepare a service blueprint for a fast food outlet.
- Using data, software, user and mash up as services prepare a next gen service oriented architecture.
- Prepare a comparative chart analysing any four food delivery agencies and rank them based on reliability, responsiveness, assurance, and empathy.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Describe and distinguish concepts related to services, operations and goods.	Apply	1,2	1,2,3,12
2	Identify ways to design Services and evaluate them using Service qualities.	Apply	1,2	1,2,3,4,12
3	Relate how various methods can be used to operate and manage Service businesses.	Apply	2	1,2,3,12
4	Analyze about how innovation can be approached from Services point of view.	Under-stand	2	1,2,3,4,12

TEXT BOOK:

1. Fitzsimmons, J. A. and M. J. Fitzsimmons, Service Management: Operations, Strategy and Information Technology, Irwin/McGraw Hill, Boston, 2004.
2. Services, marketing: Integrating Customer Focus Across the Firm, Wilson A.,Zeithaml V. A., Bitner M. J., & Gremler D. D., McGraw Hill, 2012.
3. Metters, R., K. King-Metters, M. Pullman, 2003, Successful Service Operations Management, 2003, Thomson South-Western, Australia

REFERENCE BOOKS:

1. Services Marketing, Lovelock, C, 7th Edition, Pearson Education India, 2011.
2. Service Design for Business: A Practical Guide to Optimizing the Customer Experience, Reason, Ben, and Lovlie, Lavrans, Pan Macmillan India, 2016.
3. Open Services Innovation: Rethinking Your Business to Grow and Compete In A New Era, Chesbrough, H. John Wiley & Sons, 2010.
4. Chang, C. M., Service Systems Management and Engineering: Creating Strategic Differentiation and Operational Excellence, John Wiley, New York, NY. 2010.

22DS204 ARTIFICIAL INTELLIGENCE

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Probability & statistics.

COURSE DESCRIPTION AND OBJECTIVES:

The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. In addition to this, student will understand the building blocks of AI such as search, knowledge representation, inference, logic and learning. This course enables the students to develop a small AI system for real time problems.

MODULE-1

UNIT-1   **12L+0T+8P=20 Hours**

INTELLIGENT SYSTEMS

Introduction, what is AI, Examples of AI systems, Brief history of AI Agent, Agents and environments, Structure of agents, the concept of rationality, the nature of environments, Types of agents, problem solving approaches to typical AI problem.

UNIT-2   **12L+0T+8P=20 Hours**

PROBLEM SOLVING

STATE SPACE PROBLEM; Searching: Uniform search, Informed Search: Solving problems by searching: Heuristic functions, Hill climbing, Best First Search, A* algorithm, AO* algorithm, Searching game trees: Min Max Search, Alpha Beta pruning.

PRACTICES:

- In the classical vacuum cleaner problem, we have two rooms and one vacuum cleaner. There is dirt in both the rooms and it is to be cleaned. The vacuum cleaner is present in any one of these rooms. Find the solution, how we can reach to reach a state in which both the rooms are clean and are dust free.
- In this problem, three missionaries and three cannibals must cross a river using a boat which can carry at most two people, under the constraint that, for both banks, that the missionaries present on the bank cannot be outnumbered by cannibals. The boat cannot cross the river by itself with no people on board. Find the solution, how to solve the given problem.
- You are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. Find the solution, how can you get exactly 2 gallons of water in the 4-gallon jug?
- There is a farmer who wishes to cross a river but he is not alone. He also has a goat, a wolf, and a cabbage along with him. There is only one boat available which can support the farmer and either of the goat, wolf or the cabbage. So at a time, the boat can have only two objects (farmer and one other). But the problem is, if the goat and wolf are left alone (either in the boat or onshore), the wolf will eat the goat. Similarly, if the Goat and cabbage are left alone, then goat will eat the cabbage. The farmer wants to cross the river with all three of his belongings: goat, wolf, and cabbage. What strategy he should use to do so?
- Either place a block that doesn't have other blocks stacked on top of it on another block with the same behavior, or on the table. The initial and the goal state are described by the exact position of each block. Find the solution, how to solve the given problem.

- Given a 3×3 board with 8 tiles (every tile has one number from 1 to 8) and one empty space. The objective is to place the numbers on tiles to match the final configuration using the empty space. We can slide four adjacent (left, right, above, and below) tiles into the empty space. Find the solution, how to solve the given problem by using A* search algorithm.
- The rules of tic-tac-toe on the 3 × 3 field are as follows. Before the first turn all the field cells are empty. The two players take turns placing their signs into empty cells (the first player places Xs, the second player places Os). The player who places Xs goes first, another one goes second. Find the solution, how to solve the given problem where the winner is the player who first gets three of his signs in a row next to each other (horizontal, vertical or diagonal).
- In crypt arithmetic problem, the digits (0-9) get substituted by some possible alphabets or symbols. The task in crypt arithmetic problem is to substitute each digit with an alphabet to get the result arithmetically correct. Find the solution, how to solve the given problem, where we can perform all the arithmetic operations on a given crypt arithmetic problem.

MODULE-2

UNIT-1   12L+0T+8P=20 Hours

KNOWLEDGE REPRESENTATION & PLANNING

PROPOSITIONAL LOGIC: Inference in propositional logic, Resolution, Forward chaining, Backward chaining, First order logic: Reasoning patterns in First order logic, Resolution, Forward chaining, Backward chaining, The planning problem: Planning with state space search, Partial order planning, Planning graphs.

UNIT-2   12L+0T+8P=20 Hours

LEARNING
FORMS OF LEARNING: Supervised Learning, Unsupervised learning, Reinforcement learning, Learning Decision Trees, Ensemble Learning, Expert system.

PRACTICES:
- With logic programming, compare expressions and find out unknown values.
- The Wumpus world is a cave with 16 rooms (4×4). Each room is connected to others through walkways (no rooms are connected diagonally). The knowledge-based agent starts from Room [1, 1]. The cave has – some pits, a treasure and a beast named Wumpus. The Wumpus cannot move but eats the one who enters its room. If the agent enters the pit, it gets stuck there. The goal of the agent is to take the treasure and come out of the cave. The agent is rewarded, when the goal conditions are met. The agent is penalized, when it falls into a pit or being eaten by the Wumpus. Some elements support the agent to explore the cave, like -The Wumpus's adjacent rooms are stench. -The agent is given one arrow which it can use to kill the Wumpus when facing it. (Wumpus screams when it is killed). – The adjacent rooms of the room with pits are filled with breeze. -The treasure room is always glittery. Find the Wumpus presented room.
- Implementation of word count using spark RDD.
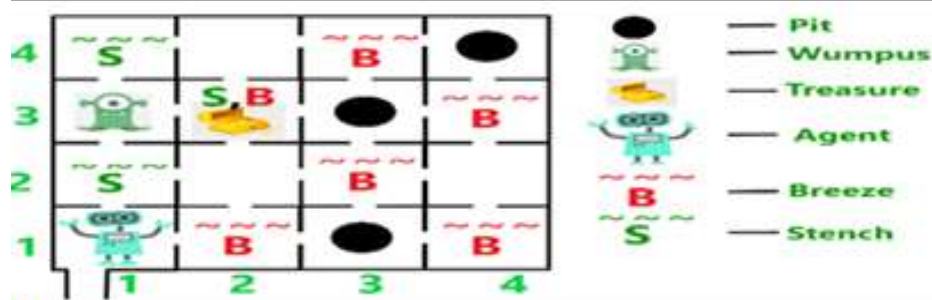
- You are on one side of a river with a wolf, a goat, and a cabbage. You want to transport all three to the other side of the river, but you can only transport one object at a time. You cannot leave the wolf and the goat alone, or the cabbage and the goat alone; you are the only thing keeping them from eating each other. How can you transport everything from one side of the

river to the other? Formulate it in terms of a Planning Domain Definition Language (PDDL).

- Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
- Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
- Implement k-nearest neighbors classification using python.
- Implement linear regression using python.
- Implement the naïve Bayesian classifier for a sample training dataset. Compute the accuracy of the classifier, considering few testdata sets.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply AI search Models and Generic Search strategies for problem solving.	Apply	1	1, 3
2	Inspect and analyze Logic for representing Knowledge and Reasoning of AI systems and Conduct investigation and implement project using AI learning techniques.	Apply	2	2
3	Apply and evaluate the searching strategies to achieve the goal for a given situation.	Analyze	1	6
4	Design different learning algorithms for improving the performance of AI systems.	Apply	2	4

TEXT BOOKS:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2010.

REFERENCE BOOKS:

1. David Poole, Alan Mack worth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press. 2018.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2010.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 2013.

22CB402 INFORMATION SECURITY

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Computer Networks.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on the modern concepts of network security using various cryptographic algorithms and underlying network security applications. It enables to understand various symmetric and asymmetric cryptographic techniques. It focuses on security implementation in practical applications such as e-mail functioning, web security and secure electronic transactions protocol and system security.

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

INTRODUCTION

INTRODUCTION TO COMPUTER AND NETWORK SECURITY CONCEPTS: Computer Security Concepts, Security attacks, Security services, Security mechanisms, Fundamental Security Design Principles, Attack Surfaces and Attack trees, A model for network security.

CLASSICAL ENCRYPTION TECHNIQUES: Symmetric cipher model, Substitution techniques, Transposition techniques.

UNIT-2   **8L+8T+0P=16 Hours**

SYMMETRIC AND ASYMMETRIC CRYPTOGRAPHY

SYMMETRIC CIPHERS: Block cipher principles, Data encryption standard, Strength of DES, Blockcipher design principles, AES cipher, Multiple encryption and triple DES, Block cipher modes of operation, RC4.

ASYMMETRIC CIPHERS AND CRYPTOGRAPHIC HASH FUNCTIONS: Principles of public key crypto systems, RSA algorithm, Diffie-Hellman Key Exchange, Message Authentication requirements, Authentication functions, Message authentication Codes, Hash functions, Security of hash functions and MACs, Digital signature standard.

PRACTICES:

- Implement Substitution and Transposition Ciphers
  - Ceaser cipher
  - Playfair cipher
  - Hill cipher
  - Rail fence cipher
- Implement Symmetric Cipher
  - S-DES
  - RC4
- Implement Asymmetric Cipher
  - RSA
  - Diffie-Hellman
  - Hash Function

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

SECURITY APPLICATIONS

Network Security Applications: Kerberos, X.509 authentication service, Public key infrastructure,

E-Mail Security: Pretty good privacy, S/MIME.

IP Security Overview: IP security architecture, Authentication header, Encapsulating security payload, Combining security associations, key management.

UNIT-2   **8L+8T+0P=16 Hours**

WEB AND SYSTEM SECURITY

Web Security: Secure socket layer and transport layer security, HTTPS, Secure Shell (SSH)

System Security: Intruders, Intrusion detection, Malicious software, Firewalls.

PRACTICES:

- Configure IP Address in a system in LAN (TCP/IP Configuration)
- Configure DNS to establish interconnection between systems
- Configuring Windows Firewall
- Adding users, setting permissions
- Configure Mail server
- Demonstrate the usage of Wireshark to identify abnormal activity in network communication.
- Demonstrate usage of NMAP (Zenmap) Tool in Network Scanning

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply cryptographic techniques in various security service solutions effectively in everyday professional and social contexts	Apply	1, 2	1, 2
2	Analyze the usage of secure protocols to safeguard sensitive data using internet.	Analyze	1, 2	1, 2
3	Usage of tools to Identify abnormal activity in network communication to take appropriate action.	Apply	2	5
4	Apply various security protocols to safe guard the data internet using SSL/TCL.	Apply	2	1, 2

TEXT BOOKS:

1. William Stallings, "Cryptography and Network security", 7th Edition, Pearson Education, 2017.

REFERENCE BOOKS:

1. William Stallings "Network Security Essentials Applications and Standards", 2nd Edition, Pearson Education, 2009.
2. Eric Malwald, "Fundamentals of Network Security", 4th Edition, Pearson Education, 2010
3. Buchmann, "Introduction to Cryptography", 2nd Edition, Pearson Education, 2009
4. Charlie Kaufman, "Radis Perlman and Mike Speciner, Network Security – Private Communication in a Public World", 1st Edition, Pearson Education, 2009.

22CB403 IT PROJECT MANAGEMENT

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Software architecture, Resource management, Data Management.

COURSE DESCRIPTION AND OBJECTIVES:

- To understand IT Project Management concepts, project overview and feasibility studies.
- To apply Project Cost Control and Scheduling techniques like PERT and CPM.
- To describe Agile Project management, Principles and Methodologies.
- To be familiar with Agile methodologies and techniques like Scrum, DevOps, etc.

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MODULE-1

UNIT-1   8L+0T+8P=16 Hours

INTRODUCTION

Project Overview and Feasibility Studies- Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal.

PROJECT SCHEDULING: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity

UNIT-2   8L+0T+8P=16 Hours

COST CONTROL AND SCHEDULING: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Levelling.

PROJECT MANAGEMENT FEATURES: Risk Analysis, Project Control, Project Audit and Project Termination

PRACTICES:

- Understand the project management skills.
  - i. UML diagrams.
  - ii. Database Designs.
  - iii. Develop and manage project budgets.
  - iv. Lead risk management and mitigation efforts.
  - v. Gather, analyse, and report IT metrics.
- Implement projects like
  - i. Academics (Course Registration System, Student marks analysing system).
  - ii. Health Care (Expert system to prescribe medicines for given symptoms, Remote Diagnostics, Patient/Hospital Management System).

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

AGILE PROJECT MANAGEMENT:

Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

SCRUM: Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

UNIT-2   **8L+0T+8P=16 Hours**

DEVOPS:

Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring. Other Agile.

METHODOLOGIES: Introduction to XP, FDD, DSDM, Crystal.

