B.Tech. AGRICULTURAL ENGINEERING

TABLE OF CONTENTS

FOREWORD

India is basically having an Agriculture dependent economy with small, medium and large farming groups. The shortage of labour in peak farming operations has become a serious problem for most farmers. Many a time, farmers have tried shifting to mechanized mode of cultivation, but often the implements available are suited for large farming land only. Majority of farmers in India are with small holdings and so cannot use the existing technologies which are more amenable to large scale farming. Hence, there is a requirement for developing small implements suited for small and medium farmers, so that even marginal farmers are able to think of mechanization at an affordable cost. The efficient use of water is also an important area as scarcity of water is leading to uneconomical progression of farming. Moreover, systematic processing of crop is getting importance with introduction of many 'ready to eat' products. These issues warrant the services of equipped engineers from Agricultural Engineering.

Department of Applied Engineering is having the undergraduate programme in Agricultural Engineering, which is a derived branch of engineering from core branches like Mechanical and Civil engineering, with the objective of applying the engineering principles to Agricultural production and processes. The course is floated with the objective of reaching out to the farming community of the country, as an endeavour towards increasing Agricultural productivity and thereby boosting the economy. It will spread knowledge of latest developments in Agricultural Engineering and promote the use of the latest know-how for farmers and related agencies. The new regulation of this course comprises of elective streams from three domains of agricultural engineering. They are Farm Power and Machinery, Food Process Engineering and Soil and Water Conservation Engineering. Most of the courses are integrated with laboratory so that students get practical exposure. They have given the chance to acquire the necessary skills aimed from each course by providing suitable activities. Hence it is expected that, with successful completion of the programme, the students would be ready with desired knowledge coupled with required skills.

Now, it is at the center of almost all technical advancements, from health services to communications, transportation, and most other infrastructure that we see around. The Agricultural Engineers of today are multidisciplinary, with knowledge from other branches of engineering.

At VFSTR, the curriculum undergoes regular revisions to ensure local relevance with a global outlook. We believe in imparting a broad education which instills a sense of lifelong learning, community and leadership values in students, together with an appreciation of global issues.

The new curriculum of R22 accomplishes multidisciplinary holistic education, continuous assessment along with multiple honourable exit options if a student fails to complete the requirements to earn the degree within the stipulated period including the permissible spill over period.

R22 curriculum comprises of:

- Revision in tune with National Education Policy 2020.
- Various exit options.
- Regular Degree along with Honours / Minor Degree.
- The reduction in total credits.
- Module wise course syllabus.

In R22 curriculum, every care has been taken to accommodate the knowledge and skill requirements of industry through software integrated practical sessions. While making the graduates work ready, it also enables them to be successful in competitive examinations like GATE and Engineering Services.

The Board of Studies of Applied Engineering consists of eminent personalities from industry, and academia.

External BoS Members:

1. Dr. B.V.S. Prasad
   B.Tech. (Agril Engg) (ANGRAU), M.Tech. (IIT-KGP), Ph.D. (IIT-KGP), PDF (USA) Principal Scientist (Agril Engg) & Head and Univ. Head (Food Processing Technology) Acharya N.G. Ranga Agricultural University, Post Harvest Technology Centre, Agricultural College Campus, BAPATLA - 522101, Guntur Dist., Andhra Pradesh, India.

2. Dr. Vidhu Kampurath Poduvattil
   Ph.D, FIE, Joint Director - Plant Health Engineering, National Institute of Plant Health Management, Department of Agriculture, Cooperation & Farmers Welfare Ministry of Agriculture, Govt. of India, Rajendra Nagar, Hyderabad - 500 030.
   Ph: +91-40-24013346 +91-8500719241 / +91-9652216481 (M).

Internal Members:

1. Dr. T. Ramesh Babu
   Dean of School of Agri, Food Science and Technology.
   Email ID : tatinenir@yahoo.com, Mobile : 9848312629.

2. Dr. N. Narayan Rao
   Associate Prof & Head, Dept. of AE., VFSTR.
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   Email. ID: drads_ae@vignan.ac.in, Mobile : 9606342663.

4. Dr. Sujith Bobba
   Assistant Professor, Asst. Dean R&D, VFSTR.
   Email. ID: sb_ae@vignan.ac.in, Mobile : 7330813943.

5. Mr. Bibek B. Shrestha
   Asst. Prof, Dept. of Applied Engineering, VFSTR.
   Email ID: bbs_ae@vignan.ac.in, Mobile : 8145358393.

6. Mr. G. Aditya
   Asst. Prof, Dept. of Applied Engineering, VFSTR.
   Email ID: adityapfe@gmail.com, M: 9553155046.

Dr. N. Narayan Rao

HoD, AE

VIGNAN'S
Foundation for Science, Technology & Research
(Deemed to be UNIVERSITY)
-Estd. u/s 3 of UGC Act 1956

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 and contribute to the economic and technological development of the region, state and nation.

Department of
AGRICULTURAL ENGINEERING

VISION of the department

To develop skilful professionals, propagate knowledge and stimulate the engineering, science and management principles to meet societal needs with respect to agricultural, farm mechanization, irrigation, soil and water conservations and water resource systems etc.

MISSION of the department

M1: Ensuring effective teaching–learning process to provide in-depth knowledge of principles and its applications pertaining to Agriculture Engineering and interdisciplinary areas.

M2: To inculcate value-based, socially committed professionalism to the cause of overall development of students and society.

M3: To promote research and training on sustainable development of agricultural productivity, cost reduction in farming, farm mechanization and to improve production.

M4: To produce skilful and high quality engineers supported by up-to-date curriculum and scientific and industrial research to suit the industry both within the country and abroad.

B.Tech in Agricultural Engineering

Program Educational Objectives (PEOs)

PEO1: Develop diverse capability to work with tractor and implement manufacturing industries, seed processing industries, irrigation and drainage companies and also to run self-entrepreneurship like dairy farming and custom hiring centers.

PEO2: Take up higher studies in reputed institutes and motive towards innovative research by applying their skills in agricultural water management, farm machinery and power, processing and energy management systems in agriculture.

PEO3: Understand the issues of ethics, safety, professionalism, cultural diversity, globalization, environmental impact and responsibility of serving the society and the environmental issues.

Program Specific Outcomes (PSOs)

PSO1: utilize adequate knowledge in different disciplines of agricultural engineering to gain better employment in various industries of agricultural engineering.

PSO2: use their expertise in planning judicious utilization of natural recourses and their management through advanced soil and water conservation techniques and various irrigation and drainage methods with the skill of data interpretation.

PSO3: develop skills necessary to design the process and evaluate and come out with problem solutions of farm implements through adequate farm power for sustainable agriculture.

PSO4: apply the comprehensive knowledge of engineering properties of agricultural produce for upgrading the unit operation and further develop effective value added technologies and become strong in quality control.

Student Outcomes (SOs)

The graduates of Agricultural Engineering:

SO1: An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

SO2: An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor.

SO3: An ability to communicate effectively with a range of audiences.

SO4: An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

SO5: An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

SO6: An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

SO7: An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Program Outcomes (POs)

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 modeling 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 DEGREE PROGRAMME

COURSE STRUCTURE - R22

I Year I Semester

Course Code	Course Title	L	T	P	C
22BEAS101	Ordinary Differential Equations and Linear Algebra	1	2	2	3
22BEAS102	Physics for Agricultural Engineers	2	0	2	3
22BEAS103	Chemistry for Agricultural Engineers	2	0	2	3
22BEAS104	Principles of Agronomy	2	0	2	3
22BEAS105	Environmental Science and Disaster Management	2	0	2	3
22BEAS106	Engineering Mechanics	2	2	0	3
22BEAS107	Engineering Drawing	0	0	3	2
22BEAS108	Communication Skills and Personality Development	1	0	2	2
22BEAS109	Workshop Technology and Practices	1	0	4	3
Total		13	4	19	25

I Year II Semester

Course Code	Course Title	L	T	P	C
22BEAS110	Advanced Calculus and Partial Differential Equations	1	2	2	3
22BEAS111	Surveying and Levelling	1	2	2	3
22BEAS112	Fluid Mechanics and Open Channel Hydraulics	1	2	2	3
22BEAS113	Principles of Soil Science	2	0	2	3
22BEAS114	Computer Programing and Data Structures	1	2	2	3
22BEAS115	Applied Electronics and Instrumentation	2	0	2	3
22BEAS116	Strength of Materials	1	0	2	2
22SA101	Physical Education, Sports and Games-1	0	0	2	1*
22SA102	Orientation Session	-	-	6	3*
22TP101	Constitution of India	0	2	0	1*
Total		9	10	16	25

COURSE STRUCTURE - R22

R22 B.Tech.

4 YEAR DEGREE PROGRAMME

II Year I Semester

Course Code	Course Title	L	T	P	C
22BEAS201	Mathematical Methods	1	2	2	3
22BEAS202	Principles of Horticultural Crops and Plant Protection	1	0	2	2
22BEAS203	Heat and Mass Transfer	1	2	0	2
22BEAS204	Soil Mechanics	1	0	2	2
22IADE201	Ground Water, Wells and Pumps	2	0	2	3
22SWCE201	Watershed Hydrology	1	0	2	2
22BEAS205	Theory of Machines	1	2	0	2
22BEAS206	Electrical Machines and Power Utilization	2	0	2	3
22BEAS207	Entrepreneurship Development and Business Management	2	0	2	3
Total		12	6	14	22
		32 Hrs			

II Year II Semester

Course Code	Course Title	L	T	P	C
22BEAS208	Thermodynamics, Refrigeration and Air Conditioning	2	0	2	3
22BEAS209	AutoCAD Applications	0	0	4	2
22BEAS210	Machine Design	1	2	0	2
22FMPE201	Tractor and Automotive Engines	2	0	2	3
22PAFE201	Engineering Properties of Agricultural Produce	1	0	2	2
22IADE202	Irrigation Engineering	2	0	2	3
22SWCE202	Soil and Water Conservation Engineering	2	0	2	3
22REE201	Fundamentals of Renewable Energy Sources	2	0	2	3
22ELCT201/202 /203/204	Elective Course-1	2	0	2	3
Total		14	2	18	24
		34 Hrs			

R22 B.Tech.

4YEAR DEGREE PROGRAMME

COURSE STRUCTURE - R22

III Year I Semester

Course Code	Course Title	L	T	P	C
22BEAS301	Building Construction and Cost Estimation	1	2	0	2
22FMPE301	Tillage and Sowing Operation	2	0	2	3
22PAFE301	Agricultural Structures and Environmental Control	2	0	2	3
22PAFE302	Post-Harvest Engineering of Cereals, Pulses and Oilseeds	1	2	2	3
22IADE301	Sprinkler and Micro Irrigation Systems	1	0	2	2
22SWCE301	Watershed Planning and Management	1	0	2	2
22REE301	Renewable Power Sources	1	2	2	3
22BEAS302	Design of Structures	1	0	2	2
22FMPE302	Tractor and Farm Machinery Operation and Maintenance	0	2	2	2
22ELCT201/202 /203/204	Elective Course-2	2	0	2	3
Total		12	8	18	25
		38 Hrs			

III Year II Semester

Course Code	Course Title	L	T	P	C
22FMPE303	Intercultural, Harvesting and Threshing Equipment	2	0	2	3
22PAFE303	Post-Harvest Engineering of Horticultural Crops	1	0	2	2
22SWCE302	Water Harvesting and Soil Conservation Structures	2	0	2	3
22PAFE304	Dairy and Food Engineering	1	2	2	3
22REE302	Bio-Energy Systems: Design and Applications	2	0	2	3
22BEAS303	Web Designing and Internet Applications	1	0	2	2
22IADE302	Drainage Engineering	1	0	2	2
22FMPE304	Tractor Systems and Controls	2	0	2	3
22ELCT201/202 /203/204	Elective Course-2	2	0	2	3
Total		14	2	18	24
		34 Hrs			

COURSE STRUCTURE - R22

R22 B.Tech.

4 YEAR DEGREE PROGRAMME

IV Year I Semester

Course Code	Course Title	L	T	P	C
22SDT401	Skill Development Training-I	0	0	10	5
22SDT402	Skill Development Training-II	0	0	10	5
22ELP401	Experiential Learning on Campus	0	2	18	10
Total		0	2	38	20
		40 Hrs			

IV Year II Semester

Course Code	Course Title	L	T	P	C
22IAP401	Internship	0	2	18	10
22ET401	Educational Tour	0	0	4	2*
22PPRW401	Project Planning and Report Writing	0	2	18	10
Total		0	4	40	22
		44 Hrs			

R22 B.Tech.

4 YEAR DEGREE PROGRAMME

COURSE STRUCTURE - R22

Department Electives

Course Code	Course Title	L	T	P	C
SOIL & WATER CONSERVATION ENGINEERING					
22ELCT201	Floods and Control Measures	2	0	2	3
22ELCT202	Wasteland Development	2	0	2	3
22ELCT203	Remote Sensing and GIS Applications	2	0	2	3
22ELCT204	Management of Canal Irrigation System	2	0	2	3
FARM MACHINERY & POWER					
22ELCT301	Precision Farming Techniques for Protected Cultivation	2	0	2	3
22ELCT302	Hydraulic Drives and Controls	2	0	2	3
22ELCT303	Tractor Design and Testing	2	0	2	3
22ELCT304	Farm Machinery Design and Production	2	0	2	3
FOOD PROCESS ENGINEERING					
22ELCT305	Food Quality and Control	2	0	2	3
22ELCT306	Food Packaging Technology	2	0	2	3
22ELCT307	Development of Processed Products	2	0	2	3
22ELCT308	Process Equipment Design	2	0	2	3

ABSTRACT OF TOTAL CREDITS DISTRIBUTION WITH HOURS R 22

Semester	Credits	Hours
I	25 (14+11)	13+4+19=36
II	25 (13+12)	9+10+16=35
III	22 (15+7)	12+6+14=32
IV	24 (15+9)	14+2+18=34
V	25 (15+10)	12+8+18=38
VI	24 (15+9)	14+2+18=34
VII	20 (0+20)	0+2+38=40
VIII	22 (0+22)	0+4+40=44
Total	**187**	**293**

Total Credits for 4 years (8 Semesters): ICAR 182 Credits

Credit Hours @ 35 per Week in a Semester: 8 x 35 = 280 Credit Hours: 293

I

YEAR

AGRICULTURAL ENGINEERING

B.Tech.

COURSE CONTENTS

I SEM & II SEM

I SEMESTER

22BEAS101	-	Ordinary Differential Equations and Linear Algebra
22BEAS102	-	Physics for Agricultural Engineers
22BEAS103	-	Chemistry for Agricultural Engineers
22BEAS104	-	Principles of Agronomy
22BEAS105	-	Environmental Science and Disaster Management
22BEAS106	-	Engineering Mechanics
22BEAS107	-	Engineering Drawing
22BEAS108	-	Communication Skills and Personality Development
22BEAS109	-	Workshop Technology and Practices

II SEMESTER

22BEAS110	-	Advanced Calculus and Partial Differential Equations
22BEAS111	-	Surveying and Levelling
22BEAS112		Fluid Mechanics and Open Channel Hydraulics
22BEAS113	-	Principles of Soil Science
22BEAS114	-	Computer Programing and Data Structures
22BEAS115	-	Applied Electronics and Instrumentation
22BEAS116	-	Strength of Materials
22SA101	-	Physical Education, Sports and Games-1
22SA102	-	Orientation Session
22TP101	-	Constitution of India

22BEAS101 ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of differentiation and integration.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to determine the rates of change or rates by which factors, such as acceleration or weight, change. To impart analytical ability in solving mathematical problems as applied to the respective branches of engineering.

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

ORDINARY DIFFERENTIAL EQUATIONS:

First Order Differential Equations: Order and degree of a differential equation, Variable Separable method (review) Linear differential equations, Bernoulli's differential equations, Exact and non-exact differential equations.

Higher Order Differential Equations: Linear differential equations with constant coefficients, method of variation of parameters.

UNIT-2 **4L+8T+8P=20 Hours**

APPLICATIONS AND NUMERICAL METHODS FOR ODE:

Applications of ODE: Newton's law of cooling, Law of natural growth and decay, LR circuits.

Numerical Methods for ODE: Taylor series method, Picard's method, Euler's and modified Euler's method, 4th order Runge-Kutta method.

PRACTICES:

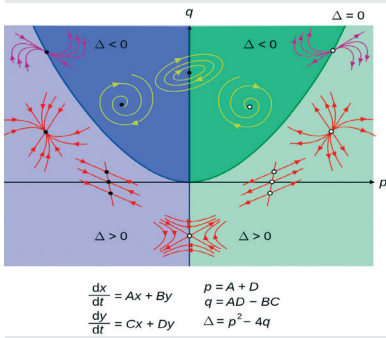
- Compute inverse of a matrix if exists.
- Explain with suitable examples how rank of matrix is independent of the elementary operations.
- Explain with suitable examples how rank of matrix is unique.
- Discuss with suitable examples when eigen values and eigen vectors are possible for a matrix.
- Discuss the possibility of solution of a system of equations.
- Discuss when inverse and power of a matrix exist using Cayley-Hamilton theorem.

MODULE-2

UNIT 1 **4L+8T+8P=20 Hours**

MATRICES:

Rank of a matrix, Echelon from, Normal form, PAQ form, Gauss Elimination method, Gauss-Jordan method, Finding Eigen values and Eigen vectors, Linear Transformation: Definition and Examples, Orthogonal transformation: Definition and Examples.Second Order Differential Equations



Source: https://www.study24x7.com/article/1227/how-to-prepare-for-engineering-mathematics-for-gate

SKILLS:

- ✓ *Find rank of a matrix using different methods.*
- ✓ *Compute the eigen values and eigen vectors of a matrix.*
- ✓ *Find analytical solution of a differential equation using appropriate method.*
- ✓ *Demonstrate any one numerical method to solve differential equation.*

UNIT 2 **4L+8T+8P=20 Hours**

APPLICATION OF MATRICES:

Finding Inverse of a matrix by Gauss-Jordan method, Consistency of System of linear equations, Cayley-Hamilton theorem (without proof), Power of a matrix, Diagonalization of a matrix, Quadratic forms.

PRACTICES:

- When inverse of a matrix exist and find it.
- How does rank of matrix is independent of the elementary operations? Explain with suitable examples.
- How does rank of matrix is unique, explain with suitable examples.
- When eigen values and eigen vectors are possible for a matrix? Discuss with suitable examples.
- Discuss the possibility of solution of a system of equations.
- Discuss when inverse and power of a matrix exist using Cayley-Hamilton theorem.

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 analytical method for solving differential equations and applications.	Apply	1	1, 2, 9, 12
2	Apply differential equations in real life problems.	Apply	1	1, 2, 9, 12
3	Apply the concepts of rank, eigen values and eigenvectors of a matrix and finding inverse of a matrix and powers of a matrix.	Apply	2	1, 2, 9, 12
4	Analyze the solution of a system of linear equations and find it.	Analyze	2	1, 2, 9, 12

TEXT BOOKS:

1. N. P. Bali, K. L. Sai Prasad, “A Textbook of Engineering Mathematics I, II, III”, 2nd Edition Universal Science Press, New Delhi, 2018.
2. B. S. Grewal,”Higher Engineering Mathematics”, 44 Edition, Khanna Publishers, 2018.

REFERENCE BOOKS:

1. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, John Wiley & Sons, Inc, 2015.
2. H. K. Dass and Er. RajanishVerma, “Higher Engineering Mathematics”, 3rd revised edition, S. Chand & Co., 2015.
3. B. V. Ramana, “Advanced Engineering Mathematics”, TMH Publishers, 2020.
4. T. K.V. Iyengar et al, “Engineering Mathematics, I, II, III”, S. Chand & Co., New Delhi,2018.

22BEAS102 PHYSICS FOR AGRICULTURAL ENGINEERS

Source: https://www.furman.edu/academics/physics/program-overview/dual-degree-pre-engineering-physics/

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of physics.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to seamless consolidation of basic principles of Physics and applications.

It emphasizes on modern technological advancement relevant to latest developments in the fields of science, engineering and technology.

MODULE – 1

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

FERROMAGNETISM:

Dia, Para and ferromagnetism-classification. Langevin theory of dia and paramagnetism. Adiabatic demagnetization. Weiss molecular field theory and ferromagnetism. Curie-Weiss law.

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

WAVE FUNCTION:

Wave particle quality, de-Broglie concept, uncertainty principle. Wave function. Time dependent and time independent Schrodinger wave equation, Qualitative explanation of Zeeman effect, Stark effect and Paschan Back effect, Raman spectroscopy. Statement of Bloch's function. Bands iii solids, velocity of Bloch's electron and effective mass.

PRACTICES:

- To find the frequency of A.C. supply using an electrical vibrator
- To find the low resistance using Carey Foster bridge without calibrating the bridge wire
- To determine dielectric constant of material using De Sauty's bridge
- To determine the value of specific charge (e/m) for electrons by helical method
- To study the induced e.m.f. as a function of velocity of the magnet
- To obtain hysteresis curve (B-H curve) on a C.R.O. and to determine related magnetic quantities
- To study the variation of magnetic field with distance along the axis of a current carrying circular coil and to detuning the radius of the coil

MODULE-2

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

SEMICONDUCTORS:

Distinction between metals. insulators and semiconductors. Intrinsic and extrinsic semiconductors, law of mass action. Determination of energy gap in semiconductors. Donors and acceptor levels. Superconductivity, critical magnetic field. Meissner effect. Isotope effect. Type-I and II superconductors, Josephson's effect DC and AC, Squids. Introduction to high Tc superconductors.

SKILLS:

- ✓ *Evaluate the relation between electricity and magnetism.*
- ✓ *Realize the phenomenon of geometrical and physical optics.*
- ✓ *Analyze semiconducting and dielectric materials.*

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

ILLUMINATION:

Spontaneous and stimulated emission, Einstein A and B coefficients. Population inversion, He-Ne and Ruby lasers. Ammonia and Ruby masers, Holography-Note. Optical fiber. Physical structure. basic theory. Mode type, input output characteristics of optical fiber and applications. Illumination: laws of illumination, luminous flux, luminous intensity, candle power, brightness.

PRACTICES:

- To determine the energy band gap in a semiconductor using a p-n Junction diode;
- To determine the slit width from Fraunhofer diffraction pattern using laser beam;
- To find the numerical aperture of optical fiber.
- To set up the fiber optic analog and digital link;
- To study the phase relationships in L.R. circuit;
- To study LCR circuit;
- To study the variations of thermo emf of a copper-constantan thermo-couple with temperature;
- To find the wave length of light by prism.
- F-test.

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 Super conductors upon their classification	Apply	2	1, 2, 6, 7, 9
2	Apply the characteristics of Lasers to realize their applications	Apply	2	1, 2, 3, 4, 6
3	Apply the knowledge of Optical fibres to sensors and communication	Apply	2	1, 2, 3, 4, 6
4	Analyze the magnetic materials and to apply principles of quantum mechanics	Analyze	1	1, 2, 3, 4, 7
5	Evaluate the energy band gap in semiconductors	Evaluate	1	1, 2, 3, 4, 6

TEXT BOOKS:

1. Brijlal and Subrahmanyam., " Text Book of optics"., S. Chand and Co., New Delhi, 2014.
2. Sarkar Subir Kumar., "Optical State Physics and Fiber Optics. S. Chand and Co.", New Delhi, 2012.

REFERENCE BOOKS:

1. Gupta S L, Kumar V Sharma R C, "Elements of Spectroscopy" Pragati Prakasam, Meeruth, 2019.
2. Saxena B S and Gupta R C, "Solid State Physics" Pragati Prakasam, Meeruth, 2008.
3. Srivastava B N, "Essentials of Quantum Mechanics" Pragati Prakasam, Meeruth, 2020.
4. Vasudeva D N, "Fundamentals of Magnetism and Electricity" S. Chand and Co., New Delhi, 2010.

22BEAS103 CHEMISTRY FOR AGRICULTURAL ENGINEERS

Source: https://www.dreamstime.com/photos-images/future-scientists.html

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basic knowledge in chemistry at intermediate level.

COURSE DESCRIPTION AND OBJECTIVES:

This course is specifically designed for the students of B. Tech. Agricultural Engineering and covers some important topics from all the areas of chemistry. This course enables students with thorough understanding of concepts in chemistry, which may be utilized later in their successive years. Students get familiar with the basic principles of phase rule for different systems, analysis of water sample, science of corrosion, fundamentals of polymers, basics of food chemistry and advanced instrumental techniques. Students develop skills which are necessary to apply in specific agricultural engineering problems.

MODULE-1

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

WATER TECHNOLOGY & INTRODUCTION TO FOOD CHEMISTRY :

Water technology: Temporary and permanent hardness, action of soap with hard water and soft water, disadvantages of hard water, scale and sludge formation in boilers, boiler corrosion.

Introduction to food chemistry: Introduction to lipids, proteins, carbohydrates, vitamins with biological significance, food preservatives, colouring and flavouring reagents of food.

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

CORROSION, POLYMERS AND LUBRICANTS:

Corrosion: Causes; Types - dry corrosion, wet corrosion, corrosion prevention by cathodic protection.

Polymers: Types of polymerization; Preparation, properties and applications of polyethylene, PMMA, phenol formaldehyde, nylon 6, 6.

Lubricants: Classification; Properties- viscosity, viscosity index, flash and fire points, cloud and pour points and mechanical stability.

PRACTICES:

- Determination of temporary-permanent hardness of water by EDTA method.
- Determination of chlorides in water.
- Determination of available chlorine in bleaching powder.
- Determination of alkalinity of water sample.
- Determination of carbonate and noncarbonate hardness by soda reagent.
- Determination of viscosity of oil.
- Synthesis of nylon-6,6 /Bakelite.

MODULE-2

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

PHASE RULE, FUELS AND COLLOIDS:

Phase rule: Introduction to phase rule equation, explanation of terms and derivation. Application of phase rule to one component systems- water system, two component systems – lead silver system.

Fuels: Classification of fuels; Calorific value of fuel- HCV, LCV; Bomb calorimeter.

SKILLS:

- ✓ *Analyze the total hardness of water sample*
- ✓ *Analyze suitability of lubricant for particular application*
- ✓ *Synthesize various polymers*
- ✓ *Characterize chemical compounds by using IR spectroscopy*

Colloids: Classification and properties of colloids – Tyndall effect, Brownian movement and electrophoresis.

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

INSTRUMENTAL TECHNIQUES:

IR Spectroscopy: Introduction; Types of vibrations; Instrumentation of IR spectrophotometer and the applications.

Atomic absorption spectroscopy (AAS): Introduction; instrumentation and applications.

Nuclear radiation detectors: GM counter and analytical applications of radioactive materials.

PRACTICES:

- Determination of Iron (II) in water by colorimetry (verification of Beer-Lambert Law).
- CST of phenol-water system.
- Determination of dissolved oxygen in water.
- Determination of BOD in waste water sample.
- Determination of COD in waste water sample.
- Determination of acidity of water sample.
- Semi-micro inorganic salt analysis.
- Measurement of radioactivity of soil & water with help of GM counter.

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 phase rule to one component and two component systems.	Apply	2	1, 2, 9, 10, 11, 12
2	Apply instrumental methods for analysis of different materials.	Apply	2	2, 3, 4, 5, 9, 10, 11, 12
3	Analyze the disadvantages of hard water and identify the chemical problems related to food chemistry.	Analyze	1	1, 2, 3, 9, 10, 11, 12
4	Recognize the disadvantages of corrosion and identify suitable prevention method. Assess various polymers and lubricants for engineering applications.	Analyze	1	1, 2,3, 9, 10, 11, 12
5	Analyze the properties of colloidal systems and determine the calorific value of fuels.	Analyze	2	1, 2, 9, 10, 11, 12

TEXT BOOKS:

1. P. C Jain and Monica Jain, “Engineering Chemistry”, 17th edition, Dhanpat Rai, 2010.
2. Shashi Chawala, “Engineering Chemistry Engineering Materials and Applications”, 3rd edition, Dhanpat Rai, 2015.

REFERENCE BOOKS:

1. Bahl B S, Arun Bahl and Tuli B D., “Essentials of Physical Chemistry”, 4th edition, S. Chand, 2017.
2. Gurudeep Raj and Chatwal Anand, “Instrumental Methods of Analysis”, 5th edition, Himalaya, 2018.
3. H. J. Arnikar “Essentials of nuclear chemistry”, 4th edition, New age, 2018.

22BEAS104 PRINCIPLES OF AGRONOMY

source: https://krishijagran.com/blog/agronomy-and-its-relation-to-other-sciences/

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of cropping system, cultivation practices for various crops.

COURSE DESCRIPTION AND OBJECTIVES:

To train and equip the students with necessary theoretical and practical knowledge on basic principles of cropping systems and acquaints them with the cultivation practice of various crops in Indian agriculture.

MODULE-1

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

INTRODUCTION AND SCOPE OF AGRONOMY:

Classification of crops, effect of different weather parameters on crop growth and development, Principles of tillage, tilth and its characteristics.

UNIT-2 **8L+0T+16P=24 Hours**

CROP SEASONS:

Methods, time and depth of sowing of major field crops, methods and time of application of manures and fertilizers.

PRACTICES:

- Identification of crops and their varieties.
- Practice on primary tillage implements.
- Practice of secondary tillage implements.
- List out various manure for food crops.
- Identification of various seeds for food crops and pulses.
- Practice of sowing in field for various crops.
- Study on different fertilizer Application methods.
- Study on various fertilizers.

MODULE-2

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

SOIL WATER PLANT RELATIONSHIP:

Crop coefficients, water requirement of crops and critical stages for irrigation, weeds and their control.

UNIT-2 **8L+0T+16P=24 Hours**

ORGANIC FARMING AND CROP ROTATION:

Sustainable agriculture, cropping systems, relay cropping and mixed cropping..

SKILLS:

- ✓ *Practice of ploughing in field.*
- ✓ *Practice of puddling in paddy field.*
- ✓ *Practice of sowing in field for various crops.*

PRACTICES:

- Study of Weed identification.
- Different weed control methods and practices in agriculture.
- Practice of ploughing in field.
- Practice of puddling in paddy field.
- Practice on organic farming methods.
- Practice on intra and intro cultivation.
- Practice of mixed cropping.
- Practice of weed management practices.

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 their knowledge and acquired principles on cereals, pulses, oilseeds and commercial crops in agriculture for increasing yields and reducing cost of cultivation.	Apply	1	1, 2, 3, 9
2	Apply and develop new package of practices for various crops in agriculture, horticulture and sericulture.	Apply	1	1, 2, 9, 12
3	Analyze the problems faced by the farmers in agriculture in view of increasing yields and reducing cost of cultivation.	Analyze	2	1, 2, 9,12
4	Evaluate the trend and current scenario of investments and returns on local and global agriculture.	Evaluate	2	1, 2, 9, 12

TEXT BOOKS:

1. Reddy G.H. Shankara Reddy T. Allamanda Reddy, by “A text book on Principles of Agronomy” 2018.
2. V C Srivastava, by “A text book on Modern Principles of Agronomy” 2015.

REFERENCE BOOKS:

1. Gupta O P. 1984, “Scientific Weed Management” in the Tropics and Sub- Tropics. Today and Tomorrow’s Printers and Publishers. New Delhi.
2. Rao V S. 1992, “Principles of Weed Science”. Oxford and IBH Publishing Co. Ltd. New Delhi.
3. Reddy Yellamanda T and Shankar Reddy G H. 1995, “Principles of Agronomy”. Kalyani Publishers Ludhiana.

22BEAS105 ENVIRONMENTAL SCIENCE AND DISASTER MANAGEMENT

Source: https://www.aimsindia.com/blog/world-environment-day-protect-our-environment-and-protect-our-health/

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of importance of natural resources, ecosystems, biodiversity and disaster management.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to focus on environmental issues and develop critical thinking skills, analyze the problems and create sustainable solutions. It identifies the problems of biodiversity and ecosystem and create solutions to conserve them. It provides training on modern analytical techniques for environmental analysis. It helps to ensure skills and abilities to analyze the impacts of disaster and apply strategies and methods to design, implement and evaluate research on disasters.

MODULE- 1

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

NATURAL RESOURCES:

Scope and importance. Natural Resources: Renewable and non-renewable resources Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

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

BIODIVERSITY:

Role of an individual in conservation. of natural resources. Equitable use of resources for sustainable lifestyles. Ecosystems: Concept, Structure, function, Producers, consumers, decomposers, Energy flow, ecological succession, food chains, food webs, ecological pyramids. Introduction, types, characteristic features, structure and function of the forest, grassland, desert and aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity and its conservation: Introduction, definition, genetic, species & ecosystem diversity and bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

PRACTICES:

- Case Studies and Field work.
- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain.
- Visit to a local polluted site-Urban/ Rural/ Industrial/ Agricultural.
- Study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.
- Expected impact of climate change on agricultural production and water resources.

SKILLS:

- ✓ *Understand structural relationships, abstract models, symbolic languages and deductive reasoning.*
- ✓ *Gain perspectives to address the challenges, improvise and devise solutions.*

MODULE- 2

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

ENVIRONMENTAL POLLUTION:

Environmental Pollution: definition, cause, effects and control measures of a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Social Issues and the Environment from Unsustainable to Sustainable development, Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

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

HUMAN POPULATION AND THE ENVIRONMENT:

Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Disaster Management: Natural Disasters and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters-Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community-based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

PRACTICES:

- Mitigation Strategies.
- Economics of climate change.
- Disaster Management introduction.
- Natural and Manmade Disaster Studies.
- Informatics for Disaster Management.
- Quantitative Techniques for Disaster Management Environmental Impact Assessment (EIA) and Disaster Management.
- Disaster Management Policy Environmental Modelling.

COURSE OUTCOMES:

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

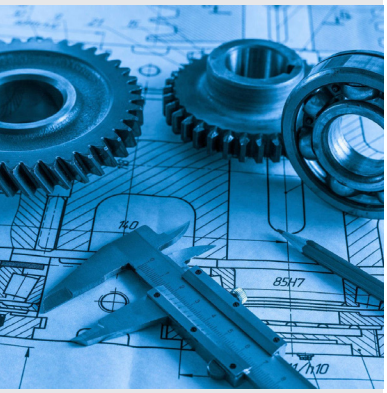
CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the basic concepts of natural resource utilization and sustainable agriculture for the purpose of food security and environmental protection.	Apply	1	1, 2, 3, 9
2	Analyze the pollutants in air, water and soil samples and suggest remediation measures.	Analyze	1	1, 2, 9, 12
3	Analyze various risks, relief needs, and lessons learned from previous disasters and formulate strategies of mitigation measures in future scenario.	Analyze	2	1, 2, 9, 12
4	Evaluate current events and public information related to biodiversity conservation especially for solving problems related to wildlife and ecosystems.	Evaluate	2	1, 2, 9, 12

TEXT BOOKS:

1. Bharucha Erach. Text Book of “Environmental Studies for Undergraduate Courses, 2005. University Grants Commission” University Press, Hyderabad.
2. Sharma J P. “Introduction to Environment Science”, Lakshmi Publications, 2005.
3. Chary Manohar and Jaya Ram Reddy. “Principles of Environmental Studies”, B S Publishers, Hyderabad, 2005

REFERENCE BOOKS:

1. Kaul S N, Ashuthosh Gautam “Water and Waste Water Analysis” Days Publishing House, Delhi, 2006.
2. Gupta P K. “Methods in Environmental Analysis – Water. Soil and Air” Agro bios, Jodhpur, 2004.
3. Climate change, Adaptation and mitigation of climate change-Scientific Technical Analysis Cambridge University Press, Cambridge, 1995.
4. Sharma, R.K. & Sharma, G. “Natural Disaster. APH Publishing Corporation” New Delhi, 2005.
5. Husain Majid, “Environment and Ecology: Biodiversity, Climate Change and Disaster Management” online book, 2003.



Source: : https://www.futurelearn.com/courses/cracking-mechanics

22BEAS106 ENGINEERING MECHANICS

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Basics of knowledge of physics and trigonometry.

COURSE DESCRIPTION AND OBJECTIVES:

To apply principles of mechanics for solving engineering problems, analyze reaction forces and moments of an equilibrium body directly or indirectly used in our real life, like machines and structures.

MODULE-1

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

SYSTEM OF FORCES:

Basic concepts of Engineering Mechanics. Force systems, Free body diagram and equilibrium of forces. Resultant of coplanar forces.

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

CENTROID AND MOMENT OF INERTIA:

Centroid, centroids of composite areas, Moment of inertia: polar moment of inertia, radius of gyration, polar radius of gyration of composite areas.

PRACTICES:

- Problems on composition and resolution of forces, moments of a force, couples, transmission of a couple, resolution of a force into a force & a couple.
- Problems relating to resultant of; Co-planer force system, collinear force system, concurrent force system, co-planer concurrent force system, co-planer non-concurrent force system.
- Problems relating to centroids of composite areas.
- Problems on moment of inertia, polar moment of inertia, radius of gyration, polar radius of gyration of composite areas.

MODULE-2

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

FRICTION:

Frictional forces: Classification of friction, Coefficient of friction, Laws of friction, angle of friction, Angle of repose and application of friction.

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

Analysis of simple framed structures using methods of joints, methods of sections and graphical method

PRACTICES:

- Problems involving frictional forces.
- Analysis of simple trusses by method of joints and method of sections.
- Analysis of simple trusses by graphical 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	Apply the force resolution methods to determine resultants of any force system and the equivalent force system.	Apply	1	1, 2, 3, 9, 12
2	Apply the principle of framed structure to design green houses.	Apply	2	1, 2, 3, 9, 12
3	Analyze the centroid, first moment and second moment of composite areas.	Analyze	1	1, 2, 3, 9, 12
4	Analyze the mechanics problems associated with friction force.	Analyze	2	1, 2, 3, 9, 12

SKILLS:

- ✓ *Analyzing system of forces*
- ✓ *Compute the centroid and moment of inertia of composite areas*
- ✓ *Demonstrate application of friction in daily life.*

TEXT BOOKS:

1. Timoshenko S and Young D H, "Engineering Mechanics" McGraw Hill Book Co., New Delhi. 2018.
2. K. Tayal, "Engineering Mechanics", Umesh Publications, 2005.

REFERENCE BOOKS:

1. J. L. Meriam, L. G. Kraige, "Engineering Mechanics: Dynamics", 7th ed., John wiley & sons, 2012.
2. S. S. Bhavakati & J. G. Rajasekharappa, "Engineering Mechanics", 3nd ed., New Age International Publications, New Delhi, 2008.

Source: https://www.3erp.com/blog/everything-you-need-to-know-about-technical-drawings/

22BEAS107 ENGINEERING DRAWING

Hours Per Week :

L	T	P	C
0	0	3	2

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to enable the students for making technical drawings of different engineering objects, to equip with knowledge and skills on visualization of machine components and objects, and to impart knowledge and skills to the students in CAD involving graphics and machine drawing.

MODULE-1

PRACTICES: **0L+0T+24P=24 HOURS**

- Introduction of drawing scales;
- First and third angle methods of projection.
- Principles of orthographic projections; References planes; Points and lines in space and traces of lines and planes;
- Auxiliary planes and true shapes of oblique plain surface;
- True length and inclination of lines;
- Projections of solids (Change of position method, alteration of ground lines);
- Section of solids and Interpenetration of solid surfaces;
- Development of surfaces of geometrical solids;
- Isometric projection of geometrical solids.
- Preparation of working drawing from models and isometric views.
- Drawing of missing views.
- Different methods of dimensioning.
- Concept of sectioning, Revolved and oblique sections and Sectional drawing of simple machine parts.

MODULE-2

PRACTICES: **0L+0T+24P=24 HOURS**

- Types of rivet heads and riveted joints.
- Processes for producing leak proof joints.
- Symbols for different types of welded joints.
- Nomenclature, thread profiles, multi start threads, left and right hand threads.
- Square headed and hexagonal nuts and bolts.
- Conventional representation of threads.
- Different types of lock nuts, studs, machine screws, cap screws and wood screws.
- Foundation bolts. Forms of screw threads, representation of threads, Bolts- headed center, study of screws, set of screws, hexagonal and square, keys-types, taper, rank taper and hollow saddle.

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	Students will develop good communication skills and team work	Apply	2	1,2,3,4,6
2	Draw orthographic projections of lines, planes and solids	Analyze	1	1,2,3,4,7
3	Draw sections of solids including cylinders, cones, prisms and pyramids.	Analyze	2	1,2,6,7,9
4	Students' ability to produce engineered drawing of any newly designed object will be improved	Evaluate	2	1,2,3,4,6
5	Construct isometric scale, isometric projections and views	Evaluate	1	1,2,3,4,6

TEXT BOOKS:

1. Bhat N D. "Elementary Engineering Drawing" Charotar Publishing House Pvt. Ltd., Anand, 2005.

REFERENCE BOOKS:

1. Bhatt N D and Panchal V M. "Machine Drawing" Charotar Publishing House Pvt. Ltd., Anand, 2008.
2. Narayana K L and Kannaiah P. "Machine Drawing" Scitech Publications (India) Pvt. Ltd., Chennai, 2010.

SKILLS:

- ✓ *Understand projections of lines, planes, and solids.*
- ✓ *Read any Engineering drawing.*
- ✓ *Understand different types of scales.*

Source:
https://gettalkative.com/info/communication-channels

22BEAS108 COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of ethics and communication.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to develop effective communication skills. Presentation skills and acquire grooming techniques. Students self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills. Develop all-round personalities with a mature outlook to function effectively in different circumstances. Bring about personality development with regard to the different behavioral dimensions that has far reaching significance in the direction of organizational effectiveness.

MODULE-1

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

COMMUNICATION SKILLS:

Communication Skills: Structural and functional grammar; meaning and process of communication.

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

VERBAL AND NON-VERBAL COMMUNICATION:

Verbal and non-verbal communication; listening and note taking, writing skills, oral presentation skills.

PRACTICES:

- Listening and note taking, writing skills, oral presentation skills.
- Field diary and lab record.
- Field indexing.
- Footnote and bibliographic procedures.

MODULE-2

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

FOOTNOTE AND BIBLIOGRAPHIC:

Field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precis writing, summarizing, abstracting

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

INDIVIDUAL AND GROUP PRESENTATIONS:

Individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

PRACTICES:

- Reading and comprehension of general and technical articles.
- Reading and comprehension of precis writing.
- Reading and comprehension of summarizing.

- Reading and comprehension of abstracting;
- Individual and group presentations.

SKILLS:

- ✓ *Able to speak fluently and confidently*
- ✓ *Body language will be improved.*

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 specific use of english for technical Communication	Apply	1	5, 6, 7, 9, 12
2	Apply the overall english proficiency of students and enable them to function effectively in different professional contexts	Apply	1	5, 6, 7, 9, 12
3	Apply knowledge of different new technologies of communication tools	Apply	2	1, 2, 3, 6, 7, 9, 12
4	Analyze student skills in the areas of reading, writing, listening and speaking and help them function effectively in their professional sphere	Analyze	2	5, 6, 7, 9, 12
5	Evaluate and development of all round personalities with nature outlook	Evaluate	2	5, 6, 7, 9, 12

TEXT BOOKS:

1. Balasubramanian T. “A Text book of Phonetics for Indian Students” Orient Longman, New Delhi, 2002.
2. Balasubrmanyam M. “Business Communication”, Vani Educational Books, New Delhi, 2009.

REFERENCE BOOKS:

1. Naterop, Jean, B. and Rod Revell. “Telephoning in English”, Cambridge University Press, Cambridge, 2009.
2. Mohan Krishna and Meera Banerjee, “Developing Communication Skills” Macmillan India Ltd. New Delhi, 1999.
3. Krishnaswamy,. N and Sriraman, T. “Current English for Colleges” Macmillan India Ltd. Madras, 2009.
4. Narayanaswamy V R. “Strengthen your writing” Orient Longman, New Delhi, 2012.
5. Sharma R C and Krishna Mohan, Business Correspondence. Tata Mc Graw Hill publishing Company, New Delhi, 1997.

Source: https://medium.com/swlh/nine-tips-for-creating-effective-accessibility-workshops-e94cb7ae0522

22BEAS109 WORKSHOP TECHNOLOGY AND PRACTICES

Hours Per Week :

L	T	P	C
1	0	4	3

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to impart knowledge and provide hands-on experience in Carpentry, Fitting, Facing and Turning. In addition, it also provides knowledge on various manufacturing processes such as Foundary, Welding, and Machine Shops.