PRACTICES:

- Understand scrum master role and responsibilities.
- DevOps Lifecycle.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand the techniques to effectively plan, manage, execute, and control projects within time and cost targets with a focus on Information Technology and Service Sector.	Under-stand	1, 2	1,2,3,12
2	Apply the project cost control and scheduling tech-niques like PERT and CPM.	Apply	1, 2	1,2,3,12
3	Explore and learn agile project management, principles and methodologies.	Apply	2	1,2,3,12
4	Aware of agile project management techniques such as Scrum and DevOps.	Under-stand	2	1,2,3,12

TEXT BOOKS:

1. Succeeding with Agile: Software Development Using Scrum, Mike Cohn.
2. Project Management for IT Related Projects. ISEB Foundation, BCS Publications.
3. Project Planning and Management with CPM and PERT, Kundan Singh and Mitthan Lal Kansal.

REFERENCE BOOKS:

1. Agile Project Management: 2 Books in 1: Beginner's Guide & Methodology, The Definitive Guide to Master Scrum, Kanban, XP, Crystal, FDD, DSDM.
2. Scrum Guide- Scrum Masters, Ken Schwaber and Jeff Sutherland.
3. DevOps For Beginners, Joseph Joyner.
4. Agile Product Management with Scrum, Roman Pichler.
5. Agile Project Management with Scrum, Ken Schwaber, Microsoft Professional.

SKILLS:

- ✓ *Project management methodologies, such as Waterfall, Agile, and PMI.*
- ✓ *Software proficiency, such as Microsoft Project, Jira, or Trello.*
- ✓ *Data analysis, such as using Excel, SQL, or Python.*
- ✓ *Cost control, such as estimating, budgeting, and tracking expenses.*
- ✓ *Time management, such as setting deadlines, milestones, and deliverables.*

DEPT. ELECTIVES

COMPUTER SCIENCE AND BUSINESS SYSTEMS

B.Tech.

DEPARTMENT ELECTIVES

▶	22CS806	-	Machine Learning
▶	22CB801	-	Image Processing and pattern Recognition
▶	22CB802	-	Introduction to IOT
▶	22CS804	-	Deep Learning
▶	22CB803	-	Advanced Social Text and Media Analytics
▶	22CB804	-	Block Chain Technology
▶	22CB805	-	Mobile Computing
▶	22CB806	-	Cryptology
▶	22CB807	-	Enterprise systems
▶	22CB808	-	Modern Web Applications
▶	22CY801	-	Big Data and Analytics
▶	22CB809	-	Usability design of software applications
▶	22CS812	-	Optimization Techniques
▶	22CB810	-	Simulation and Modelling

COURSE CONTENTS
I SEM & II SEM

22CS806 MACHINE LEARNING

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Probability & Linear Algebra, Python language.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides a broad introduction to various machine learning concepts including Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks) and Unsupervised learning (clustering, dimensionality reduction) methods. Students will get an understanding of various challenges of Machine Learning and will be able to decide on model complexity. Numerous case studies introduced in this course allow the students to apply machine-learning algorithms in computer vision, medical imaging, audio, and text domains. Laboratory experiments of this course will introduce students to advanced Machine Learning Python libraries such as Scikit-Learn, Matplotlib, and many other recent ML-related APIs. The course is designed such that the students get enough hands-on experience with a major focus on the practical implementation of theoretical concepts.

MODULE-1

UNIT-1   12L+0T+8P=20 Hours

INTRODUCTION

What is machine learning? Machine learning applications; Types of Learning: Supervised learning; Un-supervised learning; Reinforcement learning.

MODEL TRAINING ESSENTIALS: Re-sampling methods: Bias–Variance Trade-off. Hypothesis Testing and Variable Selection, Sub sampling and Upsampling, SMOTE; Cross Validation (validation set, Leave-One-Cut (LOO), k-fold strategies) and bootstrap; Evaluation measures-Error functions, Confusion Matrix, Accuracy, Precision and Recall, F1 Score.

REGRESSION ANALYSIS: Linear Regression, Simple and Multiple Linear Regression, Polynomial Regression, Logistic Regression, Multi nominal Regression. Ordinary Least Squares Method, Model Shrinkage-Ridge, and LASSO regression.

UNIT-2   12L+0T+8P=20 Hours

FEATURE SELECTION

FEATURE SELECTION STRATEGIES: Problem statement and Uses, Filter methods, Wrapper methods, Embedded methods. Branch and bound algorithm, Sequential forward/backward selection algorithms.

DIMENSIONALITY REDUCTION: Singular value decomposition, matrix factorization, Linear discriminant analysis, Principal components analysis.

PRACTICES:

- Apply the following tasks to any given dataset:
    a. Load and visualize data.
    b. Check out and replace missing values.
    c. Encode the Categorical data.
    d. Splitting the dataset into Training and Test set.
    e. Splitting the dataset into k-folds.
    f. Feature scaling.
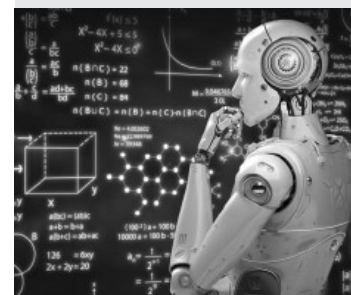
- House price prediction:

  a. Create a model that predicts a continuous value (price) from input features (square footage, number of bedrooms and bathrooms).

  b. Implement a univariate Model using Least Squares and plot best-fit line.

  c. Implement a multivariate Model using Least Squares and plot best-fit line.

  d. Retrieve model error and model coefficients.

  e. Observe Variance Inflation Factor (VIF).

  f. Implement Ridge regression model.

  g. Implement LASSO regression model.

  h. Report your observations on the above models for house prediction.

- Heart disease prediction:

  a. Implement a logistic regression model to predict whether an individual is suffering from heart disease or not.

  b. Evaluate and compare model performance using the following validation approaches:

    i. Validation set approach.

    ii. K-fold cross validation.

    iii. Stratified K-fold cross validation.

    iv. LOO strategy.

  c. Plot Confusion matrix.

  d. Report performance of the model in terms of the following metrics:

    i. Accuracy.

    ii. Precision-Recall.

    iii. F1 Score.

  e. Report your observations and explain when to use what type of measures.

- Implement the Polynomial Regression algorithm to fit data points. Select the appropriate data set for your experiment and draw graphs.

- Working with imbalanced datasets:

  a. Load an imbalanced dataset and visualize imbalance in the data as a bar plot.

  b. Implement KNN model for classification.

  c. Balance the dataset using:

    i. Random Over sampling.

    ii. Random Under sampling.

    iii. SMOTE.

  d. Implement KNN model for classifying data balanced in the above steps.

  e. Report your observations on the performance of models trained using balanced and imbalanced data.

- Perform effective feature selection in a given dataset using any one of the feature selection techniques.

- Dimension Reduction:

  a. Load a dataset and Implement Bayes classification model.

  b. Apply dimension reduction using:

    i. Principal Component Analysis

    ii. Linear Discriminant Analysis

  c. Apply the model on data with reduced dimension.

  d. Compare and contrast model performance in each case.

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

CLASSIFICATION

CLASSIFICATION: Binary, Multi-class and Multi-label Classification; K-Nearest Neighbours, Support Vector Machines, Decision Trees, The Naïve Bayes' Classifier, Class Imbalance, Perceptron ANN model.

ENSEMBLE METHODS: Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking.

UNIT-2   **12L+0T+8P=20 Hours**

CLUSTERING

CLUSTERING: Different distance functions and similarity measures, K-means clustering, Medoids, Hierarchical Clustering-Single linkage and Complete linkage clustering, Graph based Clustering -MST, DBSCAN, Spectral clustering.

PRACTICES:

- Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
- Implement the naïve Bayesian classifier for a sample training data set stored as a.csv file. Compute the accuracy of the classifier, considering few test data sets.
- Assuming a set of spam or not-spam mails that need to be classified, use the naïve Bayesian classifier model to perform this task. Calculate the accuracy, precision, and recall for your data set.
- Implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.
- Demonstrate the working of the decision tree-based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample?
- Build a model using SVM with different kernels.
- Implement and build models using the following Ensemble techniques.
  a. Bagging.
  b. Boosting: Adaboost, Stacking.
- Build a model to perform Clustering using K-means after applying PCA and determining the value of K using the Elbow method.
- Unsupervised Modeling:
  a. Cluster the data using the following models:
    i. Spectral Clustering.
    ii. K-medoids.
    iii. DBSCAN.
    iv. Hierarchical Clustering.
  b. Compare and contrast model performance in each case.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply a wide variety of learning algorithms such as Probabilistic, Discriminative and Generative algorithms for a given application.	Apply	1, 2	1
2	Design an end-to-end Machine-learning model to realize solutions for real-world problems.	Design	1	3
3	Implement various machine learning models using advanced ML tools.	Create	1, 2	5
4	Analyze and evaluate the performance of various machine learning models approaches on different kinds of data.	Analyze	2	2

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", 3rd Edition, The MIT Press, 2014.
2. Flach, Peter. "Machine learning: the art and science of algorithms that make sense of data". Cambridge University Press, 2012.

REFERENCE BOOKS:

1. Murphy, Kevin P. Machine learning: a probabilistic perspective. MIT press, 2012.
2. Aurélien Géron, "Hands-on Machine Learning with Scikit Learn and Tensor Flow", O'reilly, 2017.
3. Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2013. (ISLR).

22CB801 IMAGE PROCESSING AND PATTERN RECOGNITION

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

- To impart fundamental knowledge in the area image processing.
- To understand various filters and techniques available to process an image.
- To provide knowledge of the concepts related to image analysis.
- To learn the fundamentals of pattern recognition.

MODULE-1

UNIT-1   **12L+0T+8P=20 Hours**

INTRODUCTION

Image processing systems and its applications. Basic image file formats Image formation: Geometric and photometric models; Digitization - sampling, quantization; Image definition and its representation, neighbourhood metrics.

UNIT-2   **12L+0T+8P=20 Hours**

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING

Enhancement, contrast stretching, histogram specification, local contrast enhancement; Smoothing, linear and order statistic filtering, sharpening, spatial convolution, Gaussian smoothing, DoG, LoG.

PRACTICES:

- Display an image, its histogram and Perform shrinking, zooming and cropping of an image.
- Perform the experiment for histogram equalization, blurring and de-blurring on an image.
- Write a Matlab program to perform Removal of salt and pepper noise.
- Implement the spatial image enhancement functions on a bitmap image. a) Mirroring (Inversion)   b) Rotation (Clockwise)   c) Enlargement (Double Size).
- Program for smooth an image using Low – Pass filter in frequency domain.
- Program for smooth an image using High – Pass filter in frequency domain..
- Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter.

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

IMAGE/OBJECT FEATURES EXTRACTION

Textural features - gray level co-occurrence matrix; Moments; Connected component analysis; Convex hull; Distance transform, medial axis transform, skeletonization /thinning, shape properties.

UNIT-2   **12L+0T+8P=20 Hours**

SEGMENTATION

Pixel classification; Grey level thresholding, global/local thresholding; Optimum thresholding - Bayes analysis, Otsu method; Derivative based edge detection operators, edge detection/linking, Canny edge detector; Region growing, split/merge techniques, line detection, Hough transform.

SKILLS:

✓ *To know the importance of java web frame-works to develop enterprise java applications.*

✓ *To experience developing a web application using MVC architecture.*

✓ *Design and develop CRUD applications using different java frameworks.*

✓ *To derive hands on experience of developing enterprise applications using advanced web frameworks like Spring and Spring Boot.*

PRACTICES:

- Implement Smoothing and Sharpening of an eight bit color image.
- Implement (a) Boundary Extraction Algorithm (b) Graham's Scan Algorithm.
- Implement (a) Edge Detection (b) Line Detection.
- Implement a function in MATLAB for image segmentation.
- Develop a module to enhance the image by using image arithmetic and logical operations.
- Develop a module for an image enhancement using kernel operations.
- Develop a module for gray level slicing with and without background.
- Develop a module for image enhancement using histogram equalization.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand the basics of image formation, transformations and filters.			
2	Learn various techniques available for feature extraction and image segmentation .			
3	Understand color image processing techniques.			

TEXT BOOKS:

1. Digital Image Processing, R. C. Gonzalez and R. E. Woods, Prentice Hall.
2. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac, Roger Boyle, Brooks/Cole, 3rd Edition.

REFERENCES BOOKS:

1. Image Processing: The Fundamentals. Maria Petrou and Panagiota Bosdogianni, John Wiley & Sons Ltd.
2. Digital Image Processing, K. R. Castleman, Prentice Hall, Englewood Cliffs.
3. Digital Image Processing, William K. Pratt, Wiley.
4. Fundamentals of Digital Image Processing, Anil K. Jain, Pearson.

22CB802 INTRODUCTION TO IOT

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Computer Networks.

COURSE DESCRIPTION AND OBJECTIVES:

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain verticals ranging from civilian to defense sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support a IoT. To introduce the terminology, technology and its applications, to introduce the concept of M2M (machine to machine) with necessary protocols.

MODULE-1

UNIT-1   12L+0T+8P=20 Hours

INTERNET OF THINGS FUNDAMENTALS

INTRODUCTION TO INTERNET OF THINGS; Physical design & Functional Block of IoT, Device architectures, CoreIoT Functional Stack; Resource constrained devices; Sensors and Components; IoT Enabling Technologies. Societal Benefits of IoT (Domain Specific), Risks, Privacy, and Security.

NETWORK AND COMMUNICATION PROTOCOLS: Network Components; Internet Structure, Wireless Protocols; IoT Communication Model & APIs, Wireless Protocol Stack, IoT levels.

UNIT-2   12L+0T+8P=20 Hours

IOT AND M2M

Software defined networks, Network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCONF-YANG: SDN; NFV; Need for IOT Systems Management; SNMP-NETCONF, YANG; IOT Systems management with NETCONF-YANG.

PRACTICES:

- Identify different Sensors and IoT devices
- Identify the Components in Raspberry pi, Arduino, and UNO boards
- Examine IoT levels with any one domain specific application like home automation, weather monitoring system etc.
- Design the Network Configuration and System Management with IoT devices using NETCONF-YANG.
- Design the Network Configuration and System Management with IoT devices using SNMP-NETCONF

MODULE-2

UNIT-1   12L+0T+8P=20 Hours

INTRODUCTION TO SYSTEMS DESIGN & DEVELOPMENT

IoT system building blocks, Arduino, Node MCU– Board details, IDE programming; Raspberry Pi-Model and Interfaces, Platform: Axonize, Blynk IoT platform, Fogwing.