MODULE-1

UNIT-1 **4L+0T+16P=20 Hours**

CARPENTRY TOOLS:

Introduction to various carpentry tools, materials, types of wood and their characteristics and Processes or operations in wood working; Introduction to Smithy tools and operations.

UNIT-2 **4L+0T+16P=20 Hours**

WELDING:

Introduction to welding, types of welding, Oxyacetylene gas welding, types of flames, welding techniques and equipment. Principle of arc welding, equipment and tools. Casting processes.

PRACTICES:

- Preparation of simple joints: Cross half Lap joint and T-Halving joint.
- Preparation of Dovetail joint, Mortise and tenor joint.
- Jobs on Bending, shaping etc.; Jobs on Drawing, Punching, Riveting.
- Introduction to tools and measuring instruments for fitting.
- Jobs on sawing, filing and right angle fitting of MS Flat.
- Practical in more complex fitting job.
- Operations of drilling, reaming, and threading with tap and dies.
- Introduction to tools and operations in sheet metal work.
- Making different types of sheet metal joints using G.I. sheets.
- Introduction to welding equipment, processes tools, their use and precautions.
- Jobs on ARC welding – Lap joint, butt joint; T-Joint and corner joint in Arc welding.
- Gas welding Practice – Lab, butt and T-Joints.

MODULE-2

UNIT-1 **4L+0T+16P=20 Hours**

LATHE:

Classification, constructional details of center lathe, Main accessories and attachments. Main operations and tools used on center lathes. Types of shapers, Constructional details of standard shaper. Work holding devices, shaper tools and main operations.

UNIT-2 **4L+0T+16P=20 Hours**

DRILLING MACHINES:

Types of drilling machines. Constructional details of pillar types and radial drilling machines. Work holding and tool holding devices. Main operations. Twist drills, drill angles and sizes. Types and classification. Constructional details and principles of operation of column and knee type universal milling machines. Plain milling cutter. Main operations on milling machine.

PRACTICES:

- Introduction to metal casting equipment, tools and their use.
- Mould making using one-piece pattern and two pieces pattern.
- Demonstration of mould making using sweep pattern, and match plate patterns.
- Introduction to machine shop machines and tools.
- Demonstration on Processes in machining and use of measuring instruments.
- Practical jobs on simple turning, step turning.
- Practical job on taper turning, drilling and threading.
- Operations on shaper and planer, changing a round MS rod into square section on a shaper.
- Demonstration of important operations on a milling machine, making a plot, gear tooth forming and indexing; Any additional job.

SKILLS:

- ✓ *Prepare wooden and metal furniture.*
- ✓ *Make funnels, trays, locker and steel almirahs etc.*

COURSE OUTCOMES:

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

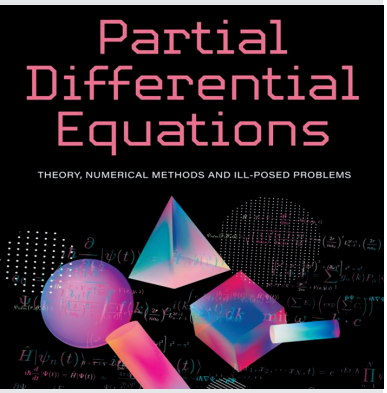
CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply turning, facing, milling, drilling, threading, etc. in project work industry or other engineering works.	Apply	2	1, 2, 3, 4, 6
2	Apply and Fabricate wooden joints and joining of metals.	Create	1	1, 2, 3, 4, 6
3	Create the foundry shop, plant lay out and lathe machine.	Evaluate	1	1, 2, 3, 4, 7
4	Create, select and apply appropriate techniques, resources and modern engineering tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	Create	2	1, 2, 3, 4, 6
5	Evaluate as a member or leader in diverse teams and in multi-disciplinary settings.	Evaluate	2	1, 2, 6, 7, 9

TEXT BOOK:

1. Hazra, Choudari S K and Bose S K. “Elements of Workshop technology” (Vol. I and II). Media Promoters and Publishers Pvt. Ltd., Mumbai, 2005.

REFERENCE BOOKS:

1. Chapman W A J. “Workshop Technology” (Part I and II). Arnold Publishers (India) Pvt. Ltd., AB/9 Safdarjung Enclave, New Delhi, 2002.
2. Raghuwamsi B S. “A Course in Workshop Technology” (Vol. I and II). Dhanpat Rai and Sons, 1682 Nai Darak, New Delhi, 2008.



Source: partial-differential-equations-theory-numerical-methods-and-ill-posed-problems/

22BEAS110 ADVANCED CALCULUS AND PARTIAL DIFFERENTIAL EQUATIONS

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of differential equations.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to understand the concept of complex geometry which is very useful in constructing machines. Complex analysis has a great role in many circuits. To understand about Fourier series which represents periodic functions. It is used in the resolution of partial differential equations, which appears in many engineering problems such as heat diffusion, wave propagation and fluid mechanics problem.

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

CALCULUS: Partial differentiation: Partial derivatives of higher order, Homogeneous functions, Euler's theorem, Total differential coefficient.

Multiple Integrals: Double and triple integrals, change of order of integration,

Vector Differentiation: Scalar and vector point functions, Differentiation of vector functions, Gradient, Divergence, Curl.

UNIT-2 **4L+8T+8P=20 Hours**

APPLICATIONS: Applications of Partial differentiation: Maxima and Minima of a function of two variables, Conditions for extreme values, Lagrange method of undetermined multipliers.

Jacobians: Definition, Properties, determining functional dependency and independency.

Application of multiple integrals: to find Area and Volume

Applications of Vector Calculus: Normal vector, Angle between surfaces, Directional Derivate, Solenoidal and Irrotational flow.

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PRACTICES:

- Determine extreme values of a function.
- Calculate area and volume.
- Determine the directional derivative of scalar at any point in the direction of the tangent to the curve.
- Determine scalar potential function.
- Identify field is solenoidal vector and irrational.

MODULE-2

UNIT-1 **4L+8T+8P=20 Hours**

PARTIAL DIFFERENTIAL EQUATIONS AND SERIES SOLUTIONS: Partial differential equation: Order and degree, Formation of partial differential equations, Higher order linear partial differential equations with constant co efficients, Solution of first order nonlinear PDE.

Series Solution Techniques: Frobeneous Series solution (Singular point only).

UNIT-2 **4L+8T+8P=20 Hours**

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS AND SERIES SOLUTIONS: Solutions of One dimensional wave equation, Heat equation and Laplace's equation,

PRACTICES:

- Learn method of forming partial differential equations.
- Identify and apply different methods to solve differential equations.
- Learn Series Solution Techniques like Frobeneous Series solution.
- Determine the displacement of a vibrational string is initially at rest in equilibrium position.
- Evaluate the temperature distribution in insulated rods.
- Determine solutions of Bessel's and Legendre's differential equations.

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 partial differentiation to estimate extreme values.	Apply	1	1, 2, 4, 9, 10, 12
2	Apply series solution methods to solve Bessel's and Legendre's differential equations.	Apply	2	1, 2, 4, 9, 10, 12
3	Evaluate the line integral, surface integral and volume integral.	Evaluate	1	1, 2, 4, 9, 10, 12
4	Evaluate the one dimensional wave equation, heat equation and Laplace's equation.	Evaluate	2	1, 2, 4, 9, 10, 12

TEXT BOOKS:

1. N. P. Bali, K. L. Sai Prasad, "A Textbook of Engineering Mathematics I, II, III", 2nd Edition Universal Science Press, New Delhi, 2018.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018

REFERENCE BOOKS:

1. H. K. Dass and Er. Rajinish Verma, "Higher Engineering Mathematics", S. Chand and Co., Third revised edition, 2015.
2. B. V. Ramana, "Advanced Engineering Mathematics", TMH Publishers, 2014.
3. T. K.V. Iyengar et al, "Engineering Mathematics, I, II, III", S. Chand and Co., New Delhi, 2018

SKILLS:

- ✓ *Apply the transformation between line integral, surface integral and volume integral.*
- ✓ *Gain deeper knowledge of multivariate differentiation operations such as Gradient, Divergent and Curl.*
- ✓ *Recognize characteristic curves and canonical forms for second-order partial differential equations.*
- ✓ *Solve PDE problems.*

Source: https://lirp.cdn-website.com/d9905c31/dms3rep/multi/opt/Vancouver+Land+Surveyor+Pros

22BEAS111 SURVEYING AND LEVELLING

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basic concept of Surveying.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an understanding and application of principles of surveying The objective of this course is to provide basic knowledge about taking measurements using different instruments like chain, tape, auto level, theodolite and total station.

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

LINEAR DISTANCES AND ANGLES:

Surveying, Principles of surveying and Maps. Chain and Tape: Principle, Basic Definitions, Equipment and Accessories. Compass: Principle, Bearing types and its designations, Instruments. Plane Table: Accessories and Orientation

UNIT-2 **4L+8T+8P=20 Hours**

FIELD MEASUREMENTS :

Chain: Field Procedure and its linear measurements with chain and Tape, Errors and Corrections. Compass: Traversing using Compass, Local Attraction and Its Correction. Plane Table: Field procedure and Its Methods.

PRACTICES:

PROBLEMS ON NUMBER CRUNCHING:

- Chaining of a line using Chain / Tape and Recording of details along the chain line.
- Obstacles in chaining.
- Measurement of Area using Chain and Tape.
- Traversing using Compass.
- Plane Table Surveying using Radiation method.

MODULE-2

UNIT-2 **4L+8T+8P=20 Hours**

THEODOLITES AND ELECTRONIC DISTANCE EQUIPMENTS:

Levelling: Principle, Basic Definition, Classification and Its Methods, Theodolite and Auto Level. Contours and Curves: Characteristics and Elements of curve. Electronic Distance Measurements: Principle, Types of EDM, Total Station Drone Survey, aerial triangulation.

UNIT-2 **4L+8T+8P=20 Hours**

FIELD PROCEDURE AND ITS MEASUREMENTS:

General Procedure of levelling and Measurement of Horizontal Angles, Vertical Angles. Electronic Distance Measurements: Total Station Survey Drone Flight Planning.

PRACTICES:

- Measurement of elevation difference between two points using any levelling Instrument.
- Measurement of Horizontal and vertical Angles.
- Estimation of Height of Building.
- Study of instrument, determination of distances, directions and elevations.
- Identifying boundaries and Determination of area using total station.

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	Articulate in basic principles of surveying using chain, tape and plane table.	Apply	1	1, 2, 5
2	Illustrate the basic concepts of Levelling, theodolite and Total station.	Apply	2	1, 4, 5, 6
3	Computing the linear and Mapping measurements using metric chain, tape, compass and plane table.	Evaluate	1	1, 2, 8, 9, 10
4	Determine the bearings, height and positional measurements using Total station, theodolite and levelling.	Evaluate	2	1, 2, 4, 5, 8

TEXT BOOKS:

1. Basak N N, Surveying and Levelling", 2nd Edition McGraw Hill Education, 2017.
2. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I. K. International, 2019.

REFERENCE BOOK:

1. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2015.

SKILLS:

- ✓ *Ability to do chaining on a plain and steep ground.*
- ✓ *Mastery of usage of chain, tape and Plain table.*
- ✓ *Proficiency in usage of compass and theodolite for measuring bearings.*
- ✓ *Illustration of total station parts and measurements.*

source: https://cde.nus.edu.sg/cee/research/laboratories/hydraulic-engineering-laboratory/

22BEAS112 FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of fluid mechanics and flow principle.

COURSE DESCRIPTION AND OBJECTIVES:

This objective of this course is to acknowledge basic principles, fundamental concepts and theories of fluid mechanics to familiarize the behaviour of the fluids at rest as well as in motion and the main of the course is to impart knowledge on static, kinematics and dynamic aspects of fluids..

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

FLUID PROPERTY:

Properties of fluids: Ideal and real fluid. Pressure and its measurement, Pascal's law, pressure forces on plane and curved surfaces, centre of pressure, buoyancy, meta centre and meta centric height, condition of floatation and stability of submerged and floating bodies..

UNIT-2 **4L+8T+8P=20 Hours**

FLUID FLOW:

Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines,. streak lines and stream lines, stream function, velocity potential and flow net. Types of fluid flow, translation, rotation, circulation and vorticity, Vortex motion; Dynamics of fluid flow, Bernoulli's theorem, venturimeter, orifice meter and nozzle, siphon.

PRACTICES:

- Study of manometers and pressure gauges.
- Verification of Bernoulli's theorem.
- Determination of coefficient of discharge of venturi-meter and orifice meter.
- Determination of coefficient of friction in pipeline.
- Determination of coefficient of discharge for rectangular and triangular notch.
- Determination of coefficient of discharge, coefficient of velocity and coefficient of contraction for flow through orifice.
- Determination of coefficient of discharge for mouth piece.

MODULE-2

UNIT-1 **4L+8T+8P=20 Hours**

TYPES OF FLOW:

Laminar flow: Stress strain relationships, flow between infinite parallel plates both plates fixed, one plate moving, discharge, average velocity; Laminar and turbulent flow in pipes, general equation for head loss Darcy, Equation, Moody's diagram, Minor and major hydraulic losses through pipes and fittings, flow through network of pipes, hydraulic gradient and energy gradient.

UNIT-2 **4L+8T+8P=20 Hours**

SKILLS:

- ✓ *Differentiate between Newtonian and non-Newtonian fluids.*
- ✓ *Determine fluid pressure using different types of gauges.*

CHANNEL DESIGN:

Flow through orifices (Measurement of Discharge, Measurement of Time),Flow through Mouthpieces, Flow over Notches , Flow over weirs, Chezy's formula for loss of head in pipes, Flow through simple and compound pipes, Open channel design and hydraulics: Chezy's formula, Bazin's formula, Kutter's Manning's formula, Velocity and Pressure profiles in open channels, Hydraulic jump; Dimensional analysis and similitude: Rayleigh's method and Buckingham's `Pi' theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery.

PRACTICES:

- Measurement of force exerted by water jets on flat and hemispherical vanes; Determination of meta-centric height.
- Determination of efficiency of hydraulic ram.
- Performance evaluation of Pelton and Francis turbine.
- Study of current meter.
- Velocity distribution in open channels and determination of Manning's coefficient of rugosity.

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 properties of fluids like viscosity, density, specific weight etc.	Apply	1	1, 2, 5
2	Apply pressure in fluid-flowing pipes and vessels.	Apply	1	1, 2, 8, 9, 10
3	Analyzes of open channels for irrigation purposes.	Analyze	2	1, 4, 5, 6
4	Creative continuity equation and energy equations in flow 5 measurement.	Create	2	1, 2, 4, 5, 8
5	Evaluate various kind of pressure measuring instruments.	Evaluate	2	1, 4, 5, 6

TEXT BOOKS:

1. Khurmi, R .S. "A Text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines S. Chand & Company Limited" New Delhi, 2005.
2. Modi P M and Seth S.M. "Hydraulics and Fluid Mechanics. Standard Book House" Delhi, 2005.

REFERENCE BOOKS:

1. Chow V T "Open Channel Hydraulics" McGraw Hill Book Co., New Delhi, 2008.
2. L. Jagadish "Fluid Mechanics and Hydraulics" Metropolitan Book Co.Pvt. Ltd., New Delhi, 2011.

source: https://www.slideshare.net/bala1957/characteristics-of-soils

22BEAS113 PRINCIPLES OF SOIL SCIENCE

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Soil Physics, Soil Chemistry, Soil genesis and classification, Soil organic matter, Soil nutrient management and Soil reclamation.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to build a grasp of the principles of soil science through Soil Physics, Soil Chemistry, Soil genesis and classification, Soil organic matter, Soil nutrient management and Soil reclamation that serves as an essential tool in several engineering applications.

MODULE-1

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

SOIL PHYSICS, SOIL GENESIS AND CLASSIFICATION & SOIL CHEMISTRY:

Nature and origin of soil; soil forming rocks and minerals, their classification and composition, soil forming processes, classification of soils – soil taxonomy orders.

Important soil physical properties and their importance; soil particle distribution; soil inorganic colloids – their composition, properties and origin of charge.

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UNIT-2 **08L+0T+8P=16Hours**

SOIL NUTRIENTS AND SOIL ORGANIC MATTER:

Ion exchange in soil and nutrient availability; soil organic matter – its composition and decomposition, effect on soil fertility; soil reaction – acidic, saline and sodic soils

PRACTICES:

- Identification of rocks and minerals.
- Examination of soil profile in the field.
- Collection of Soil Sample.
- Determination of bulk density.
- Determination of particle density and porosity of soil.
- Determination of organic carbon of soil.

MODULE-2

UNIT-1 **9L+6T+0P=15 Hours**

SOIL NUTRIENT MANAGEMENT:

Quality or irrigation water; Essential plants nutrients – their functions and deficiency symptoms in plants; Important inorganic fertilizers and their reactions in soils.

UNIT-2 **4L+8T+8P=20 Hours**

SOIL RECLAMATION:

Use of saline and sodic water for crop production, Gypsum requirement for reclamation of sodic soils and neutralising RSC; Liquid fertilisers and their solubility and compatibility.

PRACTICES:

- Determination of Nitrogen.
- Determination of Phosphorus.
- Determination of Potassium.
- Identification of nutrient deficiency symptoms of crops in the field.
- Determination of gypsum requirement of sodic soils.
- Determination of water quality 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 their knowledge and acquired principles on cereals, pulses, oilseeds and commercial crops in agriculture for increasing yields and reducing cost of cultivation	Apply	1	1,5,6,7
2	Apply and develop new package of practices for various crops in agriculture, horticulture and sericulture	Apply	2	1,3,5,8,9
3	Analyze the problems faced by the farmers in agriculture in view of increasing yields and reducing cost of cultivation	Analyze	2	2,4,6,7
4	Evaluate the trend and current scenario of investments and returns on local and global agriculture	Evaluate	2	2,3,4,6

TEXT BOOKS:

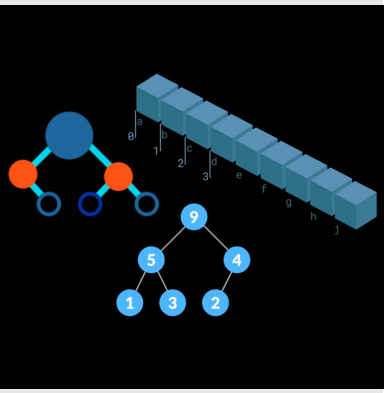
1. Indian Society of Soil Science, “Fundamentals of Soil Science IARI” New Delhi, 1998.
2. Brady Nyle C and Ray R Well. “Nature and properties of soils” Pearson Education Inc., New Delhi,2008.
3. Sehgal J.. A. Textbook of Pedology Concepts and Applications. Kalyani Publishers, New Delhi, 2015.

REFERENCE BOOK:

1. Hillel D. “Introduction to Soil Physics” Academic Press, London, 2013.

SKILLS:

- ✓ *Determination of Organic carbon of soil.*
- ✓ *Determination of Nitrogen.*
- ✓ *Determination of Phosphorus.*
- ✓ *Determination of Potassium.*
- ✓ *Determination of Gypsum requirement of sodic soils.*
- ✓ *Determination of water quality parameters.*



Source: https://tseduhub.blogspot.com/2017/05/computer-programming-books.html

22BEAS114 COMPUTER PROGRAMMING AND DATA STRUCTURES

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of programming.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to provide exposure to develop small programs in C language and thus equip them to solve problems in their chosen field of study using computer program.

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

LANGUAGES:

Introduction to high level languages, Primary data types and user defined data types, Variables, typecasting.

UNIT-2 **04L+8T+8P=20 Hours**

OPERATORS:

Operators, Building and evaluating expressions, Standard library functions, Managing input and output, Decision making, Branching, Looping, Arrays.

PRACTICES:

- Familiarizing with Turbo C IDE.
- Building an executable version of C program.
- Debugging a C program.
- Developing and executing simple programs.
- Creating programs using decision making statements such as if, go to & switch.
- Developing program using loop statements while, do & for.
- Using nested control structures.
- Familiarizing with one and two dimensional arrays.

MODULE-2

UNIT-1 **4L+8T+8P=20 Hours**

DEFINED FUNCTIONS:

User defined functions, passing arguments and returning values, recursion, scope and visibility of a variable.

UNIT-2 **4L+8T+8P=20 Hours**

STRUCTURES:

String functions, Structures and union, Pointers, Stacks, Push/Pop operations, Queues, Insertion and deletion operations, Linked lists.

PRACTICES:

- Using string functions.
- Developing structures and union.
- Creating user defined functions.
- Using local, global & external variables.
- Using pointers.
- Implementing Stacks.
- Implementing push/pop function.
- Creating queues.
- Developing linked lists in C language.
- Insertion/Deletion in data structures.

SKILLS:

- ✓ *Familiarize with basic keyword and logic used for programming tool.*
- ✓ *Develop algorithms for real time applications.*

COURSE OUTCOMES:

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

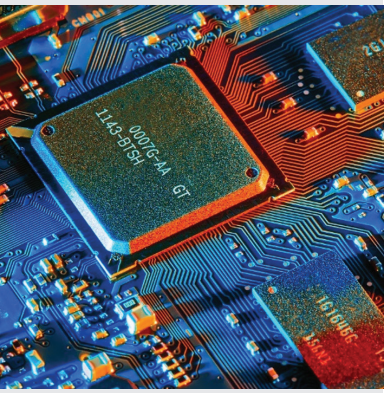
CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the basic terminology used in computer programming to write, compile & debug programs in 'C' language.	Apply	1	1, 2, 4, 6, 7, 9
2	Apply different data types to design programs involving decisions, loops and functions.	Apply	1	1, 2, 3, 4, 6, 9
3	Apply various headers for specific purpose.	Apply	2	1, 2, 3, 4, 6, 7, 9, 11
4	Create new programs for specific applications	Create	2	1, 2, 6, 7, 9

TEXT BOOKS:

1. Rajaraman V. "Computer Oriented Numerical Methods" Prentice Hall of India. Pvt. Ltd., New Delhi, 2006.
2. Balagurusamy E. "Programming in C"Tata McGraw Hill Publishing Co. Lt 12/4 Asaf Ali Road, New Delhi, 2005

REFERENCE BOOKS:

1. Rajaraman V. "Computer Programming in C". Prentice Hall of India Pvt.Ltd., New Delhi, 2002.
2. Bronson G and Menconi S. "A First Book of 'C' Fundamentals of 'C' Programming" Jaico Publishing House, New Delhi, 2005.