UNIT-2   **12L+0T+8P=20 Hours**

PROGRAMMING AND CASE STUDY

Embedded C vs Python; Operating systems for constrained devices; Domain Specific IoT Application, Task Support IoT Example: The Refrigerator, Weather Monitoring System – Case study- Design, Programming and Execution.

PRACTICES:

- Demonstration and study of Raspberry Pi board, GPIO Pins and familiarity of various sensors.
- Demonstration and study of other Hardware board of IoT such as Arduino Uno and NodeMCU.
- Design and Implementation of controlling LED-using Python in Raspberry Pi board.
- Design and Implementation of sensing light through LDR using Python in Raspberry Pi board.
- Design and Implementation to find obstacles through sensor using Python in Raspberry Pi board.
- Design and Implementation of sensing and display temperature using Python in Raspberry Pi board.
- Design and Implementation of detecting noise through microphone sensor using Python in Raspberry Pi board.
- Design and Implementation of output devices through relay using Python in Raspberry Pi board.
- Design and Implementation of vibration sensor using Python in Raspberry Pi board.
- Design and Implementation of uploading sensor data into cloud using Python.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Illustrate the impact and challenges posed by IoT networks leading to new architectural models.	Analyze	1	4, 6
2	Design an end-to-end Machine-learning model to realize solutions for real-world problems.	Design	1	3
3	Apply various machine-learning models to develop IoT applications.	Apply	2	1
4	Compare and contrast the deployment of smart objects and the technologies to connect them to network.	Evaluate	2	4

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti "Internet of Things: A Hands-on Approach", Universities Press, 2015, ISBN: 9788173719547.
2. Rajkumar Buyya and Amir Vahid Dastjerdi "Internet of Things: Principles and Paradigms", Morgan Kaufmann; 1st Edition, May 25, 2016.

REFERENCE BOOKS:

1. Matt Richardson & Shawn Wallace "Getting Started with Raspberry Pi", O'Reilly (SPD), 2014, ISBN: 9789350239759.
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, A press, and 2013.

22CS804 DEEP LEARNING

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Machine learning, Python programming.

COURSE DESCRIPTION AND OBJECTIVES:

This course offers sufficient details required to understand the basic building blocks of various deep learning based models. Especially, focuses on different types of neural network models like feed forward neural networks, convolutional neural networks, recurrent neural networks, and deep auto encoders. During this course the students build, train, and evaluate deep neural network models for various applications in image, text, and speech domains. In addition, throughout this course students will be able to understand hyper parameter tuning and other best-practices to be followed while training deep neural network models.

MODULE-1

UNIT-1 **12L+0T+8P=20 Hours**

EVOLUTION OF DEEP NEURAL NETWORKS

Deep Learning Intuition: History of Deep Learning, what is Deep Learning? Applications of Deep Learning.

Neural Network Basics: McCulloch–Pitts neuron, Perceptron learning rule, Perceptron convergence theorem, Sigmoidal neuron, Multi-layer feed forward neural network, back propagation algorithm, Gradient descent method, Stochastic gradient descent method. Shallow Neural Networks and Deep Neural Networks.

REGULARIZATION and OPTIMIZATION for training Deep Models: Optimization methods - Adagrad, Adadelta, RMSProp, Adam; Regularization Methods-Dropout, Drop connect, Batch normalization; Activation functions - Linear, sigmoid, sigmoid, ReLU and variations of ReLU; Losss Function, Improving the training process – Dataset Augmentation, Noise Robustness, Weight Initialization methods, Early stopping, Parameter sharing and tying, bagging and other ensemble methods;

UNIT-2 **12L+0T+8P=20 Hours**

CONVOLUTIONAL NEURAL NETWORKS

Convolutional Neural Networks (CNNs): Foundations of Convolutional Neural Network, Popular Deep **CNN Models:** LeNet, AlexNet, VGGNet, ResNet, Google Net and other architectures.

INSTRUCTIONS FOR PRACTICES:

- Practice Assignments can be implemented using the Keras / Tensorflow APIs of Python
- Relevant data sets can be downloaded from standard repositories such as Kaggle/UCI or can be developed by the students.

PRACTICES:

- Implement Logistic regression With Neural Network Mindset.
  - logistic regression classifier for classification.
  - Plot the loss over each epoch.
  - Plot the accuracy over each epoch.
  - Report final Accuracy.

- Implement Shallow Neural Network model:
    - Implement a binary classification neural network with a single and multiple hidden layers.
    - Implement a Multi-class classification neural network with a single and multiple hidden layers.
    - Vary the number of neurons at suitable layers.
- Hyper parameter Tuning of a Neural Network model implemented for hand-written digit classification:
    - Vary the type of activation functions.
    - Choose suitable Loss functions.
    - Vary the number of neurons at suitable layers.
    - Vary Weight Initialization methods.
    - Save the Best Model and load the saved model.
- Building a Deep Neural Network:
    - Implement a multi-class classification neural network with number of layers of your choice.
    - Include Batch Normalization layers.
    - Vary Optimization methods.
    - Add drop out layers.
- Convolutional Neural Network Models.
    - Design a Convolutional neural network with the layers of your choice
    - Compare the performance by changing the
    - Kernel size
    - Number of feature maps at each convolutional layer
    - Stride.
    - Padding.
    - Number of fully connected layers.
- Visualization of CNN Models.
    - Design a Convolutional Neural Network Model for image classification.
    - Plot Model Architecture.
    - Visualize feature maps after training of CNN.
    - Visualize class activation maps.

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

DEEP UNSUPERVISED LEARNING

Transfer learning Approaches: Deep Pre-trained architectures- AlexNet, VGG16, VGG19, ResNEt. Use deep Convolutional architectures for feature extraction and fine-tuning tasks.

Deep Unsupervised Learning: Autoencoders- Under complete Autoencoders, regularized auto encoders, Representation power, layer size and depth, stochastic encoders and decoders, Denoising auto-encoders,   Sparse auto encoder, Contractive auto-encoders

UNIT-2   **12L+0T+8P=20 Hours**

RECURRENT NEURAL NETWORKS

Architecture of an RNN, unfolding of an RNN, Backpropagation through time, Long short term memory (LSTM), Gated recurrent units, Applications- Text Classification, Sentiment Analysis.

PRACTICES:
- Using Deep pre-trained CNN model for feature extraction:
    - Extract features from the FC1 of VGG network.
    - Train any traditional ML model like SVM for classification.
    - Repeat the above by considering FC2 of VGG for feature extraction.

- Fine-tuning Deep pre-trained CNN for Classification:
  - Fine-tune VGG network for the task under consideration.
  - Check the performance by making.
  - all the layers trainable.
  - freezing the initial layers.
  - freezing the entire network except the final layer.
- Design MLFFNN with 3-level stacked autoencoder based pre-training for Black and white image data, Display features extracted by different levels of stacked autoencoder at the end of pre-training.
- Sentiment Analysis
  - Pre-process the text.
  - Convert the text into word embeddings.
  - Implement the classification network using LSTMs/ GRUs.
  - Pre-process the text.
  - Convert the text into word embeddings.
  - Implement the classification network using LSTMs/ GRUs.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Implementation of Deep learning models to solve various real-time problems.	Apply	1,2	1, 3
2	Analyse performance of a deep network and tune its capacity and hyper parameters.	Analyze	1	2
3	Leveraging tools to Build deep networks and apply them for real word tasks.	Apply	1,2	1,5
4	Developing core components for deep learning algorithms.	Design	1,2	3

TEXT BOOKS:

1. Ian Good Fellow and Yoshua Bengio and Aaron, "Deep Learning", 1st Edition, MIT Press, 2016.
2. Charu C Aggarwal "Neural Networks and Deep learning", Springer International Publishing, 2018.

REFERENCE BOOKS:

1. Francois Chollet, "Deep learning with python", 1st edition, Manning Publications, 2017.
2. S. Haykin, "Neural Networks and Learning Machines", 3rd edition, Prentice Hall of India, 2011.
3. Josh Patterson and Adam Gibson, "Deep Learning: A Practitioner's Approach", 1st Edition, O'Reilly, 2017.
4. Satish Kumar, "Neural Networks, A Classroom Approach", Tata McGraw-Hill, 2007.

22CB803 ADVANCED SOCIAL, TEXT AND MEDIA ANALYTICS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Project management skills.

COURSE DESCRIPTION AND OBJECTIVES:

- To provide an overview of common text mining and social media data analytic activities
- To understand the complexities of processing text and network data from different data sources
- Understand and apply social media analytics tools.
- To enable students to solve complex real-world problems for sentiment analysis and recommendation systems

MODULE-1

UNIT-1
                                                                    12L+0T+8P=20 Hours

TEXT MINING

Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications.

UNIT-2
                                                                    12L+0T+8P=20 Hours

METHODS & APPROACHES

Content Analysis; Natural Language Processing; Clustering &Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Prediction

WEB ANALYTICS: Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization

PRACTICES:

- What is Text Mining (or Natural Language Processing) ?
- What are the steps involved in Text Mining ?
- What are the feature engineering techniques used in Text Mining ?
- Text Mining Practical - Predict the interest level
- Text Mining is performed on which kind of data?
- Which of the following packages is where unstructured data cannot be useful?
- Which of the following is a true statement for pre-processing topics in untrusted data?
- Which of the following popular Open-source libraries for NLP?
- Which Step-by-step instruction is used to discover record closeness in NLP?
- To normalize keywords in NLP, which technique do we follow?
- Which one of the following is a perfect statement for Term Frequency (TF)?
- What will TF-IDF do?
- What is the output of the line of code shown below?
- What are the common NLP techniques?

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

WEB CRAWLING AND INDEXING, RANKING ALGORITHMS, WEB TRAFFIC MODELS SOCIAL MEDIA ANALYTICS

Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization.

UNIT-2   **12L+0T+8P=20 Hours**

MAKING CONNECTIONS

Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis Home Assignments:

1. Language Analysis: Students are expected to analyze the language of a category of text (e.g.,literary, cademic, social media) of their selection. Based on the analysis, students are expected to provide a critical description of the texts involved and possibly distinguishing them from other texts and/or ncovering relationships or concepts communicated by the text authors.

2. Students are required Perform sentiment analysis using Twitter. Students will be required touse off the-shelf software and/or code of their own to detect sentiment/emotion in the data and write a description of the methods they use and the results.

PRACTICES:

*   Why is social media analytics important for businesses?
*   Are there any ethical considerations that should be kept in mind while performing social media analytics?
*   What factors should we consider before choosing a tool or platform for performing social media analytics?
*   What do you think is the best way to deal with missing values in datasets collected from social media sources?
*   What methodologies do you follow when presenting insights from social media analytics to stakeholders?

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand Text Mining and carry out Pattern Discovery, Predictive Modelling.	Analyze	1	1, 2, 12
2	Find state of the art web mining tools and librar-ies on realistic data sets as a basis for business decisions and applications.	Apply	1	3, 5
3	Explore the use of social network analysis to un-derstand the growing connectivity and complexity in the world around us on different scales – ranging from small groups to the World Wide Web.	Evaluate	1	1,2,3,12
4	Perform social network analysis to identify import-ant social actors, subgroups (i.e., clusters),and network properties in social media sites such as Twitter, Facebook, and YouTube.	Design	2	1,2,3,6,12

TEXT BOOKS:

1. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Ronen Feldman and James Sanger, Cambridge University Press, 2006.
2. Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Hansen, Derek, Ben Sheiderman, Marc Smith, 2011 Morgan Kaufmann, 304.
3. Web Analytics 2.0: The Art of Online Accountability, Avinash Kaushik, 2009.

REFERENCE BOOKS:

1. Introduction to Social Network Method Hanneman, Robert and Mark Riddle, 2005.
2. Social Network Analysis: Methods and Applications, Wasserman S. & Faust K. New York, Cambridge University Press, 1994.
3. Theories of Communication Networks, Monge P. R. & Contractor N. S, New York, 2003.
4. http://nosh.northwestern.edu/vita.html, Oxford University Press.
5. Web Data Mining Exploring Hyperlinks, Contents, and Usage Data, Bing Liu, 2nd Edition, Springer, 2011.

22CB804 BLOCKCHAIN TECHNOLOGIES

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Cryptography and Network Security.

COURSE DESCRIPTION AND OBJECTIVES:

This course covers the technical aspects of public distributed ledgers, blockchain systems, cryptocurrencies, and smart contracts. Students will learn how these systems are built, how tointeract with them, how to design and build secure distributed applications.

MODULE-1

UNIT-1   12L+0T+8P=20 Hours

INTRODUCTION TO BLOCKCHAIN

Backstory of Blockchain, Blockchain, centralized vs.Decentralized Systems, Layers of Blockchain, Importance of Blockchain, Blockchain Uses and UseCases.

UNIT-2   12L+0T+8P=20 Hours

HOW BLOCKCHAIN WORKS

Laying the Blockchain Foundation, Cryptography, Blockchain- Merkle trees, Properties of Blockchain Solutions, Blockchain Transactions, Distributed Consensus Mechanisms, Blockchain Applications-Scaling Blockchain.

HOW BITCOIN WORKS: The History of Money, Dawn of Bitcoin, Bitcoin- The Bitcoin Blockchain,The Bitcoin Network- Bitcoin Scripts, Full Nodes vs. SPVs, Bitcoin Wallets.

PRACTICES:

- Generate the crypto material for the various participants in the bootstrapping network.
- Generate the genesis block for the Orderer node and start ordering service (solo node) in the bootstrapping network.
- Generated the configuration transaction block to create a new channel in the bootstrapping network.
- Sign the configuration block and create the new channel.
- Make peers of all the organizations join the channel that we created in the bootstrapping network.
- Setup Metamask in the System and Create a wallet in the Metamask with Test Network.
- Create multiple accounts in Metamask and perform the balance transfer between the
- accounts and describe the transaction specifications.
- Create a custom RPC network in Metamask and connect it with Ganache tool and transfer the ether between ganache account.

MODULE-2

UNIT-1   12L+0T+8P=20 Hours

HOW ETHEREUM WORKS

From Bitcoin to Ethereum -Enter the Ethereum Blockchain-Ethereum Smart Contracts Ethereum Virtual Machine and Code Execution - Ethereum Ecosystem.