Source: https://www.goodfon.ru/wallpaper/electronics-electrical.html

22BEAS115 APPLIED ELECTRONICS AND INSTRUMENTATION

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of electronics.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to provide an overview of the principles, operation and application of the building blocks like diodes, BJT, OP-amps, Feedback amplifiers, oscillators etc for performing various functions. To understand the internal structure of all instruments that are used in measuring parameters related to electronics and to understand how different bridge networks are constructed and balanced for find out values of capacitance, resistance and inductance. To understand about different transducers, that are used for measurement purpose and their working principles.

MODULE-1

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

SEMICONDUCTORS:

Semiconductors. p—n junction. V—I characteristics of p—n junction. diode as a circuit element. rectifier. clipper. damper, voltage multiplier, capacitive filter. diode circuits for OR &AND (both positive and negative logic), bipolar junction transistor: operating point. classification (A.B & C) of amplifier.

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

BIASING METHODS:

Various biasing methods (fixed. Self-potential divider). h-parameter model of a transistor. analysis of small signal. CE amplifier. phase shift oscillator, analysis of differential amplifier using transistor. ideal OP-AMP characteristics. linear and non-linear applications of OP-AMP (adder. subtractor. integrator, active rectifier. comparator. differentiator. differential, instrumentation amplifier and oscillator).

PRACTICES:

- To study V-I characteristics of p-n junction diode.
- To study half wave. full wave and bridge rectifier.
- To study transistor characteristics in CE configurations.
- To design and study fixed and self bias transistor.
- To design and study potential divider bias transistor.

MODULE-2

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

LOGIC CIRCUITS:

Zener diode voltage regulator. transistor series regulator. current limiting. OP-AMP voltage regulators. Basic theorem of Boolean algebra. Combinational logic circuits (basic gates. SOP rule and Kmap).

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

BINARY LADDER:

Binary ladder D/A converter, successive approximation A/D converter, generalized instrumentation, measurement of displacement. temperature. velocity, force and pressure using potentiometer. resistance thennometer. thermocouples. Bourclen tube. LVDT. strain gauge and tacho-generator.

PRACTICES:

- To study a diode as clipper and clamper.
- To study a OP-AMP IC 741 as inverting and non- inverting amplifier.
- To study a OP-AMP IC 741 as differentiator and integrator to study a differential amplifier using two transistors.
- To study a OP-AMP IC 741 as differential amplifier.
- To study a zener regulator circuit.
- To study a OP-AMP IC 741 as a active rectifier.
- To study a OP-AMP IC 741 as a comparator.
- To familiarize with various types of transducers.

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*

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 notation and usage of components in electric circuits.	Apply	1	1, 2, 4, 6, 7, 9
2	Apply various electrical machines used in agriculture and troubleshoot the problems associated with it.	Apply	2	1, 2, 6, 7, 9
3	Application of various electronic devices to perform small task.	Apply	2	1, 2, 3, 4, 6, 7, 9, 11
4	Analyze AC (single and three phase) and DC and AC circuits using different methods and laws.	Analyze	1	1, 2, 3, 4, 6, 9

TEXT BOOKS:

1. Mehta V K. “Principles of Electronics”, S. Chand and Co., New Delhi, 2014.
2. Shaney A K. “Measurement of Electronics and Electronic Instrumentation, 2019 Khanna Publications, 2017.

REFERENCE BOOKS:

1. Roy Chowdary, “Integrated Electronics”, John Wiley International.
2. Kumar Anand, “Digital Electronics” A. PHI, 2009.
3. Gupta Sanjeev, Sonthosh Gupta “Electronic Devices and Circuits”, Danapath Rai Publications, 2012.

Source: https://www.wallpaperflare.com/h?wallpaper=strength+of+materials llpaper=strength+of+materialsaterials-search?wallpaper=strength+of+materials

22BEAS116 STRENGTH OF MATERIALS

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

This objective of this course is to acknowledge concepts of mechanics of deformable solids including static equilibrium. Know the behaviour of materials when subjected different loading and boundary condition. Enable the students to have an exposure to the systematic methods of solving engineering problems in solid mechanics. In addition, it also provides the basic mechanical principles underlying modern approaches for design of various types of structural members subject to axial, torsion, bending, transverse shear, and combined loading.

MODULE-1

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

SLOPE AND DEFLECTION OF BEAMS:

Slope and deflection of beams using integration techniques, moment area theorems and conjugate beam method.

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

COLUMNS AND STRUTS:

Columns and Struts. Riveted and welded connections. Stability of masonry dams.

PRACTICES:

- To perform the tension test on metal specimen (M.S., C.I.).
- to observe the behaviour of materials under load.
- to calculate the value of E, ultimate stress, permissible stress, percentage elongation.
- etc. and to study its fracture.
- To perform the compression test on.
- Concrete cylinders &cubes.
- C.I., M.S. & Wood specimens and to determine various physical and mechanical properties.
- To perform the bending test on the specimens; M.S. Girder, Wooden beam, Plain concrete beams & R.C.C. beam, and to determine the various physical and mechanical properties.
- To determine Young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre & quarter points.
- To study the behaviour of materials (G.I. pipes, M.S., C.I.) under torsion and to evaluate various elastic constants.

MODULE-2

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

INTERMEDIATE BEAMS:

Analysis of statically intermediate beams. Propped beams.

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

FIXED AND CONTINUOUS BEAM:

Fixed and continuous beam analysis using superposition, three moment equation and moment distribution methods.

PRACTICES:

- To study load deflection and other physical properties of closely coiled helical spring in tension and compression.
- To perform the Rockwell, Vicker's and Brinell's Hardness tests on the given specimens.
- To perform the Drop Hammer Test.
- Izod Test and Charpay's impact tests on the given specimens.
- To determine compressive & tensile strength of cement after making cubes and briquettes.
- To measure workability of concrete (slump test, compaction factor test).
- To determine voids ratio & bulk density of cement, fine aggregates and coarse aggregates.
- To determine fatigue strength of a given specimen.
- To write detail report emphasizing engineering importance of performing tension, compression, bending, torsion, impact and hardness tests on the materials.

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 various stresses acting on elastic materials for different loading conditions.	Apply	1	1, 2, 5
2	Apply the concept of elasticity in project, research and industry.	Apply	1	1, 2, 8, 9, 10
3	Analyze the strength of riveted and welded connections.	Analyze	2	1, 4, 5, 6
4	Apply, Design of beams having different boundary conditions, under different types of loading conditions.	Create	2	1, 2, 3, 5, 8

TEXT BOOK:

1. Khurmi R.S., "Strength of Materials", S. Chand & Co., Ltd., New Delhi, 2001.

REFERENCE BOOKS:

1. Junarkar S.B. 2001, "Mechanics of Structures (Vo-I)". Choratar Publishing House, Anand.
2. Ramamrutham S. 2003, "Strengths of Materials", Dhanpat Rai and Sons, Nai Sarak, New Delhi.

SKILLS:

- ✓ *Measure tensile and compressive strength of materials using UTM.*
- ✓ *Measures shear strength of materials.*

II

YEAR

AGRICULTURAL ENGINEERING

B.Tech.

COURSE CONTENTS

I SEM & II SEM

I SEMESTER

22BEAS201	-	Mathematical Methods
22BEAS202	-	Principles of Horticultural Crops and Plant Protection
22BEAS203	-	Heat and Mass Transfer
22BEAS204	-	Soil Mechanics
22IADE201	-	Ground Water, Wells and Pumps
22SWCE201	-	Watershed Hydrology
22BEAS205	-	Theory of Machines
22BEAS206	-	Electrical Machines and Power Utilization
22BEAS207	-	Entrepreneurship Development and Business Management

II SEMESTER

22BEAS208	-	Thermodynamics, Refrigeration and Air Conditioning
22BEAS209	-	AutoCAD Applications
22BEAS210	-	Machine Design
22FMPE201	-	Tractor and Automotive Engines
22PAFE201	-	Engineering Properties of Agricultural Produce
22IADE202	-	Irrigation Engineering
22SWCE202	-	Soil and Water Conservation Engineering
22REE201	-	Fundamentals of Renewable Energy Sources
	-	Elective Course-1

22BEAS201 MATHEMATICAL METHODS

Source: http://clipart-library.com/mathematics.html

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of interpolation and statistics.

COURSE DESCRIPTION AND OBJECTIVES:

The course aims at making the students to understand the concepts of limits and continuities of functions, differentiability, conjugacy, periodicity and the methods to expand the given function into series form under Fourier's technique, half-range series and series for discontinuous functions. Further this course enables the students to get better understanding over the method of interpolation of functions by finite differences, Newton's forward and backward formulae, interpolation with unevenly spaced points by Newton's divided difference formula and Lagrange's interpolation formula. Moreover, the objectives of this course are extended to enable the students to understand the concept of testing hypothesis for small sample and large sample data by means of single mean, two means, single proportion and two proportions and it clarifies the technique of one tailed and two tailed paired tests as well.

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

FUNCTIONS OF COMPLEX VARIABLE:

Limit and Continuity, Differentiability, Analytic functions, Cauchy-Riemann equations in Cartesian form only (without proof), Harmonic functions, Conjugate harmonic functions, Construction of conjugate harmonic function, Milne-Thomson method.

UNIT-2 **4L+8T+8P=20 Hours**

FOURIER SERIES:

Periodic Functions, Fourier series, Dirichlet's conditions, Fourier series for discontinuous functions, Fourier series for even and odd functions, Half-range series, functions having arbitrary period.

PRACTICES:

- Finding singular points of a function.
- Examine analytic and harmonic nature of a complex function.
- Construction of analytical function.
- Discuss the harmonic conjugate.
- Approximating a function as a Fourier series.
- Approximating a function as a half-range series.

MODULE -2

UNIT-1 **4L+8T+8P=20 Hours**

INTERPOLATION:

Introduction, Finite differences, Various difference operators and their relations, Interpolation with equally spaced points: Newton's forward and backward formulae, Interpolation with unevenly spaced points: Newton's divided difference formula, Lagrange's interpolation formula.

SKILLS:

- ✓ *Differentiability of functions.*
- ✓ *Justifying continuity and discontinuity of functions.*
- ✓ *Applying Fourier series technique to expand the required functions into series form.*
- ✓ *Analyze the data for the homogeneity through their means and proportions under large samples.*
- ✓ *Test of hypothesis for the data set and test of goodness of fit with curve fitting.*

UNIT-2 **04L+08T+8P=20 Hours**

TEST OF HYPOTHESIS:

Correlation: Pearson's Coefficient of correlation, Spearman's rank correlation.

Regression: lines of regression of X on Y and Y on X.

Hypothesis testing: Null hypothesis, Errors, Level of significance, Confidence Limits, t-test and Z test for single mean.

PRACTICES

- Finding missing values of a function.
- Predict the function based on the data given.
- Develop an interpolating polynomial from the given data.
- Estimating coefficient of correlation.
- Study the correlation between marks of any of your subject with mathematics.
- Study the regression between marks of any of your subject with mathematics.
- Estimating regression coefficients and find the lines of regression.
- Take a sample and define Null and alternate hypotheses.
- Test a large/ small sample for acceptance or rejection.

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 Fourier's technique to approximate the functions into series.	Apply	1	1, 2, 4, 9, 10, 12
2	Apply the method of interpolation to evenly and unevenly spaced data.	Apply	2	1, 2, 4, 9, 10, 12
3	Apply test the hypothesis technique to make reliable decisions.	Apply	2	1, 2, 4, 9, 10, 12
4	Evaluate the nature of singularity of a function and test the analyticity.	Evaluate	1	1, 2, 4, 9, 10, 12

TEXT BOOKS:

1. Bali, N. P., Sai Prasad, K. L., "A Textbook of Engineering Mathematics I, II, III", Universal Science Press, New Delhi, 2018.
2. Grewal, B. S., "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2018.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons, Inc, 2020.
2. Ramana, B. V., "Higher Engineering Mathematics", TMH Publishers, 2017.
3. H. K. Dass, , and Er. Rajanish Verma, "Higher Engineering Mathematics", S. Chand and Co., Third revised edition, 2015.
4. A. Singaravelu, "Probability and Statistics", 22nd edition, Meenakshi Agency, 2015.

22BEAS202 PRINCIPLES OF HORTICULTURAL CROPS AND PLANT PROTECTION

Source: http://www.freshtec.co.uk/template/2.jpg

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of vegetables and floriculture crops, post-harvest practices..

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to develop layout of planting methods through knowledge of climate, crops varieties and different sowing methods. This course also helps to nurture post-harvest plant growing structures through adequate knowledge of post-harvest practices.

MODULE-1

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

SCOPE OF HORTICULTURE:

Soil and climatic requirements for fruits, vegetables and floriculture crops, improved varieties.

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

PLANTING METHODS:

Criteria for site selection, layout and planting methods, nursery raising, commercial varieties/hybrids, sowing and planting times and methods, seed rate and seed treatment for vegetable crops.

PRACTICES:

- Judging maturity time for harvesting of crop.
- Study of seed viability and germination test.
- Identification and description of important fruits.
- Study of flowers and vegetable crops.
- Study of different garden tools.
- Preparation of nursery bed.
- Cultural operations for vegetable crops i.e. sowing.
- Seed extraction techniques.

MODULE-2

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

PROPAGATION METHODS:

Macro and micro propagation methods, plant growing structures, pruning and training, fertilizer application, harvesting, grading and packaging, post-harvest practices.

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

ORCHARD MANAGEMENT:

Crop coefficients, water requirements and critical stages, fertigation, irrigation methods. Garden tools, management of orchard, Extraction and storage of vegetables seeds. Major pests and diseases and their management in horticulture crops.

SKILLS:

- ✓ *Developing plan to grow seedlings in Nursery Bed.*
- ✓ *Able to manage operations in orchard.*
- ✓ *Able to plan and execute different cultural practices during specific season.*

PRACTICES:

- Practices of pruning in some important fruit crops.
- Practices of training in some important fruit crops.
- Cultural operations for vegetable crops i.e. fertilizer application.
- Cultural operations for vegetable crops i.e. mulching.
- Cultural operations for vegetable crops i.e. irrigation methods.
- Cultural operations for vegetable crops i.e. weed control.
- Identification of important pests and diseases and their control.
- Visit to commercial greenhouse/ polyhouse.

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	Able to prepare seed bed for different type of horticultural crops based on their climatic requirements	Apply	1	1, 2, 3, 4, 5, 7, 9, 10, 11
2	Able to organize different cultural operations in nursery and orchards	Analyze	1	1, 5, 12
3	Able to develop layout for orchards and nurserys	Create	1	1, 2, 3, 4, 5, 7, 9, 10, 11
4	Able to develop sustainable varieties through macro or micro propagation methods	Create	2	1, 2, 3, 4, 5, 7, 9, 10, 11
5	Able to develop new tools for different cultural activities in orchards	Create	2	1, 2, 3, 4, 5, 7, 9, 10, 11
6	Able to recommend suitable irrigation, planting and harvesting methods for different horticultural crops	Evaluate	2	1, 2, 3, 4, 5, 7, 9, 10, 11

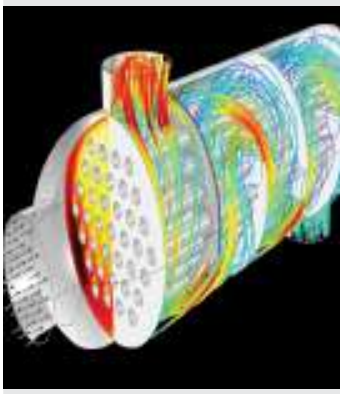
TEXT BOOKS:

1. Saraswathy, S., T.L. Preethi, S. Balasubramanyan, J. Suresh, N. Revathy and S. Natarajan. 2007.
2. “Postharvest management of Horticultural Crops”, Agrobios Publishers, Jodhpur 2012.

REFERENCE BOOKS:

1. Bansal. P.C. 2008. “Horticulture in India. CBS Publishers and Distributors”, New Delhi.
2. Arjunan, G., Karthikeyan, G, Dinakaran, D. and Raguchander, T. 2005, “Diseases of Horticultural Crops” AE Publications, Coimbatore.
3. Sharma Neeta and Mashkoor Alam. 1997. Postharvest diseases of Horticultural crops. International Book publishing Co. UP.

22BEAS203 HEAT AND MASS TRANSFER



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Hours Per Week :

L	T	P	C
1	2	0	2

PREREQUISITE KNOWLEDGE: Basics of heat transfer and mass transfer.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to examine different heat transfer operations occurred in food processing industries and compute overall heat transfer throughout operation. It also helps to design heat exchanger required in food processing industries to accomplish operations. It accomplishes to evaluate mass transfer permeability during food processing such as packaging.

MODULE-1

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

BASIC HEAT TRANSFER:

Concept, modes of heat transfer, thermal conductivity of materials, measurement. Insulation materials. Fins free and forced convection. Newton's law of cooling, heat transfer coefficient in convection.

UNIT-2 **04L+8T+0P=12 Hours**

CONDUCTION AND CONVECTION HEAT TRANSFER:

General differential equation of conduction. One dimensional steady state conduction through plane and composite walls, tubes and spheres with and without heat generation. Electrical analogy.

Critical thickness of insulation, heat transfer through fins, dimensional analysis of free and forced convection, useful non dimensional numbers, equation of laminar boundary layer on flat plate and in a tube, laminar forced convection on a flat plate and in a tube, combined free and forced convection.

MODULE-2

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

RADIATION HEAT TRANSFER:

Introduction, absorptivity, reflectivity and transmissivity of radiation, black body and monochromatic radiation, types of heat exchangers, fouling factor, mass transfer.

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

HEAT EXCHNAGER AND MASS TRANSFER:

Planck's law, Stefan- Boltzman law, Kirchoff's law, grey bodies and emissive power, solid angle, intensity of radiation, radiation exchange between black surfaces, geometric configuration factor, heat transfer analysis involving conduction, convection and radiation by networks, log mean temperature difference, heat exchanger performance, transfer units, heat exchanger analysis restricted to parallel and counter flow heat exchangers, steady state molecular diffusion in fluids at rest and in laminar flow, Fick's law, mass transfer coefficients. Reynold's analogy.

SKILLS:

- ✓ *Illustrate the basic principle of heat transfer occurs in food industry.*
- ✓ *Compute overall heat transfer to propose fins or insulating materials by examining different aspect in food processing.*
- ✓ *Compute convective heat transfer coefficient through non dimensional no in free or forced convection.*
- ✓ *Evaluate performance of different types of heat exchanger in industries.*

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 knowledge of basic heat transfer and practice at home or industry.	Apply	1	1, 2, 6, 7
2	Analyze knowledge of conductivity and convective heat transfer coefficient to compute overall heat transfer.	Analyze	1	1, 2, 3, 4, 6, 11
3	Investigate different types of flow occurred in pipe or plate during mass transfer.	Analyze	2	1, 2, 3, 4, 6, 11
4	Examine different flow in pipe or flat plate by help of non-dimensional no during heat transfer.	Evaluate	1	1, 2, 3, 4, 6, 11
5	Apply the knowledge of heat transfer to design and develop heat exchanger.	Create	2	1, 2, 3, 4, 5, 6, 11

TEXT BOOKS:

1. R. K. Rajput, 2015, “Heat and Mass Transfer”, S. Chand and Company Pvt. Ltd.,2015.
2. R. C.Sachdeva,2010, “Fundamentals of Engineering Heat and Mass Transfer”, 7th edition, New Age International

REFERENCE BOOKS:

1. S. C. Arora and S. Domkundwar,2010, “A Course in Heat & Mass Transfer”, 8th edition, DhanpatRai and Sons, Delhi.
2. C.J. Geankoplis,2003, “Transport Processes and UNIT Operations”, 4th edition, Prentice Hall of India, New Delhi.
3. P. K. Nag, 2011, “Heat and Mass Transfer”, 3rd edition, Tata McGraw Hill.

22BEAS204 SOIL MECHANICS

Source : https://lh3.googleusercontent.com/oPwFRGRcNvM

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Nil

COURSE DESCRIPTION AND OBJECTIVES:

This course offers study of the behaviour of soils under the influence of loading forces, soil- water interaction and knowledge on design of foundations, retaining walls, earth dams, clay liners and geosynthetics for waste containment. The objective of this course is to provide a basic understanding of the physical and mechanical characteristics of soils and how to relate these to the engineering behaviour of soil and understanding of the meaning and measurement of parameters for geotechnical engineering design.

MODULE-1

UNIT-1 **5L+0T+0P=5 Hours**

FUNDAMENTALS OF GEOTECHNICAL ENGINEERING:

Soil formation and soil types, Phase diagrams, Simple definitions, important relationships.

Introduction, Particle size classification as per IS code, Unified soil classification system, Indian standard soil classification system.

UNIT-2 **3L+0T+16P=19 Hours**

PROPERTIES OF SOIL:

Mechanical analysis – Sieve analysis, Stroke's law, Hydrometer analysis, and Atterberg's limits.

Determination of coefficient of permeability constant and variable head method. Compaction of soils: Laboratory tests, Effects of compaction, Factors affecting compaction, Compaction in the field, Compaction specification and field control. Shear strength of soils: Stress at a point, Mohr circle of stress, Measurement of shear strength, Shear strength of clayey soils & sands, Drainage conditions and strength parameters.

PRACTICES:

- Estimate the water content in a given sample by oven drying method.
- Determine the specific gravity by Density bottle method & Pycnometer method.
- Examine gradation analysis by Mechanical sieve & Hydrometer analysis.
- Determination of Atterberg's Limit & Free Swell Index.
- Interpretation of Field Unit weight by Core cutter & Sand Replacement method.
- Evaluate permeability of a given soil sample by Constant Head & Variable Head Permeability methods.
- Determine compaction of a given sample by Standard Proctor and Modified Proctor test.

SKILLS:

- ✓ *Identify and classify soils.*
- ✓ *Determine permeability for different soils.*
- ✓ *Assess the compaction characteristics of soils.*
- ✓ *Measure the effective stresses in soils at different conditions.*
- ✓ *Measures shear strength parameters of soil at different drainage conditions.*

MODULE-2

UNIT-1 **4L+0T+0P=04 Hours**

PERMEABILITY, STRESS DISTRIBUTION AND CONSOLIDATION :

Capillary rise, Darcy's law and its validity, Factors affecting permeability, Permeability of stratified soil deposits: Total, Neutral and effective stresses, Seepage force, Quick sand condition, Flow nets – Characteristics and uses.

UNIT-2 **4L+0T+16P=20 Hours**

STRESS DISTRIBUTION AND CONSOLIDATION OF SOILS:

Introduction, Boussin equation, Vertical stress distribution diagrams, Vertical Stress beneath loaded areas, Newmark's influence chart, approximate stress distribution method for loaded areas, Westergaard's equation. Consolidation: Introduction, Time rate of consolidation, Consolidation test, Computation of settlement.

PRACTICES:

- Find unconfined compression test for a soil sample.
- Determine direct shear test.
- Determine Vane shear test.
- Examine Triaxial test by: Unconsolidated Undrained, Consolidated Undrained, Consolidated Drained.

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 index properties and classification of soil along with the basic concepts of geotechnical engineering.	Apply	1	1, 2, 5, 6
2	Analyze the compressibility, consolidation and shear strength parameters.	Analyze	2	1, 2, 5
3	Assess the basic properties of soil.	Evaluate	1	1, 2
4	Determine the permeability and seepage analysis.	Evaluate	1, 2	1, 2, 5
5	Compute the settlement in shallow foundation.	Create	2	1, 2, 5, 6, 8

TEXT BOOKS:

1. Arora. K. R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, Delhi, 7th re-print edition, 2020.
2. Venkatramaiah. C, "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 5th edition, 2017.

REFERENCES :

1. Venkatramaiah. C, "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 5th edition, 2017.
2. Manoj Datta, S. Gulhati, "Geotechnical Engineering", Tata McGraw Hill Education Ltd., 1st edition, 2008.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Soil Mechanics and Foundation", Laxmi Publications Pvt. Ltd., New Delhi, 16th edition, 2005.
4. Gopal Ranjan and A. S. R. Rao, "Basic and Applied Soil Mechanics", New Age International Pvt. Ltd., New Delhi, 2nd edition, 2004.

22IADE201 GROUND WATER, WELLS AND PUMPS

Source : https://lh3.googleusercontent.com/ 00lPS4MFdaUwb7ylbVhn8tdQNkcZvvOsJxcSb8iVZ_JozaSy37agc_MVkWyRbR01n7pVug=s151

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of Hydrology.

COURSE DESCRIPTION AND OBJECTIVES:

This course covers the fundamentals of surface and subsurface flow, emphasizing the role of groundwater in the hydrologic cycle, the relation of groundwater flow to geologic structure, and the management of contaminated groundwater. The objective of the course to enable the students to have knowledge on occurrence and movement of ground water, analyzing the data of pumping test and artificial recharge of ground water methods.

MODULE-1

UNIT-1 **9L+0T+6P=15 Hours**

AQUIFER:

Occurrence and movement of ground water, aquifer and its types, classification of wells, fully penetrating tube wells and open wells, familiarization of various types of bore wells, design of open wells, groundwater exploration techniques, methods of drilling of wells, percussion, rotary, reverse rotary.

UNIT-2 **8L+0T+08P=16 Hours**

DESIGN OF TUBE WELLS AND ASSESSMENT OF GROUND WATER QUALITY:

Design of tube well and gravel pack, installation of well screen, completion and development of well, groundwater hydraulics-determination of aquifer parameters by different method such as Theis, Jacob and Chow's, Theis recovery method, well interference, multiple well systems, estimation of ground water potential, quality of ground water, artificial groundwater recharge techniques, pumping systems.

PRACTICES:

- Verification of Darcy's Law; study of different drilling equipments.
- Sieve analysis for gravel and well screens design.
- Estimation of specific yield and specific retention.
- Testing of well screen.
- Estimation of aquifer parameters by Theis method, Coopers-Jacob method, Chow method.
- Theis Recovery method.

MODULE-2

UNIT-1 **9L+0T+6P=15 Hours**

WATERLIFTING DEVICES:

Water lifting devices; different types of pumps, classification of pumps, component parts of centrifugal pumps, priming, pump selection, installation and trouble shooting, performance curves, effect of speed on capacity, head and power, effect of change of impeller dimensions on performance characteristics.

UNIT-2 **08L+0T+08P=16 Hours**

PERFORMANCE OF PUMPS:

Hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; deep well turbine pump and submersible pump.

SKILLS:

- ✓ *Differentiating various types of pumps based on their working mechanisms.*
- ✓ *Identifying various components of pumps.*
- ✓ *Identifying the location of groundwater resources.*

PRACTICES:

- Well design under confined and unconfined conditions.
- Well losses and well efficiency; estimating ground water balance.
- Study of artificial ground water recharge structures.
- Study of radial flow and mixed flow centrifugal pumps, multistage centrifugal pumps, turbine, propeller and other pumps.
- Installation of centrifugal pump.
- Testing of centrifugal pump and study of cavitations, study of hydraulic ram.
- Study and testing of submersible pump.

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 knowledge of aquifer parameters and yield of wells	Apply	1	1, 2, 7
2	Analyze radial flow towards wells in confined and unconfined aquifers	Analyze	1	1, 2, 4, 7
3	Evaluate pump performance and troubleshooting characteristics	Analyze	2	1, 2, 4, 5, 7
4	Creative design of wells and understand the construction practices	Create	1	1, 2, 3, 4, 5, 6

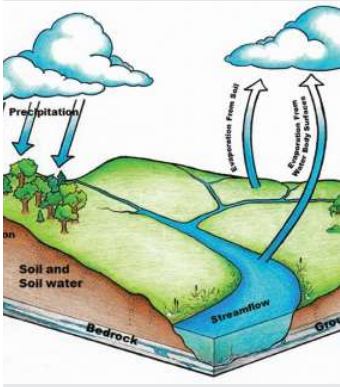
TEXT BOOK:

1. Michael AM, Khepar SD. and SK Sondhi. 2008. “Water Well and Pumps” 2nd Edition, Tata Mc-Graw Hill, 2018.

REFERENCE BOOKS:

1. Todd David Keith and Larry W. Mays. 2004. “Groundwater Hydrology”, 3rd Edition, John Wiley & Sons, New York (International Book Distributing Company Lucknow).
2. Michael AM. and Ojha TP. 2014. “Principles of Agricultural Engineering” Vol-II, 5th Edition. Jain Brothers Publication, New Delhi.

22SWCE201 WATERSHED HYDROLOGY



Source: https://www.google.com

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of Hydrology.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the basic concepts on hydrologic cycle, engineering hydrology computations and the relationships between hydrology and other disciplines such as ecology, meteorology and climatology. The objective of this course is to enable the student to learn the essential components and functions of the hydrologic cycle. To familiarize the students with the important aspects of watershed hydrology. To impart the knowledge about the various hydrologic phenomena and their relevance in the field of soil and water conservation.

MODULE-1

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

INTRODUCTION TO HYDROLOGY : Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves (DAD) and intensity-duration-frequency relationship.

UNIT-2 **04L+0T+08P=12 Hours**

RUNOFF DETERMINATION: Hydrologic processes- Interception, infiltration – Factors influencing, measurement and indices. Evaporation-Estimation and measurement. Runoff-Factors affecting and measurement, stage-discharge rating curve, estimation of peak runoff rate and volume, Rational method, Cook's method and SCS curve number method.

PRACTICES:

- Visit to meteorological observatory and study of different instruments.
- Design of rain gauge network. Exercise on intensity - frequency - duration curves.
- Exercise on depth - area – duration and double mass curves.
- Analysis of rainfall data and estimation of mean rainfall by different methods.
- Exercise on frequency analysis of hydrologic data and estimation of missing data, test for consistency of rainfall records

MODULE-2

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

HYDROGRAPH:

Geomorphology of watersheds–Linear, aerial and relief aspects of watersheds-stream order, drainage density and stream frequency. Hydrograph - Components, base flow separation, unit hydrograph theory, S-curve, synthetic hydrograph, applications and limitations.

SKILLS:

- ✓ *Analyze rainfall data using different techniques (Mean rainfall over an area, mass curve, double mass curve, frequency analysis, etc).*
- ✓ *Estimate evapotranspiration and infiltration using different equations and field methods.*
- ✓ *Prepare hydrograph for watershed and its analysis.*
- ✓ *Estimate runoff using different methods.*

UNIT-2 **04L+0T+8P=12 Hours**

FLOOD ROUTING:

AStream gauging - discharge rating curves, flood peak, design flood and computation of probable flood. Flood routing – channel and reservoir routing. Drought–classification, causes and impacts, drought management strategy.

PRACTICES:

- Exercise on computation of infiltration indices.
- Computation of peak runoff and runoff volume by Cook's method and rational formula. Computation of runoff volume by SCS curve number method.
- Study of stream gauging instruments-current meter and stage level recorder.
- Exercise on geomorphic parameters of watersheds.
- Exercise on runoff hydrograph. Exercise on unit hydrograph. Exercise on synthetic hydrograph. Exercise on flood routing.

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 knowledge in determining the rainfall characteristics.	Apply	1	1, 2, 4
2	Investigate characteristics of watershed and apply the knowledge to predict hydrograph.	Apply	2	1, 2, 4, 5, 11
3	Investigate causes and impact of draught and their management.	Analyze	2	1, 2, 4, 6, 7, 11, 12
4	Compute runoff of watershed and Analyze different hydrologic process.	Evaluate	1	1, 2, 4, 5, 6, 7
5	Compute discharge rating curve and design of flood routing in channel or reservoirs.	Evaluate	2	1, 2, 3, 4, 5, 6, 7, 11

TEXT BOOK:

1. Subramanya, K., "Engineering Hydrology" 3rd Edition, Tata McGraw-Hill Publishing Co., New Delhi, 2008.

REFERENCE BOOKS:

1. Chow, V.T., D.R. Maidment and L.W. Mays, "Applied Hydrology", McGraw Hill Publishing Co., New York, 2010.
2. Jaya Rami Reddy, P. "A Text Book of Hydrology" University Science Press, New Delhi, 2011.
3. Linsley, R. K., M .A . Kohler, and J.L.H. Paulhus, "Hydrology for Engineers" McGraw-Hill Publishing Co., Japan, 2012.
4. Mutreja, K.N.1990. Applied Hydrology. Tata Mc Graw-Hill Publishing Co., New Delhi.

22BEAS205 THEORY OF MACHINES

Source: https://ourmechanicalengg.files .wordpress.com/2016/04/06.jpg

Hours Per Week :

L	T	P	C
1	2	0	2

PREREQUISITE KNOWLEDGE: Knowledge of Engineering Mechanics and Basic Engineering Mathematics.

COURSE DESCRIPTION AND OBJECTIVES:

The course provides the foundation to analyze the displacement, velocity and acceleration and the forces required for the proper design of mechanisms.

MODULE-1

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

MACHINE AND MECHANISM: Elements, links, pairs, kinematics chain, and mechanisms. Classification of pairs and mechanisms. Lower and higher pairs. Four bar chain, slider crank chain and their inversions.

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

GEARS AND GEAR TRAINS: ATypes of gears. Law of gearing, velocity of sliding between two teeth in mesh. Involute and cycloidal profile for gear teeth. Spur gear, nomenclature, interference and undercutting. Introduction to helical, spiral, bevel and worm gear. Simple, compound, reverted, and epicyclic trains. Determining velocity ratio by tabular method.

MODULE-2

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

FLYWHEEL AND BELT DRIVES: Turning moment diagrams, coefficient of fluctuation of speed and energy, weight of flywheel, flywheel applications.

Belt drives, types of drives, belt materials. Length of belt, power transmitted, velocity ratio, belt, size for flat and V belts. Effect of centrifugal tension, creep and slip-on power transmission

UNIT-2 **4L+8T+0P=14 Hours**

GOVERNORS AND BEARINGS: Types of governors. Constructional details and analysis of Watt, Porter, Proell governors. Effect of friction, controlling force curves. Sensitiveness, stability, hunting, iso-chronism, power and effort of a governor.

Friction of pivots and collars. Single disc, multiple disc, and cone clutches. Rolling friction, anti-friction bearings.

SKILLS:

- ✓ *Analyzing inversions of mechanisms.*
- ✓ *Demonstrate application of governors in controlling speed.*

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 and optimize mechanisms to perform a specified task.	Apply	1	1, 2, 3, 4, 9, 12
2	Effectively present written, oral, and graphical solutions to design problems.	Apply	2	1, 2, 3, 9, 12
3	Work cooperatively in teams in the improvement of mechanism design.	Apply	2	1, 9, 10, 1, 12
4	Analyze the dynamic characteristics of mechanisms such as linkage, gears, and cams	Analyze	1 & 2	1, 2, 3, 9, 12

TEXT BOOKS:

1. Theory of Machines. Tata McGraw Hill Publishing Co. Ltd., , New Delh. 2020.
2. Khurmi R S and Gupta J K. . Theory of Machines. Eurasia Publishing House Pvt. Ltd., New Delhi. 2019.

REFERENCE BOOKS:

1. Bevan Thomas. “Theory of Machines” CBS Publishers and Distributors, Delhi 1984.
2. Rao J S and Dukkipatti R V. “Mechanisms and Machine Theory” Wiley eastern Ltd., New Delhi. 1990.

22BEAS206 ELECTRICAL MACHINES AND POWER UTILIZATION

Source: https://lh3.googleusercontent.com/cDeg477xpI0FXu-JCZNjTUf guqoFxGPSPc704bp0JQkmHuq0nvydvM4l05d5oj M1L-JazOkg=s129

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of Electromagnetics and AC&DC supply systems.

COURSE DESCRIPTION AND OBJECTIVES:

To obtain the introductory knowledge of magnetic circuits, to focus on the study of electro mechanical energy conversion & different parts of electrical machines, to address the concept of principle and working of electrical machines, Obtain the performance of transformer and induction motor and Evaluate the characteristics of DC Machines and Analyze the performance of DC machine under different testing conditions.

MODULE-1

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

MAGNETIC CIRCUITS: Electro motive force, magneto motive force, reluctance, laws of magnetic circuits, Comparison of electric and magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits.

MEASUREMENT OF POWER : Balanced three phase system, Star and Delta connections, Active power, reactive power, apparent power and power factor, various methods of three phase power measurement.

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

DC GENERATOR: Principle and operation of DC Generator, EMF equation, types of DC generators and their characteristics.

DC MOTOR: Principle and operation of DC Motor, torque equation, types of DC motors and their characteristics, speed control methods.

PRACTICES:

- Measure the three phase power by using two wattmeter method.
- Measurement of reactive power by using single wattmeter in three-phase circuit.
- Conduct the Load test on DC shunt generator and obtain the internal and external characteristics.
- Conduct the direct load test on DC shunt motor and determine the efficiency.
- Obtain the Speed control of DC shunt motor by (i)armature voltage/Resistance control (ii) field control.

MODULE-2

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

TRANSFORMERS:

Principle of working, construction of single phase transformer, EMF equation, Phasor diagram on load, leakage reactance, voltage regulation, equivalent circuit, efficiency, open circuit and short circuit tests.

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

THREE PHASE INDUCTION MOTORS:

Construction, operation, phasor diagram, torque equation, effect of rotor resistance, starting and speed control methods.

SKILLS:

- ✓ *Measurement of power for single phase & three phase system.*
- ✓ *Analyze the load characteristics of different DC generators*
- ✓ *Analyze the speed control & characteristics of DC motor.*
- ✓ *Test the transformer under no load and short circuit conditions and obtain the Equivalent circuit.*
- ✓ *Obtain the Equivalent circuit of induction motor from the testing data.*
- ✓ *Selection of electrical machines for desired applications.*

SINGLE PHASE INDUCTION MOTOR: Double field revolving theory, equivalent circuit, characteristics, types of single phase induction motors.

PRACTICES:

- Conduct the Open circuit test on single phase transformer & find core loss and the shunt branch parameters.
- Determine the transformation ratio of single phase transformer.
- Conduct the short circuit test on single phase transformer & find copper loss and the shunt branch parameters.
- Conduct the Brake test on three Induction motor.
- Perform the load test on single phase induction motor.

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 magnetic circuits and various three phase power measurement.	Analyze	1	1, 2, 6
2	Analyze the construction and characteristics of different single phase induction motor.	Analyze	2	1, 2
3	Evaluate the performance characteristics of DC motors through experimentation.	Evaluate	1	1, 2, 9
4	Evaluate the performance characteristics of three phase Induction motors.	Evaluate	2	1, 2, 6
5	Describe the construction and working principle of single phase Transformers.	Create	2	2, 3

TEXT BOOKS:

1. P.S. Bimbra, “Electrical Machinery”, 7th edition, Khanna Publishers, 2011.
2. I.J. Nagrath and D.P. Kothari, “Basic Electrical Engineering”,4th edition, Tata Mc-Graw Hill Publishers, 2019.

REFERENCE BOOKS:

1. I.J. Nagrath and D.P. Kothari, “Electric Machines”, 5th edition, Tata Mc-Graw Hill Publishers, 2017.
2. Bhattacharya. S. K, “Basic Electrical and Electronics Engineering”, Pearson Education, New Delhi, 2011.

22BEAS207 ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS MANAGEMENT

Source: https://lh3.googleusercontent.com/rL0pdq-bg5ARK_v_tP2ZLXJ8EtY5gmyG2rbAw4B8VNyH01gOOieaC-DG_GaPPgY1rB_76g=s113

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Entrepreneurship concept, Agro based industries, sensitivity analysis, entrepreneurial and managerial characteristics and Economic system and its implications.

COURSE DESCRIPTION AND OBJECTIVES:

This course is framed to make the students enlighten about entrepreneurship development. To make the students understand in starting their own business. To make the understand about the concept of entrepreneurship. Enlighten students about business management. To motivate the students to become entrepreneur.

MODULE-1

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

ENTREPRENEURSHIP:

Management - Management functions - planning - Organizing - Directing - motivation - ordering - leading - supervision - Communication and control - Capital - Financial management importance of financial statements - balance sheet - profit and loss statement, Analysis of financial statements - liquidity ratios - leverage ratios, Coverage ratios - turnover ratios - profitability ratios.

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

AGRO-BASED INDUSTRIES:

Project - project cycle - Project appraisal and evaluation techniques undiscounted measures - payback period - proceeds per rupee of outlay, Discounted measures Net Present Value (NPV) - Benefit-Cost Ratio (BCR) - Internal Rate of Return (IRR) - Net benefit investment ratio (N / K ratio).

Sensitivity analysis: Importance of agribusiness in Indian economy International trade-WTO agreements - Provisions related to agreements in agricultural and food commodities. Agreements on agriculture (AOA) - Domestic supply, market access, export subsidies agreements on sanitary and phyto-sanitary (SPS) measures, Trade related intellectual property rights (TRIPS). Development (ED): Concept of entrepreneur and entrepreneurship Assessing overall business environment in Indian economy.

PRACTICES:

- Analyze the various functions of management in the organization.
- Find out the financial financial performance of the company in the society.
- Evaluation and assign the ranks to the projects in the organization.
- Analyze the importance of agribusiness to the domestic country and foreign countries.

MODULE-2

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

ENTREPRENEURIAL AND MANAGERIAL CHARACTERISTICS:

Entrepreneurship development Programmes (EDP)Generation incubation and commercialization of ideas and innovations- Motivation and entrepreneurship development- Globalization and the emerging business entrepreneurial environment- Managing an enterprise: Importance of planning, budgeting, monitoring evaluation and follow-up managing competition. Role of ED in economic development of a country- Overview of Indian social, political systems and their implications for decision making by individual entrepreneurs.

SKILLS:

- ✓ *Identify various renewable energy sources.*
- ✓ *Design and development of a solar water heater and solar cooker.*

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

ECONOMIC SYSTEM AND ITS IMPLICATIONS:

Decision making by individual entrepreneurs- Social responsibility of business. Morals and ethics in enterprise management- SWOT analysis- Government schemes and incentives for promotion of entrepreneurship. Government policy on small and medium enterprises (SMEs)/SSIs/MSME sectors- Venture capital (VC), contract farming (CF) and joint ventures (JV), public-private partnerships (PPP)- Overview of agricultural engineering industry, characteristics of Indian farm machinery industry.

PRACTICES:

- Analyze the role of entrepreneurship development in economic development of country.
- Evaluate the government schemes and incentives for promotion of entrepreneurship.
- Analyze the importance and characteristics of Indian farm machinery industry.

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 ability to discern distinct entrepreneurial traits.	Apply	1	1, 2, 4
2	Apply the parameters to assess opportunities and constraints for new business ideas.	Apply	1	1, 2, 4, 5, 6, 7
3	Analyze the systematic process to select and screen a business idea.	Analyze	2	1, 2, 4, 5, 11
4	Create strategies for successful implementation of ideas.	Create	2	1, 2, 3, 4, 5, 6, 7, 11
5	Create a business plan.	Create	2	1, 2, 4, 6, 7, 11, 12

TEXT BOOKS:

1. Harsh, S.B., Conner, U. J and Schwab, G.D., “Management of the Farm Business” Prentice Hall Inc., New Jersey, 2017.
2. Joseph, L. Massie, Essentials of Management. Prentice Hall of India Pvt. Ltd, 2018.

REFERENCE BOOKS:

1. Omri Rawlins, N. Introduction to Agribusiness. Prentice Hall Inc., New Jersey, 2017.
2. Gittenger Price, J. Economic Analysis of Agricultural Projects. John Hopkins University, Press, London, 2018.

22BEAS208 THERMODYNAMICS, REFRIGERATION AND AIR CONDITIONING

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of heat transfer, gas laws and thermodynamic laws.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to evaluate thermal efficiency of different heat engine used in engineering field by help of Carnot cycle, Otto cycle, Diesel and Dual cycle. It also helps to investigate the efficiency of refrigeration system by knowledge of T vs. S diagram or Mollier chart. It also acknowledges us to evaluate performance of air conditioning system by help of psychrometric chart.

MODULE-1

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

BASICS OF THERMODYNAMICS:

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Carnot cycle, Carnot theorem. Entropy, physical concept of entropy. Principles of refrigeration, - units, terminology. Air refrigeration system. Vapour refrigeration-mechanism. Common refrigerants and their properties.