UNIT-2   **12L+0T+8P=20 Hours**

BLOCKCHAIN APPLICATION DEVELOPMENT

Decentralized Applications- Blockchain Application, Development-Interacting with the Bitcoin Blockchain -Interacting Programmatically with Ethereum Interacting Programmatically with Ethereum—Creating a Smart Contract-Interacting Programmatically with Ethereum—Executing Smart Contract Functions-Blockchain Concepts Revisited-Public vs. Private Blockchains- Decentralized Application Architecture

PRACTICES:

- Install and Getting Started with the Bitcoin core client. Write a program to get a Bitcoin and create transaction.
- Write a program to implement application on bitcoin
- Setup the Ethereum development environment. Generate addresses and create transaction.
- Write a program to implement application on Ethereum.
- Write a program to create smart contract

UNIT-2   **12L+0T+8P=20 Hours**

MAKING CONNECTIONS

Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis Home Assignments:

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyse the interaction process with blockchain systems.	Analyze	1	1, 2, 3
2	Design, build, and deploy smart contracts and distributed applications.	Analyze	1	1, 2, 3
3	Apply the process involved in decentralization of Bit coin development.	Apply	2	3
4	Demonstrate the usage of Ethereum tool	Create	2	1,3,5

TEXT BOOKS:

1. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.

REFERENCE BOOKS:

1. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System.
2. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellowpaper.2014.
3. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.
   Melanie Swan, Blockchain - Blueprint for a new economy, O'Reilly Media, Inc., 2015

22CB805 MOBILE COMPUTING

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Computer Networks, MANET, WSN.

COURSE DESCRIPTION AND OBJECTIVES:

- To learn about the basic concepts of wireless and mobile infrastructure
- To learn location management, handoff process, narrowband and wide brand spectrum
- To describe current technology trends for the implementation and deployment of Mobile ad hoc and wireless sensor networks.
- To design the wireless networks based on the cognitive radios and gives an understanding of cognitive radio architecture and D2D communications in 5G cellular networks.

MODULE-1

UNIT-1   12L+0T+8P=20 Hours

INTRODUCTION: Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations: - 1G to 5G.

UNIT-2   12L+0T+8P=20 Hours

LOCATION MANAGEMENT: Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based); Mobility models characterizing the movement of groups of nodes (Reference point-based group mobility model, Community based group mobility model); Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based);

Terminal Paging (Simultaneous paging, Sequential paging); Location management and Mobile IP; Overview of Handoff Process; Factors affecting handoffs and performance evaluation metrics; Handoff strategies; Different types of handoffs (soft, hard, horizontal, vertical.

PRACTICES:

- Installation of Android studio, its required tools and Android Virtual Device (Emulator).
- Displaying the welcome message in AVD.
- Creating a basic Activity and applying themes, styles to it.
- Displaying various types of Dialog objects.

MODULE-2

UNIT-1   12L+0T+8P=20 Hours

Wireless Transmission Fundamentals: Introduction to narrow and wideband systems; Spread spectrum; requency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to FDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and zigbee). .

MOBILE ADHOC NETWORKS: Characteristics and applications; Coverage and connectivity problems; outing in MANETs. Wireless Sensor Networks: Concepts, basic architecture, design objectives and

applications; Sensing and communication range; Coverage and connectivity; Sensor placement; Data relaying and aggregation; Energy consumption; Clustering of sensors; Energy efficient Routing (LEACH).

UNIT-2   **12L+0T+8P=20 Hours**

COGNITIVE RADIO NETWORKS: Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

D2D Communications in 5G Cellular Networks: Introduction to D2D communications; High level requirements for 5G architecture; Introduction to the radio resource management, power control and mode selection problems; Millimeter wave communication in 5G.

PRACTICES:

- Passing data using intent object.
- Usage of Fragments and adding them dynamically to the application.
- Communication between fragments.
- Creating various layouts.
- Displaying Action bar.
- Handling view events.
- Linking activities with Intents.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	understand the concepts of wireless, mobile infra-structure and to create propagation and path loss models	Unda-stand	1	1,2,3,12
2	understand location management, handoff process, narrowband and wideband spectrum.	unda-stand	1	1,2,3,12
3	Analyze the functionality of wireless transmission protocols and enables the students to examine the important aspects of Mobile Ad hoc Networks and wireless sensor networks	Analyze	2	1,2,3,12
4	Design and understand the wireless networks based on the cognitive radios, and to explain the concepts behind D2D communications in 5G Cellular networks.	Design	2	1,2,3,12

TEXT BOOKS:

1. Jochen schiller, mobile communications, 2nd edition, Pearson education, 2009.
2. Goldsmith, Andrea. Wireless communications. Cambridge university press, 2005.
3. Rappaport, Theodore S. Wireless communications: Principles and practice, 2/E. Pearson Education, India, 2010.

REFERENCE BOOKS:

1. Ezio Biglieri, MIMO Wireless Communications, Cambridge University Press,2007.
2. Ivan Stojmenovic , Handbook of Wireless Networking and Mobile Computing, , Wiley,2002.
3. Cowling, James. "Dynamic location management in heterogeneous cellular networks." Bachelor Thesis, University of Sydney, Australia (2004).
4. Stüber, Gordon L., and Gordon L. Steuber. Principles of mobile communication. Vol. 2. Boston: Kluwer academic, 2001.

22CB806 CRYPTOLOGY

Hours Per Week :

L	T	P	C
3	2	0	4

PREREQUISITE KNOWLEDGE: .

COURSE DESCRIPTION AND OBJECTIVES:

- To explain the basic and emerging concepts of cryptography algorithms.
- To illustrate and defend against unauthorized access using Authentication process.
- To illustrate and defend the security attacks on information systems using secure Algorithms.
- To evaluate the key concepts of cryptanalysis and quantum cryptography.

MODULE-1

UNIT-1   **12L+8T+0P=20 Hours**

INTRODUCTION TO CRYPTOGRAPHY

Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems. Basic Security Services: confidentiality, integrity, availability, non-repudiation, privacy..

UNIT-2   **12L+8T+0P=20 Hours**

BASIC SYMMETRIC KEY CRYPTOSYSTEMS

Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC.

BASIC SYMMETRIC KEY CRYPTOSYSTEMS

Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication.

PRACTICES:

- Perform encryption and decryption using following transposition techniques i. Rail fence ii. Row & Column Transformation.
- Implement the Diffie-Hellman Key Exchange algorithm for client-server model.
- Calculate the message digest of a text/image/video using the SHA-1 algorithm..
- Implement the SIGNATURE SCHEME - Digital Signature Standard.

MODULE-2

UNIT-1   **12L+8T+0P=20 Hours**

PUBLIC KEY CRYPTOSYSTEMS: RSA, ECC; DIGITAL SIGNATURES

SECURITY APPLICATIONS (SELECTED TOPICS): Electronic commerce (anonymous cash,

micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis

UNIT-2   **12L+8T+0P=20 Hours**

INTRODUCTORY TOPICS IN POST-QUANTUM CRYPTOGRAPHY

Post-Quantum Cryptography, lattice-based cryptography-NTRU Encryption, code-based cryptography-

McEliece Cryptosystem, hash-based cryptography. Contact Tracing Applications, Issues related to Quantum Cryptanalysis.

PRACTICES:

- Perform encryption and decryption using following transposition techniques i. Rail fence ii. Row & Column Transformation.
- Implement the Diffie-Hellman Key Exchange algorithm for client-server model.
- Calculate the message digest of a text/image/video using the SHA-1 algorithm.
- Implement the SIGNATURE SCHEME - Digital Signature Standard.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Illustrate the need of security to introduce strong cryptosystems and analyse the cryptographic algorithms for information security.	Analyze	1	1, 2, 3
2	Design the authentication schemes for membership authorization.	Apply	1	1, 2, 3
3	Evaluate the requirements for secure communication and challenges related to the secure applications.	Apply	2	3
4	Provide solutions for security related issues using Post quantum cryptography.	Create	2	1,3,5

TEXT BOOKS:

1. Cryptography, Theory and Practice, D. R. Stinson, CRC Press.
2. Handbook of Applied Cryptography, A. J. Menezes, P. C. van Oorschot and S. A. Vanstone, CRC Press.
3. A Course in Number Theory And Cryptography, N. Koblitz, GTM, Springer

REFERENCE BOOKS:

1. Cryptography and Network Security. W. Stallings, Prentice Hall
2. Security Engineering, R. Anderson, Wiley
3. RC4 Stream Cipher and Its Variants, G. Paul and S. Maitra, CRC Press, Taylor & Francis Group, Chapman & Hall Book, 2012.
4. Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony, C. S. Mukherjee, D. Roy, S. Maitra, Springer, 2020.
5. Contact Tracing in Post-Covid World - A Cryptologic Approach, P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer, 2020.

22CB807 ENTERPRISE SYSTEMS

Hours Per Week :

L	T	P	C
3	2	0	4

PREREQUISITE KNOWLEDGE: Computer networks.

COURSE DESCRIPTION AND OBJECTIVES:

- To introduce the essential concepts of ERP involved in business processes
- To impart skills in the design and implementation of ERP architecture
- To impart skills in the implementation of ERP architecture
- To familiarize with various tools and technologies for developing ERP for large project

MODULE-1

UNIT-1   **12L+8T+0P=20 Hours**

INTRODUCTION: MODEL - VIEW - CONTROL (MVC) ARCHITECTURE

Overview of MVC -MVC method of software development in a 3-tier environment -Control (MVC) development in a 3-tier environment. TOOLS AND TECHNOLOGIES: Microsoft .NET framework, PHP, Ruby on Rails, JavaScript, Ajax and Overview of SAP and Oracle Applications.

UNIT-2   **12L+8T+0P=20 Hours**

ERP ARCHITECTURE AND GENERIC MODULES

Service Oriented Architecture (SOA) - Principles of loose coupling – encapsulation - Inter-operability - Enterprise Resource Planning (ERP) systems and their architecture - Generic ERP Modules: Finance, HR, Materials Management, Investment - Examples of Domain Specific Modules.

ERP TECHNOLOGIES: Business Process Reengineering - Decision Support System - On-Line Analytical Processing -Electronic Data Exchange - Customer Relationship Management (CRM) - Supplier Relationship Management (SRM).

PRACTICES:

- Design and implement CRM models.
- Design and implement SOA architecture.

MODULE-2

UNIT-1   **12L+8T+0P=20 Hours**

ERP NETWORKING & SECURITY

Overview of MPLS - Virtual Private Networks (VPN) – Firewalls - Network monitoring and enforcement of policies - ERP Security Issues – Authentication – Authorisation - Access control – Roles - single-sign-on -Directory servers - Audit trails - Digital signatures – Encryption - review of IPSec – SSL.

UNIT-2   **12L+8T+0P=20 Hours**

SOFTWARE ARCHITECTURES FOR ENTERPRISE SYSTEMS

Software: Acquisition Process – Tendering - conditions of contract - Commercial off the shelf software

(COTS) Implementations - Bespoke Implementations - Total cost of ownership - Issues on using Open source software or free software and Licensed software Hardware Architectures for Enterprise Systems: Hardware: Servers –Storage area networks - Storage units - Back-up strategies - Local Area Network (LAN) technologies and products - Data Centres - Hardware Acquisition - Disaster Recovery.

PRACTICES:
- Design and implement SRM models.
- Design web application using MVC.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify the design involved in simple web applications using MVC architecture, related tools and techniques.	Understand	1	1,2,3,12
2	Evaluate SOA, ERP models, design and implement CRM, SRM models.	understand	1	1,2,3,12
3	Analyze interactive network and applications.	Analyse	2	1,2,3,12
4	Develop model for ERP for large projects understanding both hardware and software requirement.	Analyse	2	1,2,3,12

TEXT BOOKS:
1. Enterprise Resource Planning, Alexis Leon, 4th Edition, Tata McGraw Hill, 2020 .
2. Enterprise Resource Planning and Supply Chain Management, Kurbel K. E., Springer, 2016.

REFERENCE BOOKS:
1. Enterprise Resource Planning - Fundamentals of Design and Implementation, Ganesh K., Sanjay M., Anbuudayasankar S. P., Sivakumar P., Springer, 2014.
2. Enterprise Systems for Management, Luvai F. Motiwalla and Jeff Thompson, 2nd Edition, Pearson, ISBN-13: 978-0-13-214576-3, 2011.
3. Enterprise Systems for Management, Motiwalla, L. F., & Thompson J., eBook, 2nd Edition, Boston, MA, Pearson, 2012.

22CB808 MODERN WEB APPLICATIONS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: .

COURSE DESCRIPTION AND OBJECTIVES:

- To enable students to develop modern web application by leveraging latest Technologies
- To build strong foundation in students making them job ready as per industry
- Requirements
- To enable them to learn new technologies by applying foundation paradigms
- To building strong expertise to develop end to end application - web frontend and backend development

MODULE–1

UNIT-1   **12L+0T+8P=20 Hours**

INTRODUCTION

Concept of website, its need and purpose, Types of websites: Static and dynamic website, Introduction to HTML, XML, JSON, Web Browsers, − Web Servers, Uniform Resource Locator, Tools and Web Programming Languages. Web Standards, Tiered Architecture: Client Server Model, Three Tier Model, Service Oriented Architectures, REST services.

UNIT-2   **12L+0T+8P=20 Hours**

HYPERTEXT MARK UP LANGUAGE

Languages used for website development, HTML5: basic tags, formatting tags, Adding images, Lists, Embedding multimedia in Web pages, Inserting tables, Internal and External Linking, Frames, Forms.