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

APPLICATION OF THERMODYNAMICS AND REFRIGERATION:

Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow processes. Carnot cycle, Carnot theorem. Change of entropy of gases in thermodynamics process. Otto, diesel and dual cycles. Production of low temperatures, air refrigerators working on reverse Carnot cycle and Bell Coleman cycle. P-V, P-S, P-H diagrams of vapor compression cycles, dry and wet compression, super cooling and sub cooling. Vapour absorption refrigeration system.

PRACTICES:

- Tutorials on thermodynamic air cycles.
- Study and application of P V and T S chart in refrigeration.
- P H chart (or) Mollier diagram in refrigeration.
- Numerical on air refrigeration cycle systems.
- Numerical on vapour compression cycle refrigeration system.
- Study of domestic water cooler.
- Study of domestic household refrigerator.
- Study of absorption type solar refrigeration system.

MODULE–2

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

PSYCHROMETRIC CHART:

Cold storage plants. Thermodynamic properties of moist air. Perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement. Air conditioning – principles –Type and functions of air conditioning.

Source: Image source: http://4.bp.blogspot.com/-z5Gytxyj7oY/VGnj1J-7e_I/AAAAAAAAAAw/xCFmS0-kUAw/s1600/heritage_refrigeration_0026_air _conditioning_fa37e896_f85a_5d54 _5e5b_7d2858cf0004.jpg

SKILLS:

- ✓ *Compute and predict thermodynamic state in different system after application of thermodynamic process.*
- ✓ *Evaluate thermal efficiency of heat engine and heat pump in different thermodynamic gas cycle or vapor cycle.*
- ✓ *Examine Psychrometric chart thoroughly and predict the condition of air present.*
- ✓ *Plan and design different air conditioning system required in different climate or season.*

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

APPLICATION OF AIR CONDITIONING:

Design calculations for refrigeration system. Psychometric chart and its use, elementary psychometric process. Physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers – cooling load calculations, types of air conditioners – applications.

PRACTICES:

- Study cold storage for fruit and vegetables.
- Freezing load and time calculations for food materials.
- Determination of refrigeration parameters using refrigeration tutor – II.
- Numerical on design of air conditioning systems.
- Study of window air conditioner.
- Study on repair and maintenance of refrigeration and air-conditioning systems.
- Visit to chilling or ice making and cold storage plants.

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 knowledge of basic gas laws and thermodynamic laws in home or in industry.	Apply	1	1, 2, 3, 4
2	Apply the knowledge of psychrometric process to design humidifiers or dehumidifiers.	Apply	2	1, 2, 3, 4, 5, 7, 11
3	Analyze knowledge of Bell Coleman Cycle or Reversed Carnot Cycle to evaluate COP of VCRS and VARS system.	Analyze	1	1, 2, 3, 4, 5
4	Examine different thermal applications in food processing operations by the help of psychrometric chart.	Evaluate	2	1, 2, 3, 4, 6, 7
5	Evaluate cooling load required in cold storage plant or in any industries.	Evaluate	2	1, 2, 3, 4

TEXT BOOKS:

1. R. K. Rajput, “Heat and Mass Transfer”, S. Chand and Company Pvt. Ltd.,2015.
2. R. C.Sachdeva,“Fundamentals of Engineering Heat and Mass Transfer”, 7th edition, New Age International, 2013.

REFERENCE BOOKS:

1. S. C. Arora and S. Domkundwar,“A Course in Heat & Mass Transfer”, 8th edition, DhanpatRai and Sons, Delhi, 2010.
2. C.J. Geankoplis “Transport Processes and UNIT Operations”, 4th edition, Prentice Hall of India, New Delhi, 2013.
3. P. K. Nag, “Heat and Mass Transfer”, 3rd edition, Tata McGraw Hill, 2017.

22BEAS209 AUTO CAD APPLICATIONS

Source: http://www.sjit.co.kr/assets/images/user/contents/plmsolution_img1.gif

Hours Per Week :

L	T	P	C
0	0	4	2

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to introduce modern techniques and trends in computer aided design and drafting to students and to equip them in preparing technical drawings in standard CAD software.

MODULE-1

UNIT-1 **0L+0T+32L=32 Hours**

PRACTICES:

- Application of computers for design. CAD- Overview of CAD window – Explanation of various options on drawing screen.
- Study of draw and dimension tool bar.
- Practice on draw and dimension tool bar.
- Study of OSNAP, line thickness and format tool bar.
- Practice on OSNAP, line thickness and format tool bar.
- Practice on mirror, offset and array commands.
- Practice on trim, extend, chamfer and fillet commands.
- Practice on copy, move, scale and rotate commands.
- Drawing of 2 D- drawing using draw tool bar.

MODULE-2

PRACTICES:

- Practice on creating boundary, region, hatch and gradient commands.
- Practice on Editing polyline- PEDIT and Explode commands.
- Setting of view ports for sketched drawings.
- Printing of selected view ports in various paper sizes.
- 2Ddrawing of machine parts with all dimensions and allowances- Foot step bearing and knuckle joint.
- Sectioning of foot step bearing and stuffing box.
- Drawing of hexagonal, nut and bolt and other machine parts.
- Practice on 3-D commands- Extrusion and loft.
- Practice on 3-D commands on sweep and press pull.
- Practice on 3-D Commands- revolving and joining.
- Demonstration on CNC machine and simple problems

SKILLS:

- ✓ *Practice of 2-D drawing on design software.*
- ✓ *Practice of 3-D commands on design software.*
- ✓ *Drawing of hexagonal, nut and bolt.*

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 transformation techniques in CAD.	Apply	1	1, 2, 3, 4
2	Apply mathematical models to represent curves and surfaces	Analyze	1	1, 2, 3, 4, 5
3	Analyze engineering components using solid modeling techniques.	Evaluate	2	1, 2, 3, 4, 6, 7
4	Create CNC programs to manufacture industrial components	Create	2	1, 2, 3, 4, 5, 7, 11

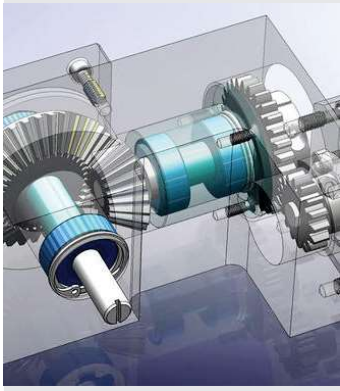
TEXT BOOKS:

1. Rao P.N, “CAD/CAM Principles and Applications” McGraw-Hill Education Pvt. Ltd., New Delhi, 2013.
2. Sareen Kuldeep and Chandan Deep Grewal, “CAD/CAM Theory and Practice” S.Chand and Company Ltd., New Delhi, 2016.

REFERENCE BOOKS:

1. Zeid Ibrahim, “Mastering CAD/CAM with Engineering” McGraw-Hill Education Pvt. Ltd., New Delhi, 2015.
2. Lee Kunwoo, “Principles of CAD/CAM/CAE Systems” Addison Vesley Longman, Inc, 2019.

22BEAS210 MACHINE DESIGN



Source : https://onlinelibrary.wiley.com/doi/full/10.1111/j.1936-704X.2015.03185.x

Hours Per Week :

L	T	P	C
1	2	0	2

PREREQUISITE KNOWLEDGE: Fundamentals and working of Design of different machine elements.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the design of different machine elements. The objective of this course is to make the students to familiarize with the various steps involved in designing the shape and dimensions of engineering components with quality functional and strength requirements.

MODULE-1

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

STATIC LOAD & THEORIES OF FAILURE :

Introduction: Meaning of design, Phases of design, design considerations, Common engineering materials and their mechanical properties. Design against static load: Types of loads and stresses, modes of failure, factor of safety, Theories of failure, selection and use of failure theories.

UNIT-2 **04L+12T+0P=16 Hours**

DYNOMIC LOAD :

Design against fluctuating load: Stress concentration and factor, Reduction of stress concentration. Fluctuating stresses, Fatigue failure, Creep, Endurance limit, Low cycle and high cycle fatigue, Notch sensitivity, Endurance limit, Design for finite and infinite life. Soderberg, Goodman and Modified Goodman diagram, Gerber Equation, Fatigue design under combined stresses.

MODULE-2

UNIT-1 **2L+4T+0P=6 Hours**

JOINTS:

Design of knuckle joint, cotter joint, Design of bolted: Joints loaded in shear and bolted joints subjected to eccentric loading. Design of welded joints subjected to static loads.

UNIT-2 **6L+12T+8P=18 Hours**

SPRINGS :

Design of helical and leaf springs, Design of shafts under torsion and combined bending and torsion.

SKILLS:

- ✓ *Assemble the components of an engine.*
- ✓ *Part drawing of machine elements.*
- ✓ *Design of rivets, bolts and cotter joints.*
- ✓ *Design of spur and helical gears.*

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 fasteners such as rivets, bolts and cotter joints properly in machines and real life practice according to the given load conditions.	Apply	1	1, 2, 3, 4
2	Apply design concepts for the components subjected to static and cyclic loading.	Apply	1	1, 2, 3, 4
3	Understand, the design procedure and selection of materials.	Under-stand	1	1, 2, 9, 10
4	Analyze power transmitted by shafts and couplings, also can design it.	Analyze	2	1, 2, 9, 12
5	Evaluate stress and load along with deformations of various types of springs.	Evaluate	2	1, 2, 5, 12

TEXT BOOK:

1. Bhandari, V. B 3rd edition, “Design of Machine Elements”, Tata-McGraw Hill Companies, New Delhi.

REFERENCE BOOKS:

1. Khurmi R. S and Gupta J. K. 2005, “A Textbook of Machine Design”, Eurasia Publishing House Pvt. Ltd. Ram Nagar, New Delhi.
2. Joseph, E. 2003, Shigley and Charles R. Mischke, 6th edition, “Mechanical Engineering Design”, McGraw-Hill International.

22FMPE201 TRACTOR AND AUTOMOTIVE ENGINES

Source: http://cdnmedia.endeavorsuite.com/images/catalogs/19350/products/detail/9b13d3c5-c40f-4b53-8da7-25646b792fec.jpg

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Fundamentals and working of IC engine, Mechanism of different components of IC engine, Testing of fuel properties .

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to familiarize the students the working principle and mechanism

of tractor engines, transmission system and fuels, ignition systems etc.

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MODULE-1

UNIT-1 **6L+6T+6P=18 Hours**

STUDY OF SOURCES OF FARM POWER:

Conventional & non-conventional energy sources. Classification of tractors and IC engines. Review of thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle. General energy equation and heat balance sheet. Study of mechanical, thermal and volumetric efficiencies. Study of engine components their construction, operating principles and functions. Study of engine strokes and comparison of 2-stroke and 4-stroke engine cycles and CI and SI engines.

Study of Engine: Valve systems, valve mechanism, Valve timing diagram, and valve clearance

adjustment Study of Cam profile, valve lift and valve opening area. Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners.

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

STUDY OF FUEL:

Fuel supply system, Study of fuels, properties of fuels, calculation of air-fuel ratio. Study of tests on fuel for SI and CI engines. Study of detonation and knocking in IC engines. Study of carburetion system, carburetors and their main functional components. Study of fuel injection system – Injection pump, their types, working principles. Fuel injector nozzles - their types and working principle. Engine governing - need of governors, governor types and governor characteristics.

PRACTICES:

- Introduction to different systems of CI engines.
- Engine parts and functions, working principles etc.
- Valve system – study, construction and adjustments.
- Oil & Fuel – determination of physical properties.
- Air cleaning system; Fuel supply system of SI engine.
- Diesel injection system & timing.

SKILLS:

- ✓ *Identify 2-stroke and 4-stroke engine.*
- ✓ *Testing of fuel properties.*
- ✓ *Repair and maintenance of cooling system.*

MODULE-2

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

STUDY OF LUBRICATION SYSTEM:

Need, types, functional components. Study of lubricants – physical properties, additives and their application. Engine cooling system – need, cooling methods and main functional components. Study of need and type of thermostat valves, Additives in the coolant. Study of radiator efficiency.

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

STUDY OF IGNITION SYSTEM:

Study of electrical system including battery, starting motor, battery charging, cut-out, etc. Comparison of dynamo and alternator. Familiarization with the basics of engine testing.

PRACTICES:

- Cooling system, and fan performance, thermostat and radiator performance evaluation.
- Part load efficiencies & governing.
- Lubricating system & adjustments.
- Starting and electrical system.
- Ignition system; Tractor engine heat balance and engine performance curves.
- Visit to engine manufacturer/ assembler/ spare parts agency.

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 their knowledge and identify the working mechanism of different components of IC engine.	Apply	1	1, 2, 3, 9
2	Apply and understand ignition system and problems faced during starting of ignition system.	Apply	2	1, 2, 9, 12
3	Analyze the problems in using right amount of fuel and lubricants for better efficiency and economy.	Analyze	1	1, 2, 9, 12
4	Evaluate and understand the heat engine balance of engine for maintaining at right temperature for different type of work.	Evaluate	2	1, 2, 9, 12

TEXT BOOKS:

1. Liljedahl J B and Others. “Tractors and Their Power units” in 2015.
2. Rodichev V and G Rodicheva. “Tractors and Automobiles” 2nd Edition, 2019.

REFERENCE BOOKS:

1. Mathur ML and RP Sharma. “A course in Internal Combustion Engines IV volume, 2011”.
2. Singh Kirpal. “Automobile Engineering – Vol II” 2008.
3. Heitner Joseph. “Automotive Mechanics: Principles and Practices” 1st Edition, 2013.

22PAFE201 ENGINEERING PROPERTIES OF AGRICULTURAL PRODUCE

Source: https://previews.123rf.com/images/galdzer/galdzer0904/galdzer090400177/4677435-wheat-and-hands-of-the-old-farmer-harvesting.jpg

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of physical, thermal and frictional properties of agricultural produce.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to evaluate different physical properties as well as thermal properties of agricultural produce. It also helps us to execute different grain storage structures or handling equipments by knowledge of different frictional properties of grain.

MODULE-1

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

BASICS OF ENGINEERING PROPERTIES:

Classification and importance of engineering properties of Agricultural Produce. Physical properties. Thermal properties of Agricultural Produce. Electrical properties of Agricultural Produce.

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

DETERMINATION OF ENGINEERING PROPERTIES:

Determination of shape, size, roundness, sphericity, volume, density, porosity, specific gravity, surface area of grains, fruits and vegetables, Determination of Heat capacity, Specific heat, Thermal conductivity, Thermal diffusivity, Heat of respiration; Co-efficient of thermal expansion, Dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination.

PRACTICES:

- Determination of the shape and size of grains of fruits and vegetables.
- Determination of bulk density and particle density/true density and porosity of solid grains.
- Finding the thermal conductivity of different grains.
- Determination of specific heat of some food grains.

MODULE-2

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

FRICTIONAL PROPERTIES:

Friction in agricultural materials; Flow of bulk granular materials; Aero dynamics of agricultural products. Rheological properties.

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

APPLICATION OF FRICTIONAL PROPERTIES:

Determination of Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, drag coefficients, terminal velocity. Force, deformation, stress, strain, elastic, plastic and viscous behaviour, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non- Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves. Application of engineering properties in handling processing machines and storage structures.

SKILLS:

- ✓ *Compute engineering properties of agricultural products and predict their nature at different operation in industry.*
- ✓ *Optimize processing parameter of different unit operations by acquiring knowledge of characteristics of properties.*
- ✓ *Design different grain storage structures such as silos, bins and conveying equipment's based on frictional properties and flow behavior of materials.*

PRACTICES:

- Determination of angle of repose of grains.
- Finding the co-efficient of external and internal friction of different crops.
- Finding out the terminal velocity of grain sample.
- Study of separating behaviour in a vertical wind tunnel.
- Determination of hardness of food material.
- Determination of viscosity of liquid foods.

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 different properties of agricultural produce.	Apply	1	1, 2, 4
2	Analyze knowledge of properties of agricultural produce during packaging, material handling and other unit operation in industry level.	Analyze	1	1, 2, 3, 4, 5
3	Examine the problems which take place in industry while thermal properties of agricultural produce is considered.	Evaluate	2	1, 2, 3, 4, 5
4	Evaluate different process equipments by considering several rheological properties.	Evaluate	2	1, 2, 4
5	Apply aerodynamic properties to develop different storage structures.	Create	2	1, 2, 3, 4, 5, 7, 11

TEXT BOOKS:

1. Rao, M.A. and Rizvi, S.H., "Engineering Properties of Foods" Marcel Dekker Inc. New York, 2016.
2. Mohesin, N.N. "Physical Properties of Plants and Animals" Gordon and Breach Science Publishers , New York, 2015.

REFERENCE BOOKS:

1. Mohesin, N.N. "Thermal Properties of Foods and Agricultural Materials" Gordon and Breach Science Publishers, New York, 2012.
2. Prentice, J.H. "Measurement in Rheological Properties of Food Stuffs" Elsevier Applied science Pub. Co. Inc. New York, 2012.
3. Singhal OP & Samuel DVK. "Engineering Properties of Biological Materials" Saroj Prakashan, 2009.

22IADE202 IRRIGATION ENGINEERING

Source: https://www.imgc.nl/wp-content/uploads/2017/03/52de913ab-3e72c42d000002_54176946_x.jpg?swifty=1

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of flow characteristics and sources of irrigation and different types of irrigation techniques.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the basic concepts on sources of irrigation, measurement of irrigation water. The objective of this course is to apply the knowledge of land grading, soil moisture characteristics, impact of evapotranspiration to build up irrigation system in to field and optimization of various irrigation efficiencies.

MODULE-1

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

INTRODUCTION TO IRRIGATION:

Major and medium irrigation schemes of India. Purpose of irrigation, environmental impact of irrigation projects, source of irrigation water, present status of development and utilization of different water resources of the country, measurement of irrigation water weir, flumes, an orifices and other methods.

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

DESIGN IRRIGATION SYSTEM:

Open channel water conveyance system: Design and lining of irrigation field channels, on farm structures for water conveyance, control and distribution. underground pipe conveyance system, components and design, land grading, criteria for land levelling and levelling design methods, estimation of earth work.

PRACTICES:

- Measurement of soil moisture by different soil moisture measuring instruments.
- Measurement of irrigation water.
- Measurement of infiltration characteristics.
- Determination of bulk density, field capacity and wilting point.
- Estimation of evapotranspiration.
- Land grading methods.

MODULE-2

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

IRRIGATION MANAGEMENT:

Soil water plant relationship: Soil properties influencing irrigation management, soil water movement, infiltration, soil water potential, soil moisture characteristics, soil moisture constants, measurement of soil moisture, moisture stress and plant response.

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

IRRIGATION METHODS:

Water requirement of crops: Concept of evapotranspiration (ET), measurement and estimation of ET, water and irrigation requirement of crops, depth of irrigation, frequency of irrigation, irrigation efficiencies: surface methods of water application; border, check basin and furrow irrigation-adaptability, specification and design considerations.

SKILLS:

- ✓ *Design an irrigation project for a water scare watershed.*
- ✓ *Estimate of irrigation requirement of a crop in the field.*
- ✓ *Compute irrigation efficiency of agriculture field on the basis of irrigation scheduling.*

PRACTICES:

- Design of underground pipeline system.
- Estimation of irrigation efficiency.
- Study of advance, recession and computation of infiltration opportunity time infiltration by inflow-outflow method.
- Evaluation of border irrigation method.
- Evaluation of furrow irrigation method.
- Evaluation of check basin irrigation 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	Apply the knowledge of sources of water to take up different irrigation project at rural area.	Apply	1	1, 2, 4, 7
2	Investigate land grading and apply the knowledge of earthwork to design graded irrigation system.	Apply	2	1, 2, 3, 4, 5, 6, 7
3	Investigate causes and impact irrigation required in to field.	Analyze	2	1, 2, 4, 5, 7
4	Compute irrigation water in different channels or reservoirs.	Evaluate	1	1, 2, 4, 5, 7
5	Design and develop different irrigation methods.	Create	2	1, 2, 3, 4, 5, 6, 7, 12

TEXT BOOKS:

1. Subramanya, K. “Engineering Hydrology” 3rd Edition, Tata McGraw-Hill Publishing Co., New Delhi, 2017.

REFERENCE BOOKS:

1. Chow, V.T., D.R. Maidment and L.W. Mays. “Applied Hydrology” McGraw Hill Publishing Co., New York, 2018.
2. Jaya Rami Reddy, P. “A Text Book of Hydrology” University Science Press, New Delhi, 2016.

22SWCE202 SOIL AND WATER CONSERVATION ENGINEERING

Source: http://xososonla.vn/Img/AnhHoat-Dong/636268970135331032.jpg

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of Soil Erosion and runoff characteristics.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the different types of erosion, causes of erosion and management. This course helps students to impart knowledge of different conservation structures and methods to control soil erosion.

MODULE-1

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

SOIL EROSION:

Soil erosion : Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion. Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion. Gullies-classification and stages of Gully development.

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

SOIL LOSS ESTIMATION:

Soil loss estimation : Universal soil loss equation (USLE) and modified USLE. Rainfall erosivity-estimation by KE>25 and EI30 methods. Soil erodibility, topography, crop management and conservation practice factors. Measurement of soil erosion, Runoff plots, soil samplers. Water erosion control measures, agronomical measures, contour farming, strip cropping, conservation by tillage and mulching.

PRACTICES:

- Study of different types and forms of water erosion.
- Exercises on computation of rainfall erosivity index, Computation of soil erodibility index in soil loss estimation.
- Determination of length of slope (LS) and cropping practice (CP) factors for soil loss estimation by USLE and MUSLE.
- Exercises on soil loss estimation/measuring techniques.
- Study of rainfall simulator for erosion assessment.
- Estimation of sediment rate using Coshocton wheel sampler and multi-slot devisor.
- Determination of sediment concentration through oven dry method.
- Design and layout of contour bunds.
- Design and layout of graded bunds.

MODULE-2

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

SOIL CONSERVATION STRUCTURES:

Engineering measures– Bunds and terraces, contour and graded bunds - design and surplussing arrangements. Terraces, level and graded broad base terraces, bench terraces, planning, design and layout procedure, stone wall and trenching.