PRACTICES:

- Design the following static web pages required for an online book store web site.
- The static home page must contain three frames.
- Top frame: Logo and the college name and links to Home page, Login page, Registration page,
- Catalogue page and Cart page (the description of these pages will be given below).
- Left frame: At least four links for navigation, which will display the catalogue of respective
- links .For e.g.: When you click the link" CSBS" the catalogue for CSBS Books should be displayed in the Right frame. Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the website.
- links .For e.g.: When you click the link" CSBS" the catalogue for CSBS Books should be displayed in the Right frame. Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the website.
-
-

LOGO	WEB SITE NAME		
Home	Login	Registration Catalogue	Cart
CSBS CSE, ECE EEE CIVIL		Description of theWeb Site	

LOGIN PAGE

This page looks like below:

LOGO	WEB SITE NAME			
Home	Login	Registration	Catalogue	Cart
CSBS				
ECE	Login:			
EEE	Password:			

CATALOGUE PAGE

The catalogue page should contain the details of all the books available in the website in a tabular format. The details should contain the following:

- Snap shot of Cover Page.
- Snap shot of Cover Page.
- Book Title, Author Name, Publisher.

LOGO		WEB SITE NAME		
Home	Login	Registration	Catalogue	Chart
CSBS		Book: XMLBible		
		Author :Winston	$ 40.5	
		Publication: Wiely		
ECE				
EEE		Book: AI	$ 63	
		Author : S.Russel		
		Publication: Princeton hall		
CIVIL		Book: Java2	$ 35.5	
		Author :Watson		
		Publication:BPB publications		
		Book: HTMLin 24hours	$ 50	
		Author :Sam Peter		
		Publication:Sam publication		

The cart page contains the details about the books which are added to the cart. The cart page should look like this:

LOGO	WEB SITE NAME			
Home	Login	Registration	Catalogue	Chart
CSBS ECE EEE CIVIL CSE	Book name Price		Quantity	Amount
	Java 2XML $35.5		2	$70
	bible		1	$40.5
		$40.5	Total amount	$130.5

- Create a "registration form" with the following fields

- Name (Text field)

- Password (password field)

- E-mail id(text field)

- Phone number(text field)

- Sex(radio button)

- Date of birth (3selectboxes)

- Languages known (checkboxes–English, Telugu, Hindi, Tamil)

- Address(text area)

3. Write Java Script to validate the following aelds of the above registration page.

- Name (Name should contains only alphabets and the length should not be less than 6 characters).

- Password (Password should not be less than 6 characters length).

- E-mail id (should not contain any invalid and must follow the standard pattern name@ domain.com)

- Phone number(Phone number should contain 10 digits only).

- Write Java Script to validate the above login page with the above parameters.

4. Design a web page using CSS (Cascading Style Sheets) which includes the following: Use different font, styles: In the style definition you define how each selector should work(font, color etc.).Then ,in the body of your pages, you refer to these selectors to activate the styles. For example: Set a background image for both the page and single elements on the page. You can define the background image for the page like this: Control the repetition of the image with the background-repeat property. As background-repeat: repeat Tiles the image until the entire page is filled, just like an ordinary background image in plain HTML. Define styles for links as A: link A: visited A: active A: hover

MODULE–2

UNIT-1   **12L+0T+8P=20 Hours**

CASCADING STYLE SHEETS (CSS3):

Basics of Cascading Style sheets, Advantages of CSS, External Style sheet, Internal style sheet, Inline style sheet, CSS Syntax, color, background, Font, images.

JAVA SCRIPT:

Features of JavaScript, extension of JavaScript, Syntax of JavaScript: data types, operators, variables, tag, Document Object Model (DOM) with JavaScript, Selection Statement using if and Switch, Iterative statement: for, for/in, while, do while, break and continue.

UNIT-2   **12L+0T+8P=20 Hours**

FRONT END FRAMEWORK

Introduction to jQuery - Syntax, Selectors, Events, Traversing, AJAX; Introduction to Bootstrap – Basics, Grids, Themes; Angular JS – Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, Validation.

BACK END TECHNOLOGIES

Introduction to RESTful services, Resources, Messages (Request, Response), Addressing, Methods – (GET, POST, PUT, DELETE)

PRACTICES:

- Write an XML ale which will display the Book information which includes the following:
- Title of the book
- Author Name
- ISBN number
- Publisher name
- Edition
- Price
- Write a Document Type Deanition (DTD)to validate the above XML file. Display the XML file as follows. The contents should be displayed in a table. The header of the table should be in color GREY. And the Author names column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use XML schemas XSL and CSS for the above purpose. Note: Give atleastfor4 books. It should be valid syntactically. Hint: You can use some xml editors like XML-spy.
- Write Program in PHP to demonstrate basics of PHP Convert all the previous forms to PHP forms.
- Write a PHP Code to make database connection, Create Data Base, Create Table In Mysql
- Write a program in PHP to perform CRUD(Create, InseRt, Update, Delete operations) Study of Image Uploading in PHP Design A from which upload And Display Image in PHP.
- Install a database (Mysql). Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).
- Write a PHP code to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page. Update user data, delete specific users

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Build static and dynamic web pages with HTML, XML, JSON.	Apply	1	2
2	Create Dynamic web pages using CSS and Java Script.	Evaluate	2	2,3
3	Understand the concepts, analyse and build interactive web applications.	Analyse	2	5
4	Apply various frameworks of web technologies to optimize the applications.	Create	2	5,10

TEXT BOOKS:

1. Internet and World Wide Web: How to Program, Deitel P. J., Deitel H. M. and Deitel A. 5th Edition, Pearson Prentice Hall, 2012.
2. HTML & CSS: Design and Build Websites, Jon Duckett, John Wiley & Sons.

REFERENCE BOOKS:

1. Programming the World Wide Web, Sebesta R. W, 8th edition, Pearson, 2014.
2. Web Engineering: a practitioner's approach, Pressman R. and Lowe D,1st Edition, Mc GrawHill, 2008.
3. Web Engineering: The Discipline of systematic Development of Web Applications, Kappel G., et al, 1st Edition, John Wiley & Sons, 2006.
4. Web Engineering: Principles and Techniques, Suh W,Idea Group Inc, 2005
   PHP for the Web: Visual Quick Start Guide, Ullman L, 5th Edition

22CY801 BIG DATA AND ANALYTICS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Basics of Databases, Data mining.

COURSE DESCRIPTION AND OBJECTIVES:

This course serves as an introductory course to gain knowledge on analyzing Big Data. Expecting to face Big Data storage, processing, analysis, visualization, and application issues on both workplaces and research environments. Get insight on what tools, algorithms, and platforms to use on which types of real world use cases.

MODULE-1

UNIT-1   **12L+0P+8P=20 Hours**

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-2   **12L+0P+8P=20 Hours**

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.

PRACTICES:

- Hadoop installation in standalone machine.
- Pig installation.
- Setup of Hadoop cluster.
- HDFS basic command-line file operations.
- HDFS monitoring User Interface.

MODULE-2

UNIT-1   **12L+0P+8P=20 Hours**

MAPREDUCE PROGRAMMING

Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting , Compression, Real time applications using Map Reduce, combiner, Partitioner, matrix multiplication using Map Reduce and page rank algorithm using Map Reduce.

UNIT-2   **12L+0P+8P=20 Hours**

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!.

Hive: Introduction to Hive, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), Partitions and bucketing, working with XML files, User-Defined Function (UDF) in Hive, Pig versus Hive.

SPARK PROGRAMMING: Introduction, features of Spark, components of Spark, Programming with Resilient Distributed datasets (RDDS).

PRACTICES:

- Word Count Map Reduce program using Hadoop.
- Implementation of word count with combiner Map Reduce program.
- Practice on Map Reduce Monitoring User Interface.
- Implementation of Sort operation using Map Reduce.
- Map Reduce program to count the occurrence of similar words in a file by using partitioner.
- Design Map Reduce solution to find the years whose average sales is greater than 30.
  - o input file format has year, sales of all months and average sales.
  - o Year Jan Feb Mar April May Jun July Aug Sep Oct Nov Dec Average.
- Map Reduce program to find Dept wise salary.
  - o Empno Emp Name Dept Salary.
- Designing of Pig Latin scripts to sort, group, join, project and filter the data.
- Implementation of Word count using Pig.
- Creation of Database and tables using Hive query language.
- Implementation of partitions and buckets using Hive query language.
- Implementation of word count using spark RDD.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Mod-ule No.	Mapping with POs
1	Use of Big data frameworks like Hadoop and NOSQL to efficiently store and process Big data to generate analytics.	Apply	1	1, 2, 5,9,10,12
2	Design a solution for data intensive problems using Map Reduce paradigm.	Apply	1	1, 2, 5, 9,10,12
3	Design and analyze the solutions of Big data using Pig and Hive to solve data intensive and to generate analytics.	Apply	2	1, 2, 3, 5, 9,10,12
4	Analyze Big data using Spark programming.	Analyze	2	1, 2, 3, 5, 9,10,12

TEXT BOOK:

1. Seema Acharya, Subhashini Chellappan, "Big Data Analytics", Wiley, 2015.
2. Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, "Learning Spark: Lightning-Fast Data Analysis", O'Reilly Media, Inc., 2015.

REFERENCE BOOKS:

1. Boris Lublinsky, KevinT. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, 2015.
2. Chris Eaton,Dirk deRooset al. , "Understanding Big data ", McGraw Hill, 2012.
3. Tom White, "HADOOP: The definitive Guide", O Reilly 2012.

SKILLS:

✓ *Build and maintain reliable, scalable, distributed systems with Apache Hadoop*

✓ *Develop Map Reduce based applications for Big data*

✓ *Design and build applications using Hive and pig based Big data applications*

✓ *Learn tips and tricks for big data use cases and solutions*

22CB809 USABILITY DESIGN OF SOFTWARE APPLICATIONS

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Prior knowledge of HTML, CSS, JavaScript, design thinking.

COURSE DESCRIPTION AND OBJECTIVES:

- To create a learning system through which management students can enhance their innovation and creative thinking skills
- To acquaint themselves with the special challenges of starting new ventures
- To use IPR as an effective tool to protect their innovations and intangible assets from exploitation
- To gain expertise in redesigning an existing Application or website for better user experience

MODULE-1

UNIT-1   **12L+0T+8P=20 Hours**

INTRODUCTION TO USER CENTRED DESIGN

Basics of User Centered Design. Aspects of User Centred Design: Product Appreciation Assignment – Evaluating the product from user centred design aspects such as functionality, ease of use, ergonomics, aesthetics.

UNIT-2   **12L+0T+8P=20 Hours**

HEURISTIC EVALUATION

10 Heuristic Principles, Examples Heuristic Evaluation: Group Assignment initiation (Website and App) Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.

PROJECT DESIGN LIFECYCLE: Redesign project through the design lifecycle – Discovery - Define – Design - Implement (Design Prototype) - Usability Testing

PRACTICES:

- Usability problems in a UI design
- Structured code writing with:
    - i. Consistency & standards.
    - ii. Error prevention.
    - iii. Recognition rather than recall.
    - iv. Aesthetic & minimalist design.

MODULE-2

UNIT-1   **12L+0T+8P=20 Hours**

UX RESEARCH

Understanding users, their goals, context of use, and environment of use. Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX, Personas and Scenarios: Scenarios and Persona Technique –Overview of Design Thinking Technique - Discovery and brainstorming

UNIT-2   **12L+0T+8P=20 Hours**

DEVELOPMENT AND PROTOTYPING

Concept Development - Task flow detailing for the Project – Prototyping Techniques - Paper, Electronic, and Prototyping Tools.

PRACTICES:

- Understand UX design cycle
- Train yourself in crucial skills and tools.
- Practice with real-world exercises

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Explain fundamentals of User Centered Design and User Experience their relevance and contribution to businesses.	Under-stand	1, 2	1,2,3,12
2	Relate the facets of User Experience (UX) Design, particularly as applied to the digital artefacts.	Apply	2	1,2,3,12
3	Appraise user research, solution conceptualization and validation as interwoven activities in the design and development lifecycle.	Evaluate	2	1,2,3,4,12
4	Analyse and identify the methods to offer a better UI experience for the applications.	Analyze	1	1,2,3,9,12

TEXT BOOKS:

1. Interaction Design: Beyond Human-Computer Interaction, Jenny Preece, Helen Sharp and Yvonne Rogers 4th Edition.
2. A Practitioner's Guide to User Research, Elizabeth Goodman, Mike Kuniavsky, Andrea Moed, Observing the User Experience, 2nd Edition.

REFERENCE BOOKS:

1. About Face, Alan Cooper and Robert Reimann, 4th Edition,.
2. The Elements of User Experience: User-Centered Design for the Web and Beyond, Jesse James Garrett, 2nd Edition.
3. Understanding Design Thinking, Lean, and Agile, Jonny Schneider.

22CS812 OPTIMIZATION TECHNIQUES

Hours Per Week :

L	T	P	C
3	2	0	4

PREREQUISITE KNOWLEDGE: Probability & Linear algebra.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces the fundamental concepts of Optimization Techniques and to make the learners aware of the importance of optimizations in real scenarios. The most important objective is to provide the concepts of various classical and modern methods for constrained and unconstrained problems in both single and multivariable. Finally, the basic idea behind the evolutionary algorithms like Ant Colony Optimization, Particle Swarm Optimization could be discussed for further study.

MODULE-1

UNIT-1   **12L+8T+0P=20 Hours**

INTRODUCTION TO CLASSICAL METHODS AND LINEAR PROGRAMMING PROBLEMS TERMINOLOGY

Design Variables – Constraints, Objective Function - Problem Formulation, Linear Programming Problem - Simplex method - Concept of Duality.

General Transportation Problem: The transportation table finding in initial basic feasible solution, North-West corner method, Least cost method, Row minima method, Column minima method.

UNIT-2   **12L+8T+0P=20 Hours**

SINGLE VARIABLE OPTIMIZATION

Problems Optimality Criterion - Bracketing Method - Region Elimination Methods -Interval Halving Method - Fibonacci Search Method - Golden Section Method. Gradient Based Methods: Newton -Raphson Method - Bisection Method - Application to Root finding.

Multi Variable Optimization, Algorithms Optimality: Criteria - Unidirectional Search. Direct Search Methods: Hooke -Jeeves pattern search method. Gradient Based Methods: Cauchy's Steepest Descent Method - Newton's method, Quasi-Newton methods, L-BFGS.