SKILLS:

- ✓ *Design prototype models of drop spillway, drop inlet spillway and chute spillway with standard procedures.*
- ✓ *Prepare an estimation of various costs and benefits of different structures.*
- ✓ *Analyze various soil and water conservation structure designs using software.*

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

DESIGN OF CONSERVATION STRUCTURES:

Gully and ravine reclamation, Principles of gully control, vegetative measures, temporary structures and diversion drains. Grassed waterways and design. Wind erosion, Factors affecting, mechanics, wind breaks and shelter belts and stabilization of sand dunes, Land capability classification, Rate of sedimentation, silt monitoring and storage loss in tanks.

PRACTICES:

- Design and layout of broad base terraces.
- Design and layout of bench terraces.
- Design of vegetative waterways.
- Exercises on rate of sedimentation and storage loss in tanks.
- Computation of soil loss by wind erosion.
- Design of shelter belts and windbreaks for wind erosion control.
- Visit to soil erosion site and watershed project areas for studying erosion control and water conservation measures.

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 knowledge of different types of erosion to conserve soil loss.	Apply	1	1, 2, 4, 7
2	Examine soil erosion and its measurement to develop erosion control measures.	Analyze	1	1, 2, 4, 5, 7
3	Design and development of soil conservation structures.	Create	2	1, 2, 3, 4, 5, 6, 7, 12
4	Development of conservation soil conservation methods in terrain area.	Create	2	1, 2, 3, 4, 5, 6, 7, 12

TEXT BOOKS:

1. Suresh, R., “Soil and Water Conservation Engineering” Standard Publisher Distributors, New Delhi, 2014.

REFERENCE BOOKS:

1. Mal, B.C. “Introduction to Soil and Water Conservation Engineering” 2014. Kalyani Publishers.
2. Mahnot, S.C. “Soil and Water Conservation and Watershed Management” International Books and Periodicals Supply Service, New Delhi, 2016.
3. Michael, A.M. and T.P. Ojha. “Principles of Agricultural Engineering” Volume II.4th Edition, Jain Brothers, New Delhi, 2016.

22REE201 FUNDAMENTALS OF RENEWABLE ENERGY SOURCES

Source: https://lh3.googleusercontent.com/04S-VigB2G84tTzk_2erOVDmyakvO1ZyGxBQYR_WNc9uAl5J2koWrcg6C690i rBdv5x-a1Ow=s170

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Fundamentals of Renewable energy, Maintenance of different renewable energy devices.

COURSE DESCRIPTION AND OBJECTIVES:

The main objective is to make the student aware of the various basic aspects of energy and their uses and impart knowledge about the different classifications of energy sources and major renewable energy sources and technologies. To familiarize the students with different bioenergy sources and production technology.

MODULE-1

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

INTRODUCTION TO ENERGY:

Concept and limitation of Renewable Energy Sources (RES), Criteria for assessing the potential of RES, Classification of RES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of renewable energy sources with non-renewable sources.

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

SOLAR ENERGY:

Energy available from Sun, Solar radiation data, solar energy conversion into heat through, Flat plate and Concentrating collectors, different solar thermal devices, Principle of natural and forced convection drying system

Solar Photo voltaic: p-n junctions. Solar cells, PV systems, Stand alone, Grid connected solar power station, Calculation of energy through photovoltaic power generation and cost economics.

PRACTICES:

- Study of different types of solar cookers.
- Study of solar water heating system.
- Study of natural convection solar dryer & forced convection solar dryer.
- Study of solar desalination unit.
- Study of solar greenhouse for agriculture production.
- Study of solar photovoltaic cell characteristics.

MODULE-2

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

WIND ENERGY:

Energy available from wind, General formula, Lift and drag. Basis of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Types of Windmill rotors, Determination of torque coefficient, Induction type generators, Working principle of wind power plant.

SKILLS:

- ✓ *Identify various renewable energy sources.*
- ✓ *Design and development of a solar water heater and solar cooker.*
- ✓ *Production of biogas and producer gas.*
- ✓ *Differentiate various biogas plants and gasifiers.*

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

BIO-ENERGY:

Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Types of gasifier, various types of biomass cook stoves for rural energy needs.

Biogas: Types of biogas plants, biogas generation, factors affecting biogas generation and usages, design consideration, advantages and disadvantages of biogas spent slurry.

PRACTICES:

- Design of biogas plants.
- Study of a biomass gasifiers.
- Study of a biomass improved cook-stoves.

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 renewable energy sources in agriculture energy sector.	Apply	1	1, 2, 3, 9
2	Analyze the principle of construction and working of the various renewable energy devices.	Analyze	1	1, 2, 9, 12
3	Analysing the usage and maintenance of different renewable energy devices.	Analyze	2	1, 2, 9, 12
4	Ability to design and development of solar water heater, solar cooker, windmill, biogas plant and gasifier.	Create	2	1, 2, 9, 12

TEXT BOOKS:

1. G.D.Rai, “Non-Conventional Energy Sources”, Khanna Publishers, Delhi. 2013.

REFERENCE BOOKS:

1. Mathur, A.N and Rathore N.S. ”Biogas production, management and utilization”. Himanshu Publication. Delhi, 2005.
2. Rathore N. S., Kurchania A. K. and Panwar N. L.“Non-Conventional Energy Sources”, Himanshu Publications, 2007.
3. Rathore N. S., Kurchania A. K. and Panwar N. L. “Renewable Energy, Theory and Practice”, Himanshu Publications, 2007.
4. Sukhatme, S.P and Nayak, J.K “Solar Energy: Principles of Thermal Collection and Storage”, Tata Mc-Graw Hill Education Pvt. Ltd., New Delhi, 2010.

III YEAR

B.Tech.

AGRICULTURAL ENGINEERING

COURSE CONTENTS

I SEM & II SEM

I SEMESTER

22BEAS301	-	Building Construction and Cost Estimation
22FMPE301	-	Tillage and Sowing Operation
22PAFE301	-	Agricultural Structures and Environmental Control
22PAFE302	-	Post-Harvest Engineering of Cereals,Pulses and Oilseeds
22IADE301	-	Sprinkler and Micro Irrigation Systems
22SWCE301	-	Watershed Planning and Management
22REE301	-	Renewable Power Sources
22BEAS302	-	Design of Structures
22FMPE302	-	Tractor and Farm Machinery Operation and Maintenance

II SEMESTER

22FMPE303	-	Intercultural, Harvesting and Threshing Equipment
22PAFE303	-	Post-Harvest Engineering of Horticultural Crops
22SWCE302	-	Water Harvesting and Soil Conservation Structures
22PAFE304	-	Dairy and Food Engineering
22REE302	-	Bio-Energy Systems: Design and Applications
22BEAS303	-	Web Designing and Internet Applications
22IADE302	-	Drainage Engineering
22FMPE304	-	Tractor Systems and Controls
	-	Elective Course-3

22BEAS301 BUILDING CONSTRUCTION AND COST ESTIMATION

Hours Per Week :

L	T	P	C
1	2	0	2

Source: https://alliancefacades.com/wp-content/uploads/2017/10/alliancefacadessysteminstallation-1.jpg

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

This course intended with construction materials and processes of building finishing such as Damp Proofing, Plastering, Pointing, White washing. This course also covers design of buildings, construction economics and cost evaluation of buildings. The objective of this course is to provide knowledge of building materials, construction processes and cost evaluation of buildings.

MODULE-1

UNIT-1 **4L+8T+0P=08 Hours**

BUILDING ELEMENTS:

Rocks, Stones, Bricks, Properties and varieties of Tiles, Lime, Cement, Concrete, Sand. Glass, Rubber, Iron, Steel, Aluminium, Timber.

Lintels, Arches, Stair cases, Different types of floors.

Damp Proofing and water proofing, Plastering, Pointing, White washing and distempering – Painting

UNIT-2 **4L+12T+0P=16 Hours**

DESIGN OF BUILDINGS:

Design procedures, Technology, building construction, Types of agricultural buildings and related needs, application of design theory and practice to the conservation, sloped and flat roof buildings.

PRACTICES:

- Design flow diagram.
- Design line plan of a building.
- Determination of plinth, floor and carpet area.
- Determination of FSI.
- Design of sloped roof buildings.
- Design of flat roof buildings.

MODULE -2

UNIT-1 **2L+04T+0P=6 Hours**

COST ESTIMATION:

Preliminary estimates, Detailed estimates of buildings, Source of cost information, Use of cost Analyzes for controlling design, Factors affecting building costs.

SKILLS:

- ✓ *Identify suitable and economic type of materials for given construction project.*
- ✓ *Design flow diagram and line plan of a building.*
- ✓ *Design of sloped and flat roof buildings.*
- ✓ *Design of cash flow diagram and cost optimization of a building.*

UNIT-2 **06L+12T+0P=18 Hours**

COST EVALUATION:

Cost evaluation of design and planning alternatives for building and estate development, Measurement and pricing, Economic methods for evaluating investments in buildings and building systems: cost-in-use, benefit-to-costs and savings-to-investment ratios, rate of return, net benefits, payback.

PRACTICES

- Design of cost evaluation of a building.
- Design of cash flow diagram of a building.
- Design of cost optimization of a building.
- Design of rate of return of a building.
- Design of net benefits of a building.

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 different types of estimates and their uses	Apply	1	1, 2, 3, 9
2	Analysis of the ethical questions that arise in construction estimating.	Analyze	1	1, 2, 9, 12
3	Creative and interpret the drawings and specifications.	Create	2	1, 2, 9, 12
4	Creative quantity take-offs based on the drawings and specifications and generate detailed estimates.	Create	2	1, 2, 9, 12

TEXT BOOKS:

1. B. C. Punmia, “Building construction”, Laxmi Publications, New Delhi, 11th edition, 2016.
2. Y.S. Sane, “ Planning and Designing of Buildings”, Allies Book Stall, 2011.

REFERENCE BOOKS:

1. G.C. Sahu and Joygopal Jena, “Building Materials and Construction” McGraw Hill Education (India) Pvt. Ltd. Chennai, 2015.
2. Kumar Neeraj Jha, “Construction Project Management” , Pearson Publication, 2015.
3. S.K. Duggal, “Building material”, New Age International Publishers, New Delhi, 3rd edition, 2009.

22FMPE301 TILLAGE AND SOWING OPERATION

Source: https://www.britannica.com/topic/tillage

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Farm mechanization, Construction materials, Heat treatment, Cost Estimation, Tillage Operation and equipment, Sowing operation & equipment.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to build a grasp of the principles of Farm Machinery and Equipment-I through Farm mechanization, Construction materials, Heat treatment, Cost Estimation, Tillage operation and equipment, sowing operation & equipment that serves as an essential tool in several engineering applications..

MODULE-1

UNIT-1 **4L+0T+6P=10 Hours**

CONSTRUCTION MATERIALS & HEAT TREATMENT:

Introduction to materials used in construction of farm machines. Heat treatment processes and their requirement in farm machines. Properties of materials used for critical and functional components of agricultural machines. Introduction to steels and alloys for agricultural application. Identification of heat treatment processes specially for the agricultural machinery components.

UNIT-2 **4L+0T+10P=14 Hours**

FARM MECHANIZATION AND COST ESTIMATION:

Introduction to farm mechanization. Classification of farm machines. Unit operations in crop production. Identification and selection of machines for various operations on the farm. Hitching systems and controls of farm machinery. Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines.

PRACTICES:

- Identification of materials of construction in agricultural machinery.
- Study of material properties.
- Study of heat treatment processes subjected to critical components of agricultural machinery.
- Familiarization with different farm implements and tools.
- Study of hitching systems.
- Problems on machinery management.

MODULE-2

UNIT-1 **4L+0T+10P=14 Hours**

TILLAGE OPERATION AND EQUIPMENT:

Introduction to seed-bed preparation and its classification. Familiarization with land reclamation and earth moving equipment. Introduction to machines used for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage. Measurement of draft of tillage tools and calculations for power requirement for the tillage machines. Introduction to tillage machines like mould-board plough, disc plough, chisel plough, sub-soiler, harrows, cultivators, Identification of major functional components. Attachments with tillage machinery.

SKILLS:

- ✓ *Operate tillage implements for paddy cultivation.*
- ✓ *Operate sowing and plant protection implements for paddy cultivation.*
- ✓ *Select machines for paddy cultivation based on field conditions.*
- ✓ *Compute the cost of operation of farm machinery.*
- ✓ *Select material of construction for tillage implements*

UNIT-2 **4L+0T+6P=10 Hours**

SOWING OPERATION AND EQUIPMENT:

Introduction to sowing, planting & transplanting equipment. Introduction to seed drills, no-till drills, and strip-till drills. Introduction to planters, bed-planters and other planting equipment. Study of types of furrow openers and metering systems in drills and planters. Calibration of seed-drills/ planters. Adjustments during operation.

PRACTICES:

- Study of primary and secondary tillage machinery – construction, operation, adjustments and calculations of power and draft requirements.
- Study of sowing and planting equipment – construction, types, calculation for calibration and adjustments.
- Study of transplanters – paddy, vegetable, 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	Apply to design and development of crop production machinery based on various input data.	Apply	2	1, 3, 5, 6
2	Apply and application of material substitution in production of farm machineries.	Apply	1	3, 5, 9, 10, 11
3	Analyze the various machinery components and tools used in crop production operation.	Analyze	1	1, 3, 5
4	Evaluate and determine the cost economics of the crop production machineries.	Evaluate	2	4, 6, 9, 11

TEXT BOOKS:

1. Ojha, T. P and Michael, A. M., “Principles of Agricultural Engineering Vol. I”. Jain Brothers, New Delhi, 2011.
2. Sahay, J “Elements of Agricultural Engineering”. Standard Publishers and Distributors, New Delhi, 2015.

REFERENCE BOOKS:

1. Yadav, R and Solanki, H. B.”Numericals and Short Questions in Farm machinery, Power and Energy in Agriculture”. New India Publishing Agency, New Delhi, 2009.

22PAFE301 AGRICULTURAL STRUCTURES AND ENVIRONMENTAL CONTROL

Source:https://i.pinimg.com/originals/13/3e/0f/133e0f69c6194a06b00adaca5c569231.jpg

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of grain properties and component of farmstead.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to examine factors affecting grain storage and its spoilage and construct different grain storage structures i.e. bulk and bag storage structures. It also summarizes us about farmstead and its several components as well as to propose and develop small farmstead at locality.

MODULE-1

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

STORAGE OF GRAIN:

Storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage, Moisture and temperature changes in grain bins; Storage of seeds.

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

GRAIN STORAGE STRUCTURES:

Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins), Design consideration for grain storage godown, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins.

PRACTICES:

- Design of a feed/fodder storage structures.
- Design of grain storage structures.
- Design and layout of commercial bag and bulk storage facilities.
- Study and performance evaluation of different domestic storage structure.

MODULE-2

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

FARMSTEAD:

Planning and layout of farmstead. Scope, importance and need for environmental control. Livestock production facilities, BIS Standards for dairy, piggery, poultry and other farm structures. Rural living and development, rural roads. Sources of water supply, norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community. Site and orientation of building in regard to sanitation, community sanitation system.

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

FACTORS AFFECTING FARMSTEAD AND DESIGN:

Physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods, Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc. Rural roads construction cost and repair and maintenance. Sewage system and its design, cost and maintenance, design of septic tank for small family. Estimation of domestic power requirement, source of power supply and electrification of rural housing. Calculation of cooling load in storage.

SKILLS:

- ✓ *Compute moisture migration or temperature or RH change in grain storage structures during grain storage.*
- ✓ *Evaluate lateral and vertical pressure in shallow and deep bin.*
- ✓ *Examine different component of farm stead.*
- ✓ *Investigate physiological reaction of animal livestock in animal shed.*
- ✓ *Evaluate domestic power requirement for small house hold family.*

PRACTICES:

- Measurements for environmental parameters and cooling load of a farm building.
- Design and layout of a dairy farm.
- Design and layout of a poultry house.
- Design and layout of a goat house/sheep house
- Design of a farm fencing system.
- Estimation of a Farm building.

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 effect of grain properties in the field of grain spoilage and storage.	Apply	1	1, 2, 7
2	Analyze knowledge of grain frictional properties to determine grain pressure in bin and to develop design bag bulk storage structures.	Analyze	1	1, 2, 3, 4, 6, 9
3	Examine different component farmstead at rural area.	Evaluate	2	1, 2, 6, 7, 9
4	Propose and design sewage system for rural area and evaluate performance.	Evaluate	2	1, 2, 3, 4, 7, 9, 11
5	Design small animal shelter in farm stead.	Create	2	1, 2, 3, 4, 6, 7, 9, 11

TEXT BOOKS:

1. Ojha, T.P and Michael, A.M. Principles of Agricultural Engineering, Vol. I, Jain Brothers, Karol Bag, New Delhi, 2009.
2. Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana, 2006.

REFERENCE BOOKS:

1. Nathonson, J.A. Basic Environmental Technology, Prentice Hall of India, New Delhi, 2009. Venugopal Rao, P. Text Book of Environmental Engineering, Prentice Hall of India, New Delhi, 2012.
2. Garg, S.K. Water Supply Engineering, Khanna Publishers, New Delhi-6, 2016.
3. Dutta, B.N. Estimating and Costing in Civil Engineering, Duttta & CO, Lucknow, 2012.
4. Khanna, P.N. Indian Practical Civil Engineer's Hand Book, Engineer's Publishers, New Delhi, 2016.
5. Sahay, K.M. and Singh, K.K. Unit Operations of Agricultural Processing, Vikas publishing pvt. Ltd, Noida, 1999.
6. Banerjee, G.C. A Text Book of Animal Husbandry, Oxford IBH Publishing Co, New Delhi, 2008.

22PAFE302 POST-HARVEST ENGINEERING OF CEREALS, PULSES AND OIL SEEDS

Source : https://c1.staticflickr.com/1/162/399414627_ea29498bd1_b.jpg

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of food processing operations in industry.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to evaluate performance of cleaning, size reduction, mixing and milling operation in food processing industry. It also helps us to examine drying rate of agricultural produce and develop suitable drying model. It illustrates about different milling methods of cereals, pulses and oil seeds.

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

CLEANING MIXING HANDLING:

Cleaning and grading, aspiration, scalping; size separators, screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, shape graders. Mixing: Theory of mixing of solids and pastes, Types of mixers for solids, liquid foods and pastes. Material handling equipment. Types of conveyors: Belt, roller, chain and screw. Elevators: bucket, Cranes & hoists. Trucks (refrigerated/ unrefrigerated), Pneumatic conveying. Drying: moisture content and water activity; Free, bound and equilibrium moisture content, isotherm, hysteresis effect.

UNIT-2 **4L+8T+8P=20 Hours**

DRYING & DRYERS :

Sieve analysis, capacity and effectiveness of screens. Mixing index, Mixing time. Determination of power requirement and capacity of conveying systems. EMC determination, Psychrometric chart and its use in drying. Drying principles and theory, Thin layer and deep bed drying analysis. Falling rate and constant rate drying periods, maximum and decreasing drying rate period, drying equations, Mass and energy balance, Shedd's equation, Dryer performance, Different methods of drying, batch-continuous; mixing-non-mixing, Sun-mechanical, conduction, convection, radiation, superheated steam, tempering during drying, Different types of grain dryers: bin, flat bed, LSU, columnar, RPEC, fluidized, rotary and tray.

PRACTICES:

- Performance evaluation of different types of cleaners and separators.
- Determination of separation efficiency.
- Determination of fineness modulus and uniformity index.
- Study of different types of conveying and elevating equipments.
- Study of different types of mixers.
- Measurement of moisture content: dry basis and wet basis.
- Study on drying characteristics of grains and determination of drying constant.
- Determination of EMC (Static and dynamic method).
- Study of various types of dryers.

SKILLS:

- ✓ *Compute effectiveness of screen and performance of mixers.*
- ✓ *Evaluate equilibrium moisture content and drying rate using the concept of psychrometric chart and sorption isotherm.*
- ✓ *Examine performance of size reduction and determine power requirement of various size reduction equipment.*
- ✓ *Investigate various operations involved in milling of cereals, pulses and oil seed.*
- ✓ *Evaluate performance of various extruders and design component of extruders.*

MODULE-2

UNIT-1 **4L+8T+8P=20 Hours**

SIZE REDUCTION & MILLING :

Size reduction: principle, procedure (crushing, impact, cutting and shearing). Milling of rice: Conditioning and parboiling, advantages and disadvantages. Milling of wheat, unit operations and equipment. Milling of corn and its products. Dry and wet milling. Extrusion cooking: principle, factors affecting. By-products utilization.

UNIT-2 **4L+8T+8P=20 Hours**

PERFORMANCE EVALUATION OF SIZE REDUCTION & MILLING:

Bond's law, Kick's law, Rittinger's law, Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill. Traditional methods, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment. Milling of pulses: traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods: CFTRI and Pantnagar methods. Pulse milling machines, Milling of oilseeds: mechanical expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oilseeds, refining of oil, stabilization of rice bran. Extrusion cooking: single and twin screw extruders.

PRACTICES:

- Study of different size reduction machines and performance evaluation.
- Study of different equipments in rice mills and their performance evaluation.
- Study of different equipments in pulse mills and their performance evaluation.
- Study of different equipments in oil mills and their performance evaluation.
- Type of process flow charts with examples relating to processing of cereals pulses and oil seeds.
- Visit to grain processing industries.

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 effect of screening, mixing and material handling and optimize performance.	Apply	1	1, 2, 7
2	Analyze knowledge of sorption isotherm to develop different types dryers and drying types.	Analyze	1	1, 2, 3, 4, 6, 9
3	Examine different factors affecting size reduction process and compute their performance.	Evaluate	2	1, 2, 6, 7, 9
4	Design small cereal milling pilot plant.	Create	2	1, 2, 3, 4, 6, 7, 9, 11
5	Design small pulses milling pilot plant.	Create	2	1, 2, 3, 4, 6, 7, 9, 11

TEXT BOOKS:

1. Chakraverty, A. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing Co. Ltd., New Delhi, 2003.
2. Sahay, K.M. and Singh, K.K. "Unit operations of Agricultural Processing" Vikas Publishing house Pvt. Ltd. New Delhi, 1994.

REFERENCES :

1. Dash, S.K., Bebartta, J.P. and Kar, A. "Rice Processing and Allied Operations" Kalyani Publishers, New Delhi, 2015.

22IADE301 SPRINKLER AND MICRO IRRIGATION SYSTEMS

Source : https://1740009751.rsc.cdn77.org/sites/balkanbaba/docs/6fe98443f75e43594dc9cbf0a1ecb80e.jpg

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of irrigation and fertigation techniques.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the modern irrigation techniques to optimize irrigation water by micro irrigation systems. This course also helps students to acquaint knowledge in developing the layout and designing micro irrigation systems.