PRACTICES:

A company makes two products (X and Y) using two machines (A and B). Each unit of X that is produced requires 50 minutes processing time on machine A and 30 minutes processing time on machine B. Each unit of Y that is produced requires 24 minutes processing time on machine A and 33 minutes processing time on machine B. At the start of the current week there are 30 units of X and 90 units of Y in stock. Available processing time on machine A is forecast to be 40 hours and on machine B is forecast to be 35 hours. The demand for X in the current week is forecast to be 75 units and for Y is forecast to be 95 units. Company policy is to maximise the combined sum of the units of X and the units of Y in stock at the end of the week. Formulate the problem of deciding how much of each product to make in the current week as a linear program. Solve this linear program graphically.

Solve using the Simplex method the following problem:

$$\text{Maximize } Z = f(x,y) = 3x + 2y$$

$$\text{subject to:} \quad 2x + y \leq 18$$
$$2x + 3y \leq 42$$
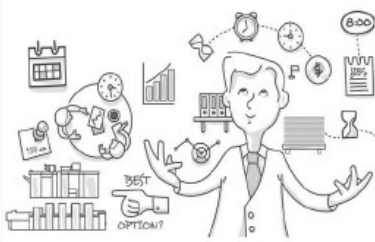
$$3x + y \leq 24$$
$$x \geq 0 \, , y \geq 0$$

Luminous lamps have three factories - F1, F2, and F3 with production capacity 30, 50, and 20 units per week respectively. These units are to be shipped to four warehouses W1, W2, W3, and W4 with requirement of 20, 40, 30, and 10 units per week respectively. The transportation costs (in Rs.) per unit between factories and warehouses are given below. Find an initial basic feasible solution of the given transportation problem using northwest corner rule.

Factory	Warehouse				Supply
	W1	W2	W3	W4	
F1	1	2	1	4	30
F2	3	3	2	1	50
F3	4	2	5	9	20
Demand	20	40	30	10	

- A mobile phone manufacturing company has three branches located in three different regions, say Jaipur, Udaipur and Mumbai. The company has to transport mobile phones to three destinations, say Kanpur, Pune and Delhi. The availability from Jaipur, Udaipur and Mumbai is 40, 60 and 70 units respectively. The demand at Kanpur, Pune and Delhi are 70, 40 and 60 respectively. The transportation cost is shown in the matrix below (in Rs). Use the Least Cost method to find a basic feasible solution (BFS).

DESTINATIONS

		Kanpur	Pune	Delhi	Supply
	Jaipur	4	5	1	40
Sources	Udaipur	3	4	3	60
	Mumbai	6	2	8	70
	Demand	**70**	**40**	**60**	**170**

- Find Solution using Row minima method.

	D1	D2	D3	D4	Supply
S1	11	13	17	14	250
S2	16	18	14	10	300
S3	21	24	13	10	400
Demand	200	225	275	250	

- Find Solution using Column minima method.

	D1	D2	D3	D4	Supply
S1	11	13	17	14	250
S2	16	18	14	10	300
S3	21	24	13	10	400
Demand	200	225	275	250	

- Find the positive root of the following equation by (Bisection) method,
  $f(x) = \sin(x/2\pi) - \cos^2 x$

- Consider figure below. The cross-sectional area A of a gutter with equal base and edge length of 2 is given by:
  $A = 4\sin\theta\,(1 + \cos\theta)$

Using an initial interval of $[0, \pi/2]$, find the interval after 3 iterations. Use an initial interval $\varepsilon = 0.2$.
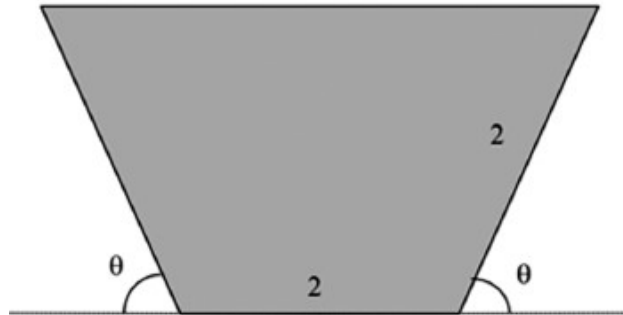
MODULE-2

UNIT-1   **12L+8T+0P=20 Hours**

STOCHASTIC OPTIMIZATION PROBLEMS

Notion of regret, online to batch conversion, Methods offering vanishing regret - OGD, EG, OMD Convex Sets and Functions: Affine and convex sets, convexity preserving operations, separating and supporting hyper-planes, generalized inequalities, Operations preserving convexity, conjugate function, Quasi-convex functions, Log-concave and log-convex functions, Convexity with respect to generalized inequalities

UNIT-2   **12L+8T+0P=20 Hours**

NON-CONVEX OPTIMIZATION PROBLEMS

Applications - sparse recovery, affine rank minimization, low-rank matrix completion, Convex approaches - relaxation-based methods, Non-convex approaches - projected gradient descent, alternating minimization

Algorithms: Unconstrained problems, equality constrained problems

PRACTICES:

- Show that each convex cone is indeed a convex set.
- Consider the linear system $0 \le x_i \le 1$ for $i = 1, \ldots, n$ and let P denote the solution set. Explain how to solve a linear programming problem $\max\{c^\top x : x \in P\}$.
  What if the linear system was $a_i \le x_i \le b_i$ for $i = 1, \ldots, n$. Here we assume $a_i \le b_i$ for each i.
- Can projected gradient descent (PGD) be used to obtain a stationary solution?
- Show that strong smoothness does not imply convexity by constructing a nonconvex function f : R
- $p \to R$ that is 1-SS.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand the classical, linear programming and transportation problem along with game theory.	Understand	1	1
2	Analyze real world problems around you.	Analyze	1	1, 2
3	Apply optimization to real-world problems.	Apply	1	1, 2, 3
4	Implement dynamic programming in real world complex problems.	Implement	2	3, 4, 11, 12

TEXT BOOKS:

1. Kanti Swarup, Man Mohan and P.K.Gupta, "Operations Research", Sultan Chand &Sons, 2005.
2. S. S. Rao, "Engineering Optimization Theory and Practice", 4th Edition, Wiley Publishers, 2009.

REFERENCE BOOKS:

1. M.C. Bhuvaneswari, "Application of Evolutionary Algorithms for Multi-Objective Optimization in VLSI and Embedded Systems", Spinger, 2014.
2. Ashlock D, "Evolutionary Computation for Modeling and Optimization", Springer, 2006.
3. Kalyanmoy Deb, "Optimization for Engineering Design", Prentice Hall of India, 2nd Edition, 2012.
4. A. Ravindran and K.M. Rogsdell, G.V. Reklaites, "Engineering Optimization: Methods and Applications",Wiley, 2nd Edition, 2006.
5. E. J. Haug and J.S. Arora, "Applied Optimal Design", Wiley Publishers,1979.

22CB810 SIMULATION AND MODELLING

Source: https://www.
researchgate.net/
figure/The-Simulation-
Modelling-Process-
Simple-Outline_
fig1_3834396
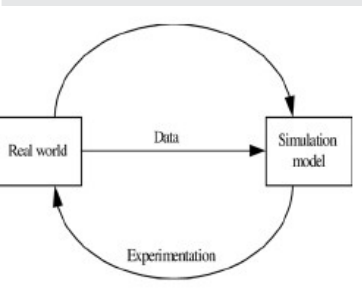
Hours Per Week :

L	T	P	C
3	2	0	4

PREREQUISITE KNOWLEDGE: Probability and statistics, OOPS.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces discrete-event simulation techniques including model design and development, comparison to analytical models, input data preparation, random number generation, output statistical analysis, and model validation and evaluate the performance of real-world systems by analyzing the output of the model under various conditions.

MODULE-1

UNIT-1   12L+8T+0P=20 Hours

INTRODUCTION TO SIMULATION, GENERAL PRINCIPLES

When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation, Areas of application, Systems and system Environment, Components of a System-Discrete and continuous systems, Model of a system, Types of Models, Discrete-Event System Simulation, Steps in a Simulation Study, Simulation Examples.

General Principles, Simulation Software: Concepts in Discrete-Event Simulation, The Event-Scheduling/Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling, List processing, Basic properties, Operations-Using Arrays, Dynamic Allocation, Linked Lists-Simulation in Java -Simulation in GPSS.

UNIT-2   12L+8T+0P=20 Hours

MATHEMATICAL AND STASTICAL MODELS

Statistical Models in Simulation: Review of terminology, concepts, Useful statistical models, Discrete Distributions, Continuous Distributions, Poisson Process, Empirical distributions.

Queuing Models: Characteristics of queuing Systems, Queuing notation, Long-run measures of performance of queuing Systems, Steady-state behavior of M/G/1 queue, Networks of queues, Rough-cut modeling: An illustration

PRACTICES:

- Discuss the system components of a grocery store, healthcare system, material dispatching system.
- Discuss the steps in simulation study for the above given systems.
- A simulation is to be conducted of cooking a porridge to discover at what time a person should start order to have the it on the table by 7:00 P.M. Read a recipe for preparing a dinner or ask a friend or relative for the recipe. As best you can, trace what you understand to be needed, in the data-collection phase of the simulation process, include each step in the recipe. What are the events, activities, and state variables in this system?
- The daily demand for a product is found to follow the distribution as

Demand	Probability
10	0.25
11	0.35
12	0.30
13	0.10

Determine the total demand for the next 10 days.

- Students are arriving at the college office at the rate of one every 6 ± 2 minutes to pay the fees. They hand over the forms to one of the two clerks available and it takes I 0 ± 2 minutes for the clerk to verify each form. Then the forms are sent to a single cashier who takes 6 ± I minute per form. Simulate the system for 100 hours and determine the

  (a) utilization of each clerk (b) utilization of the cashier (c) average time required to process a form (clerk + cashier).

- A patient arrives at the Emergency Room at Hello-Hospital about every 40 ± 19 minutes. Each patient will be treated by either Doctor Slipup or Doctor Gutcut. Twenty percent of the patients are classified as NIA (need immediate attention) and the test as CW (can wait). NIA patients are given the highest priority (3), see a doctor as soon as possible for 40 ± 37 minutes, but then iheir priority is reduced to 2 and they wait until a doctor is free again, when they receive further treatment for 30 ± 25 minutes and are then discharged. CW patients initially receive the priority 1 and are treated (when their torn comes) for 15 ± 14 minutes; their priority is then increased to 2, they wait again until a doctor is free and receive I 0 ± 8 minutes of final treatment, and are then discharged. Simulate for 20 days of continuous operation, 24 hours per day. Precede this by a 2-day initialization period to load the system with patients. Report conditions at times 0 days, 2 days, and 22 days. Does a 2-day initialization appear long enough to load the system to a level reasonably close to steady-state conditions? (a) Measure the average and maximum queue length of NIA patients from anival to first seeing a doctor. What percent do not have to wait at all? Also tabulate and plot the distribution of this initial waiting time for NIA patients. What percent wait less than 5 minutes before seeing a doctor? (b) Tabulate and plot the distribution of total time in system for all patients. Estimate the 90% quantile-that is, 90% of the patients spend less than x amount of time in the system. Estimate x. (c) Tabulate and plot the distribution of remaining time in system from after the first treatment to discharge, for all patients. Estimate the 90% quantile. (Note: Most simulation packages provide the facility to automatically tabulate the distribution of any specified variable).

- Using Excel, generate 12 columns, each with 250 values, using the formula = RAND(). In cell MI, place the formula = SUM(AI:LI)-6 and copy it to the 249 cells below M1 in column M.

a) Compute descriptive statistics about the data in that column, including minimum value, maximum value, mean, median, and standard deviation.

b) Tabulate the values with 9 bins: the first bin will include all values less than or equal to -3.5; the next six bins are of width one; the last bin will include all values greater than 3.5.

c) Does the histogram resemble any distribution with which you are familiar? If so, what is its name? Hint I: Use FREQUENCY in Excel to form bins.

- Of the orders a job shop receives, 25% are welding jobs and 75% are machining jobs. What is the probability that (a) half of the next five jobs will be machining jobs? (b) the next four jobs will be welding jobs?

- Students' arrival at a university library follows Poisson with a mean of 20 per hour. Determine (a) the probability that there are 50 arrivals in the next I hour. (b) the probability that no student arrives in the next I hour. (c) the probability that there are 75 arrivals in the next 2 hours.

- The cars arriving at a gas station is Poisson distributed with a mean of IO per minute. Determine the number of pumps to be installed if the ftrm wants to have 50% of arriving cars as zero entries (i.e., cars serviced without waiting).

- Given the following distributions, Normal (10, 4) Triangular (4, 10, 16) Uniform (4, 16) find the probability that 6 < X< 8 for each of the distributions.

- Vehicles pass through a toll gate at a rate of 90 per hour. The average time to pass through the gate is 36 seconds. The arrival rate and service rate follow Poisson distribution. There is

a complaint that the vehicles wait for a long duration. The authorities are willing to install one more gate to reduce the average time to pass through to 30 seconds, if the idle time of the toll gate is less than 10% and the present average queue length at the gate is more than five vehicles. Check whether the installation of the second gate is justified.

MODULE-2

UNIT-1   12L+8T+0P=20 Hours

RANDOM NUMBERS AND INPUT MODELLING

Random-Number Generation, Random-Variate Generation: Properties of random numbers, Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers, Random- Variate Generation, Inverse transform technique, Acceptance-Rejection technique, Special properties.

Input Modeling: Data Collection, Identifying the distribution with data, Parameter Estimation, Goodness of Fit Tests, Fitting a non-stationary Poisson process, Selecting input models without data, Multi-variate and Time-Series input models.

UNIT-2   12L+8T+0P=20 Hours

ANALYSIS OF SIMULATION DATA

Verification and Validation of simulation models: Optimization of simulation Models: Model Building, Verification, Validation, Verification of simulation models, Calibration, Validation of models, Optimization, Optimization via Simulation

Output Analysis for A Single Model: Types of simulations with Respect to Output analysis, Stochastic Nature of Output Data, Measures of Performance and their Estimation, Output Analysis for Terminating Simulations, Output analysis for steady-State Simulations.

PRACTICES:

- Develop the triangular random-variate generator with range (0, 12) and mode 5.
- In an inventory system, the lead time is found to follow uniform distribution with mean 10 days and half width 3 days. Generate five lead times.
- Write a computer program to generate exponential random variates for a given mean value. Generate 1000 values and verify the variates generated using chi-square test.
- In a college library, collect the following in formation at the books return counter: arrival of students for returning books service time taken by the counter clerk 305 Consolidate the data collected and verify whether it follows any standard distribution.
- Draw the pdf of normal distribution with J.l. = 6, a= 3
- The following data represent the time to perform transactions in a bank, measured in minutes: 0.740, 1.28, 1 .46, 2.36, 0.354, 0.750, 0.912, 4.44, O.l l4, 3.08, 3.24, 1. 10, 1.59, 1.47, 1.17, 1.27, 9. 12, 1 1.5, 2.42, 1.77. Develop an input model for these data.
- A simulation model. of a job shop was developed to investigate diff erent schedulliJg rules. To validate the model, the scheduling rule currently used was incorporated into the model and the resulting output was compared agamst observed system behavior. By searching the previous year's database records it was estimated that the average number of jobs in the shop was 22.5 on a given day. Seven independent replications of the model were run, each of 30 days' duration, with the following results for average number of Jobs in the shop: 18.9 22.0 19.4 22.1 19.8 21.9 20.2 (a) Develop and conduct a stastical test to evaluate whether model output is consistent with system behavior. Use the level of significance a= 0.05. · (b) What is the power of this test if a difference of two jobs is viewed as critical? What sample size is needed to guarantee a power of 0.8 or higher? (Use a= 0.05.)

- Consider the following inventory system: (a) Whenever the inventory level falls to or below 10 units, an order is placed. Only one order can be outstanding at a time. (b) The size of each order is Q; Maintaining an inventory costs $0.50 per day per item in inventory. Placing an order incurs a fixed cost, $10.00. (c) Lead time is distributed in accordance with a discrete uniform distribution between zero and 5 days. (d) If a demand occurs during a period when the inventory level is zero, the sale is lost at a cost of $2.00 per unit. (e) The number of customers each day is given by the following distribution:

No of customers per day	Probability
1	0.23
2	0.41
3	0.22
4	0.14

f) The demand on the part of each customer is Poisson distributed with a mean of 3 units.

g) For simplicity, assume that an·demands occur at noon and that all orders are placed immediately thereafter. Assume further that orders are received at 5:00 P.M., or after the demand that occurred on that day. Consider the poi icy having Q = 20 .. Make five independent replications, each of length 100 days, and compute a 90% confidence interval for long-run mean daily cost. Investigate the effect of initial inventory level and existence of an outstanding order on the estimate of mean daily cost. Begin with an initial inventory of Q + I 0 and no outstanding orders.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the steps in design of various simulation models.	Analyze	1	2
2	Conceptualize real world situations related to systems development decisions, originating from source requirements and goals. Construct model for a given set of data and motivate its validity.	Apply	1	1, 4
3	Generate and test random number variates and apply them to develop simulation models.	Apply	2	1
4	Analyze output data produced by a model and test validity of the model.	Analyze	2	2

TEXT BOOKS:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, "Discrete-Event System Simulation", 5th Edition, Pearson Education © 2013.
2. Zeigler B.P. Praehofer. H. and Kim I.G. "Theory of modeling and simulation", 2nd Edition Academic press 2000.

REFERENCE BOOKS:

1. Averill M. Law, "Simulation Modeling and Analysis", 4th Edition, Tata McGraw-Hill, 2007.
2. Lawrence M. Leemis, Stephen K. Park, "Discrete – Event Simulation: A First Course", Pearson Education, 2006.

OPEN ELECTIVES

COMPUTER SCIENCE AND BUSINESS SYSTEMS

B.Tech.

▶	22CB851 -	Introduction to Innovation, IP Management and Entrepreneurship
▶	22CB852 -	Business Strategy
▶	22CB853 -	Augmented Reality and virtual Reality
▶	22CB854 -	Human Resource management
▶	22CB855 -	Financial Management
▶	22CB856 -	Marketing Research and Marketing Management
▶	22CB857 -	Behavioral Economics
▶	22CB858 -	Advance Finance
▶	-	Capstone Project

COURSE CONTENTS

22CB851 INTRODUCTION TO INNOVATION, IP MANAGEMENT AND ENTREPRENEURSHIP

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.

- To identify and differentiate various types of innovation.
- To explore new vistas of entrepreneurship environment to generate innovative business ideas.
- To provide comprehensive knowledge to the students regarding the general principles of IPR.
- To enhance the students regarding the effect of IPR on emerging issues.

MODULE-1

UNIT-1   **8L+4T+0P=12 Hours**

INTRODUCTION TO INTELLECTUAL PROPERTY

BUILDING AN INNOVATIVE ORGANIZATION

Innovation as a core business process, Sources of Innovation, Knowledge pushes need pull innovations, The Role of innovation as a manageable activity vs random gambling activity; Creating new products and services, exploiting open innovation and collaboration, Use of innovation for starting a new venture Case Studies.

UNIT-2   **8L+12T+0P=20 Hours**

ENTREPRENEURSHIP: AN INNOVATORS GUIDE TO STARTUPS

Opportunity recognition and entry strategies, Entrepreneurship as a style of management, Maintaining Competitive advantage-use of IPR to protect innovation, Financial Projections and Valuation, Stages of financing, Debt, Venture Capital and other forms of Financing, Case Studies.

PRACTICES:

- Is innovation manageable or just random gambling activity?
- Innovation- Cooperating across networks vs 'go-it-alone' approach
- Major court battles regarding violation of patents between two corporate companies

MODULE-2

UNIT-1   **6L+4T+0P=10 Hours**

INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)

Introduction, Economics behind the development of IPR: Business Perspective, IPR in India- Genesis and Development, International Context, Concept of IP management, Use in marketing, Case Studies.

UNIT-2   **10L+12T+0P=22 Hours**

TYPES OF INTELLECTUAL PROPERTY

Patent-Procedure, Licensing and Assignment, Infringement and Penalty; Trademark-Use in marketing, example of trademarks-Domain name; Geographical Indications-Definition GI, Protection; Copyright-Definition, Industrial designs; Industrial Protection, Case Studies.

PRACTICES:

- Show that each convex cone is indeed a convex set.
- Group Discussion over diverse national and International IPR related issues.
- Procedure for drafting and filing of Patents.
- Procedure for drafting and filing of Copyrights, Patents.
- Procedure for drafting and filing of Design Patent, GI, Plant varieties.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Learn to be familiar with creative and innovating thinking styles.	Apply	1	1, 11, 12
2	Learn to investigate, understand and internalize the process of founding a startup while becoming an entrepreneur.	Apply	1	1, 7, 9, 12
3	Learn to start new ventures while using IPR as an effective tool.	Analyze	2	3, 6, 9, 12
4	Learn to manage various types of IPR to protect their innovations and intangible assets from exploitation to achieve competitive advantage.	Analyze	2	3, 8, 12

TEXT BOOKS:

1. JoeTidd, John Bessant, "Managing Innovation: Integrating Technological, Marketand Organizational change".
2. Robert Hirsh, MichaelP Peters, Dean A Shepherd," Entrepreneur ship" Sixth Edition,, Tata McGraw-Hill Companies, New Delhi

REFERENCE BOOKS:

1. N.S. Gopala Krishnan. Agatha, "Principles of Intellectual Property Eastern Book Company, Lucknow
2. R.C. Dreyfuss, J.Pila, "The Oxford Hand book of Intellectual Property Law", Oxford University Press
3. Looking Good : An Introduction to Industrial Designs for Small and Medium-sized Enterprises; WIPO publication No.498. URL: www.wipo.int/ebookshop.
4. Creative Expression: An Introduction to Copyright and Related Rights for Small and Medium-sized Enterprises; WIPO publication No. 918.URL: www.wipo.int/ebookshop.

22CB852 BUSINESS STRATEGY

Hours Per Week :

L	T	P	C
2	2	0	3

Source: https://businessjargons.com/
wp-content/uploads/2017/03/business-
strategy.jpg
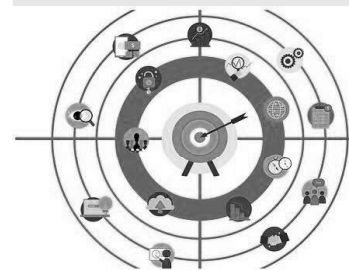
PREREQUISITE KNOWLEDGE: Basic Knowledge of management.

COURSE DESCRIPTION AND OBJECTIVES:

- To explain the basic concepts, principles, and practices of Strategic Management
- To identify the internal and external environment of Business
- To describe the various growth strategies available for the corporates
- To understand the stages in strategy implementation and evaluation

MODULE-1

UNIT-1   6L+4T+0P=10 Hours

INTRODUCTION

Importance of Strategic Management, Vision and Objectives, Schools of thought in Strategic Management, Strategy Content, Process and Practice, Fit Concept and Configuration Perspective in Strategic Management. Core Competence as the Root of Competitive Advantage, Sources of Sustained Competitive Advantage, Business Processes and Capabilities-based Approach to Strategy.

UNIT-2   2L+12T+0P=14 Hours

EXTERNAL ENVIRONMENTS OF FIRM- COMPETITIVE STRATEGY

Five Forces of Industry Attractiveness that Shape Strategy, The concept of Strategic Groups, and Industry Life Cycle, Generic Strategies and the Value Chain.

PRACTICES:

- Case Study on Strategic Intent
- Case Study on Environment Appraisal
- Case study on competitor analysis
- Case study on generic strategies

MODULE-2

UNIT-1   6L+4T+0P=10 Hours

CORPORATE STRATEGY AND GROWTH STRATEGIES

The Motive for Diversification, Related and Unrelated Diversification, Business Portfolio Analysis, Expansion, Integration and Diversification, Strategic Alliances, Joint Ventures and Mergers & Acquisitions.

UNIT-2   2L+12T+0P=14 Hours

STRATEGY IMPLEMENTATION

Structure and Systems: The 7S Framework, Corporate Governance. Strategy Evaluation and Control: An overview, Strategic Control, Operational Control and Techniques.

PRACTICES:
- Case study on resource allocation
- Case study on business expansion strategy
- Case study on strategy implementation
- Case study on strategy evaluation and control

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the fundamental concepts and principles of strategic management to analyse business Situations.	Apply	1	1, 2, 12
2	Analyse interrelationships among business functions such as: R&D, production, marketing, finance, HR and information technology	Analyze	1	1, 2, 5, 12
3	Evaluate the inter-relationships of business to individuals, other organizations, government, and society.	Evaluate	2	1, 2, 3, 5, 12
4	Analyse complex, unstructured qualitative and quantitative problems, using appropriate tools.	Analyze	2	1, 2, 3, 12

TEXT BOOKS:
1. Contemporary Strategic Management by Robert M. Grant, 7th Edition, Blackwell, 2012
2. Competitive Strategy by Michael E. Porter, The Free Press, 1980
3. Competitive Advantage by Michael E. Porter, The Free Press, 1985

REFERENCE BOOKS:
1. Good Strategy Bad Strategy: The Difference and Why It Matters by Richard Rumelt, Profile Books Ltd, 2013.
2. Strategic Management by Francis Cherunilam, 4th Edition, HPH, 2016
3. Strategic Management and Business Policy by Azhar Kazmi, McGraw Hill Education, 2018.

22CB853 AUGMENTED REALITY AND VIRTUAL REALITY

Source: https://images.adsttc.
com/media/images/64ab/
cf16/5921/1867/15c1/1091/newsletter/
personal-metaverse-immersion-
devices-unlocking-the-potential-of-ar-
and-vr_9.jpg?1688981317

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Nil.

COURSE DESCRIPTION AND OBJECTIVES:

• To understanding of the concepts of Virtual Reality (VR)

• To studying geometric modelling concepts

• To building VR applications

• To perception on future needs

MODULE-1

UNIT-1   **10L+10T+0P=20 Hours**

INTRODUCTION TO VIRTUAL REALITY (VR)

Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR.

GEOMETRIC MODELLING: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation. Generic VR system: Introduction, Virtual environment, Computer environment, VR technology**.**

UNIT-2   **6L+6T+0P=12 Hours**

Tracking, Coordinate Systems, Characteristics of Tracking technology, Stationary Tracking systems, Mobile Sensors

MODULE-2

UNIT-1   **10L+10T+0P=20 Hours**

INTRODUCTION TO AUGMENTED REALITY (AR)

Definition and Scope A brief history of AR, Examples, Related Fields, MR continuum, Virtual Reality, Ubiquitous Computing. Computer Vision for AR, Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection.

UNIT-2   **6L+6T+0P=12 Hours**

The future-Driving forces of Business Cases, AR developer's Wish List, Tracking AR Outdoors, Interface with Smart Objects.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand geometric modelling and Virtual environment	Understand	1	1,2,3,12
2	Study about Virtual Hardware and Software	Understand	1	1,2,3,12
3	Develop Virtual Reality applications	Analyze	2	1,2,3,12
4	Exploring AR and VR Business Cases	Design	2	1,2,3,12

TEXT BOOKS:

1. Virtual Reality Systems, John Vince, Pearson Education Asia, 2007
2. Augmented Reality, Principles and Practices, Dieter Schmalstieg, Tobias Hollerer, Pearson 2017
3. Augmented and Virtual Reality, Anand R., Khanna Publishing House, Delhi.

REFERENCE BOOKS:

1. Visualizations of Virtual Reality, Adams, Tata McGraw Hill, 2000
2. Virtual Reality Technology, Wiley Inter Science, Grigore C. Burdea, Philippe Coiffet, 2nd Edition, 2006
3. Understanding Virtual Reality: Interface, William R. Sherman, Alan B. Craig,
4. Application and Design, Morgan Kaufmann, 2008.

22CB854 HUMAN RESOURCE MANAGEMENT

Hours Per Week :

L	T	P	C
2	2	0	3

Source: https://nextinnovationasia.com/b
function-of-human-resource-managemen

PREREQUISITE KNOWLEDGE: Your passion, enthusiasm and just a bit of logical skills should be enough.

COURSE DESCRIPTION AND OBJECTIVES:

- To understand the functions, systems, policies and applications of Human Resource Management in organizations

- To familiarize how HRM assess the constraints and opportunities associated with managing employees in different socio-economic and political context

- To explain the emerging horizons of HRM in Organizations

- To understand how HRM activities lead to performance and sustainability of the organisation.

- To understand the impact of HR activities on different career outcomes

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

INTRODUCTION TO HUMAN RESOURCE MANAGEMENT AND SYSTEM DESIGN

Human Resource Management: Concept and Challenges, HR Philosophy, Policies, Procedures and Practices, HR Profession, and HR Department, Line Management Responsibility in HRM.

UNIT-2   **6L+6T+0P=12 Hours**

HUMAN RESOURCE SYSTEM DESIGN AND FUNCTIONAL AREAS OF HRM

Measuring HR, Human resources accounting and audit; Training, recruitment and staffing, benefits, compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

HUMAN RESOURCE PLANNING AND STRATEGIC MANAGEMENT OF HUMAN RESOURCES

Demand Forecasting, Action Plans– Retention, Training, Redeployment & Staffing, Succession Planning, SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace.

UNIT-2   **6L+6T+0P=12 Hours**

Human Resource Management in Service Sector- Special considerations for Service Sector including

- Managing the Customer – Employee Interaction

- Employee Empowerment and Customer Satisfaction

- Service Failure and Customer Recovery – the Role of Communication and Training

- Similarities and Differences in Nature of Work for the Frontline Workers and the Backend

- Support Services - Impact on HR Practices Stressing Mainly on Performance

• Flexible Working Practices – Implications for HR.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Understand the basic concepts of HRM	Understand	1, 2	1,2,3,11,12
2	Identify necessary skill set for application of various HR functions	Understand	1, 2	1,2,3,11,12
3	Design the strategic HR activities with real time organisational environment	Create	2	1,2,3,12
4	Assess cross-cultural work dynamics and HR activities	Apply	2	1,2,11,12

TEXT BOOKS:

1. Human Resource Management, Dessler G., Varrkey B., 16th Edition, Pearson Education, India, 2020
2. International Human Resource Management, Peter J. Dowling, Marion Festing, Allen D. Engle, Cengage, 2017.

REFERENCE BOOKS:

1. Human Resource and Personal Management, K. Aswathappa, 8th Edition, Tata McGraw Hill, 2017
2. Human Resource Management, Joseph J. Martocchio, 15th Edition, Pearson Education Champaign, 2019.
3. Human Resource Management, Mathis R. L., Jackson J. H., 15th Edition, Jakarta, Salemba Empat.

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22CB855 FINANCIAL MANAGEMENT

Hours Per Week :

L	T	P	C
2	2	0	3

Source: https://jaro-website.s3.ap-south-1.amazonaws.com/2023/01/What-Is-Strategic-Financial-Management-Objectivity-and-Purpose-58-11zon.jpg

PREREQUISITE KNOWLEDGE: Mathematics.

COURSE DESCRIPTION AND OBJECTIVES:

- To understand the fundamentals of Financial Management and Time Value of Money

- To explain the Valuation of securities and calculation of portfolio of risk and return

- To understand fundamentals of Leverages and how resources are used efficiently, effectively and economically

- To understand cash management and accounts receivables in business firms

MODULE-1

UNIT-1   6L+8T+0P=14 Hours

INTRODUCTION

Introduction to Financial Management - Goals of the firm - Financial Environments. Time Value of Money: Simple and Compound Interest Rates, Amortization, Computing more that once a year, Annuity Factor.

UNIT-2   10L+8T+0P=18 Hours

VALUATION OF SECURITIES

Bond Valuation Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM. Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM).

OPERATING & FINANCIAL LEVERAGE

Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study; Cost of Capital: Concept, Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital.

PRACTICES:

- What is meant by capital structure?
- Discuss the two objectives of Financial Planning.
- What is 'financial risk? Why does it arise?
- Define a 'current assets' and give four examples.
- Financial management is based on three broad financial decisions. What are these?
- What is the main objective of financial management? Explain briefly.
- Discuss about working capital affecting both the liquidity as well as profitability of a business.

MODULE-2

UNIT-1   6L+8T+0P=14 Hours

CAPITAL BUDGETING

The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods.

UNIT-2   **10L+8T+0P=18 Hours**

WORKING CAPITAL MANAGEMENT

Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

CASH MANAGEMENT

Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring; Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

PRACTICES:

- What is meant by capital structure?
- Discuss the two objectives of Financial Planning.
- What is 'financial risk? Why does it arise?
- Define a 'current assets' and give four examples.
- Financial management is based on three broad financial decisions. What are these?
- What is the main objective of financial management? Explain briefly.
- Discuss about working capital affecting both the liquidity as well as profitability of a business.
- What is meant by working capital? How is it calculated? Discuss five important determinants of working capital requirements.
- Capital structure decision is essentially optimisation of risk-return relationship. Comment.
- A capital budgeting decision is capable of changing the financial fortune of a business. Do you agree? Why or why not?
- Explain factors affecting the dividend decision.
- Explain the term 'trading on equity'. Why, when and how it can used by a business organisation?

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Course Outcomes	Blooms Level	Module No.	Mapping with POs
2	Analyze the concepts of financial management, and importance of Time value of Money, valuation of Securities	Analyze	1	1,2,12
3	Apply concepts of Risk and Return such as cost of capital, risk and return, and Financial Leverage	Apply	1	3,5
4	Evaluate investment proposals through Capital Budgeting and working capital management	Evaluate	2	1,2,3,12

TEXT BOOKS:

1. Financial Management, Prasanna Chandra, Theory & Practice, Tata McGraw Hill
2. Financial Management, M. Y. Khan, P. K. Jain, 8th Edition, McGraw Hill 2018

REFERENCE BOOKS:

1. Financial Management, Srivastava, Misra, OUP
2. Fundamentals of Financial Management, Van Horne and Wachowicz, Prentice Hall/ Pearson Education
3. Investment Analysis and Management, Charles P. Jones, 9th Edition, 2004,

22CB856 MARKETING RESEARCH AND MARKETING MANAGEMENT

Hours Per Week :

L	T	P	C
2	2	0	3

Source https://www.munro.agency/wp-content/uploads/2023/03/marketing-agency-services.jpg

PREREQUISITE KNOWLEDGE: Your passion, enthusiasm and bit of basic Computer knowledge.

COURSE DESCRIPTION AND OBJECTIVES:

• To understand the need of study of Marketing and Marketing Research

• To explain the various concepts of Marketing research in Organisations

• To explain the various statistical tools and techniques for data analysis in Marketing Research

• To comprehend internet and B2B marketing

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

MARKETING CONCEPTS AND APPLICATIONS

Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector. Marketing Planning & Environment: Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social Understanding the Consumer: Determinants of consumer behaviour, Factors influencing consumer behaviour Market Segmentation: Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning.

UNIT-2   **8L+0T+6P=14 Hours**

PRODUCT MANAGEMENT, PRICING, PROMOTION AND DISTRIBUTION STRATEGY

Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging, Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication.

MODULE-2

UNIT-1   **8L+0T+8P=16 Hours**

MARKETING RESEARCH AND INTERNET MARKETING

Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research Data Analysis: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis.

Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing.

UNIT-2   **8L+0T+8P=16 Hours**

BUSINESS TO BUSINESS MARKETING

Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets.

Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy.

PRACTICES:
- Written Analyses of Cases – Students are expected to report on their analysis and recommendations of what to do in specific business situations by applying concepts and principles learned in class (Case Studies to be shared by Faculty) e.g. "Marketing Myopia"
- Field visit & live project covering steps involved in formulating Market Research Project.
- Measuring Internet Marketing Effectiveness: Metrics Analytics.
- Measuring Internet Marketing Effectiveness :Website Analytics

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the basic marketing concepts in business organisations	Apply	1	1,2,3,12
2	Interpret the dynamics of marketing and analyze how its various components interact with each other in the real world	Analyze	1, 2	1,2,3,4,12
3	Leverage marketing research concepts, and identify statistical tools and techniques in marketing research for effective decision making	Understand	2	1,2,3,12
4	Plan for internet marketing, and position and price B2B products and services	Apply	2	1,2,3,4,12

TEXT BOOKS:
1. Marketing Management, Philip Kotler & Keller Kevin, 4th Edition, Pearson Education, 2019.
2. Marketing Research: An Applied Approach, Malhotra N. K., Nunan D., & Birks D. F., Pearson Education Limited, 2019.

REFERENCE BOOKS:
1. Marketing Management: A Relationship Approach, Hollensen S, Pearson Education, 2019.
2. Marketing Management, Deepak R., Kanthiah Alias, and S. Jeyakumar, Educreation Publishing, 2019.
3. Marketing Research: Text and Cases, Nargundkar R., McGraw-Hill Education, 2020.
4. Marketing Management: A Cultural Perspective, Visconti L. M., Peñaloza L., & Toulouse N. (Eds.) Routledge, 2020.

22CB857 BEHAVIOURAL ECONOMICS

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Knowledge of Taxation, Ethics, Institutional Economics, Technical Analysis, And Finance Theory.

COURSE DESCRIPTION AND OBJECTIVES:

This course focuses on understanding the concepts of behavioural economics and impart knowledge on current ideas and concepts regarding decision making in economics, particularly from a behavioural science perspective. In addition, it explores key departures and the consequences of behaviour of firms, households and other economics entities and provide an overview of how behavioural principles have been applied to economic problems.

MODULE-1

UNIT-1   8L+8T+0P=16 Hours

INTRODUCTION

The neoclassical/standard model and behavioural economics in contrast; historical background; behavioural economics and other social sciences; theory and evidence in the social sciences and in behavioural economics; applications – gains and losses, money illusion, charitable donation.

UNIT-2   8L+8T+0P=16 Hours
BASICS OF CHOICE THEORY

Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies.

BELIEFS, HEURISTICS AND BIASES

Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behaviour, trade in memorabilia.

MODULE-2

UNIT-1   8L+8T+0P=16 Hours

CHOICE UNDER UNCERTAINTY & INTERTEMPORAL CHOICE

Background and expected utility theory; prospect theory and other theories; reference points; loss aversion; marginal utility; decision and probability weighting; applications – ownership and trade, income and consumption, performance in sports. Geometric discounting; preferences over time; anomalies of inter-temporal decisions; hyperbolic discounting; instantaneous utility; alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings, clubs and membership, consumption planning .

UNIT-2   8L+8T+0P=16 Hours
STRATEGIC CHOICE

Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and

mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion; policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Identify and evaluate evidence for systematic departures of economic behaviour from the Predictions of the neoclassical model, and psychological explanations for these anomalies.	Understand	1	1, 2, 3,11,12
2	Incorporate psychologically motivated assumptions into economic models, and interpret the implications of these assumptions	Evaluation	1	1, 2, 5, 12
3	Analyze the principles of game theory and ability to interpret incentives of people in interpersonal interactions.	Analyze	1	1, 2, 3, 5, 12
4	Apply Behavioural principles in economic problems	Apply	2	1, 2, 12

TEXT BOOKS:

1. An Introduction to Behavioural Economics, N. Wilkinson and M. Klaes, 3rd Edition, Palgaeve McMillan.
2. Introduction to Behavioural Economics, David R. Just, Wiley.

REFERENCE BOOKS:

1. Behavioural Economics: A Very Short Introduction (Very Short Introductions) Illustrated Edition, Oxford Press.

22CB858 ADVANCE FINANCE

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Nil.

COURSE DESCRIPTION AND OBJECTIVES:

- To understand about the various financial sources and instruments, and the Corporate Dividend decisions.

- To explain about Leasing and decisions involving Leasing, Organizational goals with optimum investment, and Corporate Restructuring

- To understand financial restructuring and working capital management in business firms

- To understand risk and return in the Derivatives, swaps

MODULE-1

UNIT-1   **8L+8T+0P=16 Hours**

SOURCES OF FUNDS (INCLUDING REGULATORY FRAMEWORK

Types of securities; Issuing the capital in market; Pricing of issue; Valuation of Stocks and bonds.

UNIT-2   **6L+6T+0P=12 Hours**

DIVIDEND DECISIONS

Traditional Approach, Dividend Relevance Model, Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Issue of bonus shares, Stock Split. Evaluation of Lease Contracts.

MODULE-2

UNIT-1   **8L+8T+0P=16 Hours**

CORPORATE RESTRUCTURING

Mergers and Acquisitions- Types of Mergers, Evaluation of Merger Proposal; Take-over; Amalgamation; Leverage buy-out; Management buyout; Corporate Failure and Liquidation. Financial Restructuring; Share Split; Consolidation; Cancellation of Paid-up Capital; Other Mechanisms.

UNIT-2   **8L+8T+0P=16 Hours**

WORKING CAPITAL MANAGEMENT AND INTRODUCTION TO DERIVATIVES

Working Capital Planning; Monitoring and Control of Working Capital; Working Capital Financing; Managing the Components of Working Capital-Cash Management-Receivable Management- Inventory Management-Introduction to derivatives; Basics of Futures, Forwards, Options, Swaps; Interest rate Payoff Diagrams, Pricing of Futures, Put Call Parity, Option Pricing using Binomial Model and Black Scholes Model Use of Derivatives for Risk-Return Management- Credit Default Swaps.

HOME ASSIGNMENT: Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class. Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement. 1. TOPIC: Historical perspectives of markets like major boom and busts, bull and bear cycles, major

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the decisions involved in sources of finance and Dividend Decisions	Apply	1, 2	1,2,3,12
2	Interpretation of business information and application of financial theory in corporate investment decisions, and assess working capital management and leasing contracts	Apply	1, 2	1,2,3,12
3	Evaluate the corporate and financial restructuring	Understand	2	1,2,3,12
4	Analyze the Derivative Markets and Swaps	Apply	2	1,2,3,12

TEXT BOOKS:

1. Principles of Corporate Finance, Brealey, Myers and Allen, 11th Edition, McGraw Hill, 2017.
2. Investment analysis and portfolio Management, Prasanna Chandra, 4th Edition, TMH, 2013.

REFERENCE BOOKS:

1. Elements of Corporate Finance, S. M. Maheswari, Sultan Chand, 2016.
2. Financial Management Text and Cases, IM Pandey, Vikas, 2012.
3. Accounting for Management, S. N. Maheswari, S. K. Maheswari, 4th Edition, Vikas Publishing House, 2018.