MODULE-1

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

SPRINKLER IRRIGATION:

Sprinkler irrigation: Adaptability, problems and prospects, types of sprinkler irrigation systems.

UNIT-2 **4L+0T+08P=12 Hours**

DESIGN OF SPRINKLER IRRIGATION:

Design of sprinkler irrigation system: layout selection, hydraulic design of lateral, sub main and main pipe line, design steps, selection of pump and power unit for sprinkler irrigation system, performance evaluation of sprinkler irrigation system, uniformity coefficient and pattern efficiency.

PRACTICES:

- Study of different components of sprinkler irrigation system.
- Design and installation of sprinkler irrigation system for a small Garden and Field.
- Determination of precipitation pattern, discharge and uniformity coefficient.
- Cost economics of sprinkler irrigation system.

MODULE-2

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

DRIP IRRIGATION:

Micro Irrigation Systems: Types-drip, spray and bubbler systems, merits and demerits, different components, fertigation, advantages and limitations of fertigation, fertilizers solubility and their compatibility, precautions for successful fertigation system, fertigation frequency, duration and injection rate, methods of fertigation.

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

LAYOUT OF DRIP IRRIGATION:

Design of drip irrigation system: General considerations, wetting patters, irrigation requirement, emitter selection, hydraulics of drip irrigation system, design steps, necessary steps for proper operation of a drip irrigation system, maintenance of micro irrigation system, clogging problems, filter cleaning, flushing and chemical treatment.

SKILLS:

- ✓ *Make a plan for designing and installing both the sprinkler and drip irrigation systems.*
- ✓ *Identify the suitable irrigation system based on water source, type of crop to be cultivated and economic analysis.*
- ✓ *Design venturi assembly for fertigation.*

PRACTICES:

- Study of different components of drip irrigation.
- Design and installation of drip irrigation system.
- Determination of pressure discharge relationship and emission uniformity for given emitter.
- Study of different types of filters.
- Determination of filtration efficiency.
- Determination of rate of injection and calibration for chemigation.
- Determination of rate of injection and calibration for fertigation.
- Design of irrigation and fertigation schedule for crops.
- Field visit to micro irrigation system and evaluation of drip system.
- Cost economics of drip irrigation system.

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 knowledge of micro irrigation system to reduce excessive usage of irrigation water	Apply	1	1, 2, 4, 7
2	Evaluate performance of sprinkler irrigation techniques with the help of uniformity coefficient and pattern efficiency	Evaluate	1	1, 2, 4, 5, 7
3	Analyze fertilizer application through micro irrigation system and propose remedial measures due to troubleshoot	Analyze	2	1, 2, 3, 4, 5, 6, 7
4	Design and development of drip irrigation systems	Create	2	1, 2, 3, 4, 5, 6, 7, 12
5	Problems associated with micro irrigation systems and propose solutions	Create	2	1, 2, 3, 4, 5, 6, 7, 12

TEXT BOOKS:

1. Michael A.M. “Irrigation: Theory and Practice” Vikas Publishing Vikas Pub. House New Delhi, 2012.
2. Mane M.S. and Ayare B.L.”Principles of Sprinkler Irrigation systems” Jain Brothers, New Delhi, 2007.

REFERENCE BOOKS:

1. Keller Jack and Bliesner Ron D. “Sprinkle and Trickle Irrigation. Springer Science business” Media, New York, 2001.
2. Mane M.S and Ayare B.L. and MagarS.S. “Principles of Drip Irrigation systems” Jain Brothers, New Delhi, 2006.
3. Michael AM, Shrimohan and KR Swaminathan. Design and evaluation of irrigation methods, (IARI Monograph No.1). Water Technology Centre, IARI New Delhi, 2009.

22SWCE301 WATERSHED PLANNING AND MANAGEMENT

Source : https://live.staticflickr.com/67923466138575_ab55b2f6c3.jpg

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of water shed hydrology.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the watershed characteristics, development and its management. It also helps students to impart knowledge in watershed planning, watershed budgeting, management measures in watershed, integrated watershed management. It also helps student to plan and formulate project proposal for watershed management programme including cost – benefits analysis.

MODULE-1

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

WATERSHED : Watershed - introduction and characteristics. Watershed development - problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio- economic factors. Watershed management - concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologic data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index.

UNIT-2 **04L+0T+08P=12 Hours**

WATERSHED MANAGEMENT: Water budgeting in a watershed. Management measures - rainwater conservation technologies -in-situ and ex-situ storage, water harvesting and recycling. Dry farming techniques-inter-terrace and inter-bund land management.

PRACTICES:

- Exercises on delineation of watersheds using topo sheets.
- Surveying and preparation of watershed map.
- Quantitative analysis of watershed characteristics and parameters.
- Watershed investigations for planning and development.
- Analysis of hydrologic data for planning watershed management.
- Water budgeting of watersheds.

MODULE-2

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

INTEGRATED WATERSHED MANAGEMENT:

Integrated watershed management - concept, components, arable lands - agriculture and horticulture, non-arable lands - forestry, fishery and animal husbandry. Effect of cropping systems, land management and cultural practices on watershed hydrology.

UNIT-2 **4L+0T+08P=12 Hours**

WATERSHED PROGRAMME PLANNING:

Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation. Participatory watershed management- role of watershed associations, user groups and self-help groups. Planning and formulation of project proposal for watershed management programme including cost- benefit analysis.

SKILLS:

- ✓ *Surveying and preparation of watershed map.*
- ✓ *Watershed investigations for planning and development.*

PRACTICES:

- Prioritization of watersheds based on sediment yield index.
- Study of functional requirement of watershed development structures.
- Study of watershed management technologies.
- Practice on software for analysis of hydrologic parameters of watershed.
- Study of role of various functionaries in watershed development programmes. Techno-economic viability analysis of watershed projects.
- Visit to watershed development project 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	Apply the knowledge of LCC and hydrologic data for planning of watershed management.	Apply	1	1, 2, 4, 7
2	Evaluate watershed budget.	Evaluate	1	1, 2, 4, 5, 7
3	Manifest the scientific aptitude and attitude of watershed management programmes at individual capacity and also with a team work approach.	Analyze	2	1, 2, 3, 4, 5, 6, 7
4	Create and develop innovative and results specific watershed development programmes with an integrated approach keeping in view of overall development of the stack holders.	Create	2	1, 2, 3, 4, 5, 6, 7, 12
5	Take up the various projects on the present research gaps in watershed development programmes and activities in connection to science, technology and socio economic parameters taken into account.	Create	2	1, 2, 3, 4, 5, 6, 7, 12

TEXT BOOKS:

1. Mahnot, S.C. “Soil and Water Conservation and Watershed Management” International Books and Periodicals Supply Service. New Delhi, 2014.

REFERENCE BOOKS:

1. Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
2. Ghanshyam Das. “Hydrology and Soil Conservation Engineering” Including Watershed Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi, 2008.

22REE301 RENEWABLE POWER SOURCES

Source : https://lh3.googleusercontent.com/y7DBqsOUO28zfS7GHFJk9O8AZ9AUOhXLa0vOxGqMtEKCirwb4WjASl26o9hLAIIxIXBf-A=s137

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of renewable energy.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to familiarize the students with the relevance of renewable power sources and their application. To impart knowledge about the production of bio-energy, solar energy, wind energy and hydra power, their construction, principle of working, application and maintenance.

MODULE-1

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

RENEWABLE ENERGY:

Energy consumption pattern & energy resources in India. Renewable energy options, potential and utilization. Biogas technology and mechanisms, generation of power from biogas.

UNIT-2 **4L+8T+8P=20 Hours**

BIOGAS PLANT :

Power generation from urban, municipal and industrial waste. Design & use of different commercial sized biogas plant. Solar thermal and photovoltaic.

PRACTICES:

- Performance evaluation of solar water heater.
- Performance evaluation of solar cooker.
- Characteristics of solar photovoltaic panel.
- Evaluation of solar air heater/dryer.

MODULE-2

UNIT-1 **4L+8T+8P=20 Hours**

POWER GENERATION:

Systems for power generation. Central receiver (Chimney) and distributed type solar power plant, OTEC, MHD, hydrogen and fuel cell technology. Wind farms.

UNIT-2 **4L+8T+8P=20 Hours**

AERO-GENERATORS:

Aero-generators. Wind power generation system. Power generation from biomass (gasification & Dendro thermal), Mini and micro small hydel plants. Fuel cells and its associated parameters.

PRACTICES:

- Performance evaluation of biomass gasifier engine system (throatless & downdraft).
- Performance evaluation of a fixed dome type biogas plant.
- Performance evaluation of floating drum type biogas plant.
- Estimation of calorific value of biogas & producer gas.
- Testing of diesel engine operation using dual fuel and gas alone.

SKILLS:

- ✓ *Apply the concepts of renewable energy sources for agricultural sectors .*
- ✓ *Evaluate the options and estimate the energy generation through renewable sources.*

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 perceiving status and requirement of conversion of renewable source of energy.	Apply	1	1, 2, 7
2	Understand the principle of construction and working of renewable source of energy.	Apply	1	1, 2, 3 , 4, 6, 9
3	Apply and development of renewable energy production units.	Apply	2	1, 2, 6, 7, 9
4	Evaluate and differentiate the renewable and non-renewable source of energy.	Create	2	1, 2, 3, 4, 6, 7, 9, 11

TEXT BOOKS:

1. Garg H.P. “Advances in Solar Energy Technology” D. Publishing Company, Tokyo, 1998.
2. Alan L: Farredbruch & R.H. Buse. 1983. Fundamentals of Solar Academic Press, London.

REFERENCE BOOKS:

1. Bansal N.K., Kleemann M. & Meliss Michael. “Renewable Energy Sources & Conversion Technology” Tata Mecgrow Publishing Company, New Delhi, 1999.
2. Rathore N. S., Kurchania A. K. & N.L. Panwar. “Non Conventional Energy Sources” Himanshu Publications, 2007.

22BEAS302 DESIGN OF STRUCTURES

Source : https://i.guim.co.uk/img/media/0e7ca6481d30130c8311e6c5a5673f521c7fd4cc/0_151_3869_2176/3869.jpg?width=1 280&quality=85&auto=forma t&fit=max&s=87bb9939917b8ec6039485 2f31276ce9

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

The objective of the course is to learn the basic concepts of design, and perform analysis, and design of structural steel members and their connections. To understand the concepts of the working stress method and be able to Analyze and design reinforced concrete structural elements.

MODULE-1

UNIT-1 **3L+0T+0P=3 Hours**

DESIGN PHILOSOPHIES FOR STEEL STRUCTURES:

Structural steel types: Mechanical properties of structural steel, Types of loads, Combinations of loads and use of BIS Codes.

UNIT-2 **5L+0T+16P=21 Hours**

ANALYSIS AND DESIGN OF TESNION AND COMPRESSION MEMBERS:

Design of connections. Design of structural steel members in tension, compression and bending.

PRACTICES:

- Design and detailing of steel roof truss.
- To measure workability of cement by slump test.
- To measure workability of cement by compaction factor test.
- To determine the compression of concrete.
- To determine the tensile strain test of concrete.

MODULE-2

UNIT - 1 **3L+0T+0P=3 Hours**

DESIGN PHILOSOPHIES FOR CONCRETE STRUCTURES:

Objective of structural design: steps in RCC structural design process. Code of practices and specifications, Concept of Limit State design methods.

UNIT - 2 **5L+0T+16P=21 Hours**

ANALYSIS AND DESIGN OF STAIRCASE, COLUMNS AND FOOTINGS:

Analysis and design of singly and doubly reinforced sections, Shear, Bond and Torsion. Design of Flanged Beams, Slabs, Columns, and Foundations.

PRACTICES:

- Design and detailing of Singly reinforced beam, Doubly reinforced beam.
- Design and detailing of One-way slabs, Two-way slabs.
- Design and detailing of shear reinforcements.
- Design and detailing of Column.
- Design and detailing of footings square or rectangular.

SKILLS:

- ✓ *Identify tension members in trusses.*
- ✓ *Select the suitable configuration for the compression member.*
- ✓ *Calculate the cross-section area required for plate girders.*
- ✓ *Decide the connection methods (Bolting / Welding).*
- ✓ *Design beams for limit state of collapse.*
- ✓ *Study about bond and anchorage, design and analysis of substructure.*

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 various design methodologies for the design of steel and RC elements.	Apply	1,2	1, 3
2	Analyze common bolted connections for steel structures,	Analyze	1	2, 5, 6
3	Analyze ability to design and proportion structural concrete members including slabs, beams and columns for strength, serviceability, and economy.	Analyze	1	1, 2, 3
4	Evaluate columns for axial, uniaxial and biaxial eccentricity loadings,	Evaluate	2	2, 3
5	Creative design of footing by limit state method of footing by limit state method,	Create	2	2, 3, 6, 9

TEXT BOOKS:

1. Bhavikatti, S.S. “Design of Steel Structures” By Limit State Method, Fifth Edition,2017.
2. Varghese,P.C. Limit State “ Design of Reinforced Concrete” 2nd Edition, PHI, 2009.
3. Unnikrishna Pillai, S., Devdas Menon “Reinforced Concrete Design” Tata McGraw Hill Education, 2003.
4. Punmia, B.C.Limit State “Design of Reinforced Concrete” Laxmi Publications, 2016.

REFERENCE BOOKS:

1. Subramanian, N. Design of Steel Structures, Oxford University Press, New Delhi,2018.
2. Subramanian, N. Design of Reinforced Concrete Structures, Oxford University Press,New Delhi,2014.
3. Krishnaraju, N. Design of Reinforced Concrete Structures, Fourth Edition, CBS Publishers & Distributors Pvt. Ltd., New Delhi. 2019.
4. Ramachandra, Limit state Design of Concrete Structures, Standard Book House, New Delhi. 2014.

22FMPE302 TRACTOR AND FARM MACHINERY OPERATION AND MAINTENANCE

Hours Per Week :

L	T	P	C
0	2	2	2

Source: https://meratractor.com/blogs/11/How-To-Choose-The-Best-Tractor-For-Your-Farm

PREREQUISITE KNOWLEDGE: Basics of farm machinery implements.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to familiarize the students with agricultural tractors and power tillers, its systems, operation, maintenance and safety precaution.

MODULE-1

0L+16T+16P=32 Hours

PRACTICES:

- Familiarization with different makes and models of agricultural tractors.
- Identification of functional systems including fuels system, cooling system, transmission system, steering and hydraulic systems.
- Study of maintenance points to be checked before starting a tractor.
- Familiarization with controls on a tractor.
- Safety rules and precautions to be observed while driving a tractor.
- Driving practice of tractor.
- Practice of operating a tillage tool (mould-board plough/ disc plough) and their adjustment in the field.
- Study of field patterns while operating a tillage implement. Hitching & De-hitching of mounted and trail type implement to the tractor.

MODULE-2

PRACTICES: **0L+16T+16P=32 Hours**

- Driving practice with a trail type trolley – forward and in reverse direction.
- Introduction to tractor maintenance – precautionary and break-down maintenance.
- Tractor starting with low battery charge.
- Introduction to trouble shooting in tractors.
- Familiarization with tools for general and special maintenance.
- Introduction to scheduled maintenance after 10, 100, 300, 600, 900 and 1200 hours of operation. Safety hints. Top end overhauling. Fuel saving tips. Preparing the tractor for storage.
- Care and maintenance procedure of agricultural machinery during operation and offseason.
- Repair and maintenance of implements – adjustment of functional parameters in tillage implements.
- Replacement of broken components in tillage implements.
- Replacement of furrow openers and change of blades of rotavators.
- Maintenance of cutter bar in a reaper.
- Adjustments in a thresher for different crops.
- Replacement of V-belts on implements.
- Setting of agricultural machinery workshop.

SKILLS:

- ✓ *Replacement of broken components and furrow opener.*
- ✓ *Operation and maintenance of tractors.*

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 need of different farm machineries for different farming operation.	Apply	1	1, 2, 3, 4, 7
2	Apply to operate tractor and various farm implements	Apply	1	1, 2, 3, 4, 6
3	Analyze the Hitching and De-hitching of implements.	Analyze	2	1, 2, 6, 7, 9
4	Analyzes to understand and analyze care and maintenance of tractor and farm implements	Evaluate	2	1, 2, 3, 4, 6

TEXT BOOKS:

1. Ghosh RK and S Swan “Practical Agricultural Engineering” 2015.
2. Black PO and WE Scahill “Diesel Engine Manual” 2009.

REFERENCE BOOKS:

1. Southorn N. “Tractor operation and maintenance” 2014.
2. Jain SC and CR Rai “Farm Tractor Maintenance and Repair” 2009.
3. “Operators manuals of tractors” 2007.

22FMPE303 INTERCULTURAL, HARVESTING AND THRESHING EQUIPMENT

Source: https://devette.nl/en/products/plant-protection-equipment

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of intercultural, harvesting & threshing operation.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of the study is to impart knowledge about machines / implements for plant protection, intercultural operation, harvesting and threshing.

MODULE-1

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

INTRODUCTION TO PLANT PROTECTION EQUIPMENT:

Sprayers and dusters. Classification of sprayers and sprays. Types of nozzles. Calculations for calibration of sprayers and chemical application rates. Introduction to interculture equipment. Use of weeders – manual and powered. Study of functional requirements of weeders and main components. Familiarization of fertilizer application equipment.

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

INTRODUCTION TO HARVESTING:

Study of harvesting operation – harvesting methods, harvesting terminology. Study of mowers – types, constructional details, working and adjustments. Study of shear type harvesting devices – cutter bar, inertial forces, counter balancing, terminology, cutting pattern.

PRACTICES:

- Familiarization with plant protection and intercultural equipment.
- Study of sprayers, types and functional components.
- Study of dusters, types and functional components.
- Calculations for chemical application rates.
- Study of nozzle types and spread pattern using patternator.
- Familiarization with manual and powered weeding equipment and identification of functional components.
- Study of fertilizer application equipment including manure spreaders and fertilizer broadcasters.

MODULE–2

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

STUDY OF REAPERS, BINDERS AND WINDROWERS:

Study of reapers, binders and windrowers – principle of operation and constructional details. Importance of hay conditioning, methods of hay conditioning, and calculation of moisture content of hay.

Introduction to threshing systems – manual and mechanical systems. Types of threshing drums and their applications. Types of threshers- tangential and axial, their constructional details and cleaning systems. Study of factors affecting thresher performance.

SKILLS:

- ✓ *Operate crop protection equipment.*
- ✓ *Perform calibration of sprayer.*
- ✓ *Perform intercultural operations.*
- ✓ *Operate harvesting.*
- ✓ *Compute the material losses in harvesting and threshing.*
- ✓ *Selection of suitable material handling system.*

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

STUDY OF GRAIN COMBINES:

Combine terminology, classification of grain combines, study of material flow in combines. Computation of combine losses, study of combine troubles and troubleshooting. Study of chaff cutters and capacity calculations. Study of straw combines – working principle and constructional details. Principle of operation, blade adjustment and approach angle, and calculation of material handled. Study of potato and groundnut diggers. Study of Cotton harvesting – Cotton harvesting mechanisms, study of cotton pickers and strippers, functional components. Study of maize harvesting combines. Introduction to vegetables and fruit harvesting equipment and tools.

PRACTICES:

- Study of various types of mowers, reaper, reaper binder.
- Study of functional components of mowers and reapers.
- Familiarization with threshing systems, cleaning systems in threshers.
- Calculations of losses in threshers.
- Familiarization with functional units of Grain combines and their types.
- Calculations for grain losses in a combine.
- Study of root crop diggers and familiarization with the functional units and attachments.
- Familiarization with the working of cotton and maize harvesters.
- Familiarization with vegetable and fruit harvesters.

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 and application of practical knowledge to troubleshoot the machinery/implement problems.	Apply	2	1, 2, 9, 12
2	Apply, calculate material losses in harvesting and threshing operation.	Apply	2	1, 2, 9, 12
3	Evaluate and calibrate sprayer and dusters.	Evaluate	1	1, 2, 9, 12

TEXT BOOKS:

1. Jain S. C. and Grace Philip. “Farm Machinery – An Approach”. Standard Publishers Distributors., New Delhi, 2010.

REFERENCE BOOKS:

1. Kepner, R. A., Bainer, R., and Barger, E. L.” Principles of Farm Machinery”.CBS Publishers and Distributors Pvt. Ltd., New Delhi, 2009.
2. Ojha, T. P. and Michael, A. M. “Principles of Agricultural Engineering Vol. I”. Jain Brothers, New Delhi, 2006.
3. Sahay, J. “Elements of Agricultural Engineering. Standard Publishers and Distributors”, New Delhi, 2015.
4. Yadav, R. and Solanki, H. B.” Numerical and Short Questions in Farm Machinery, Power and Energy in Agriculture”. New India Publishing Agency, New Delhi, 2009.

22PAFE303 POST-HARVEST ENGINEERING OF HORTICULTURAL CROPS

Source: https://www.futura-technology.com/nuovo/wp-content/uploads/2016/11/sorting-grading-machine-1.jpg

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of post-harvest practices in food processing industry.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to acquaint and specialize the students with processing and handling of fruits and vegetables to minimize the post-harvest losses and also to facilitate with design features of the equipments

MODULE-1

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

POST HARVEST PRACTICES: Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing. Post-harvest management and equipment for spices and flowers, Quality control in fruit and vegetable processing industry. Food supply chain. Peeling; Slicing; Blanching; Drying - Importance and objectives.

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

PEELRS BLANCHERS DRYERS: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling), equipment for slicing, shredding, crushing, chopping, juice extraction, etc., Blanching methods, effects on food (nutrition, colour, pigment, texture), Dryers for fruits and vegetables, Osmo-dehydration. Flowcharts for preparation of different finished products, Important parameters and equipment used for different unit operations.

MODULE-2

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

FREEZING PACKAGING: Chilling and freezing. Thermophilic, mesophilic & Psychrophilic micro-organisms. Effect on food during chilling and freezing. Cold storage. Packaging of horticultural commodities. Packaging requirements (in terms of light transmittance, heat, moisture and gas proof, microorganisms, mechanical strength), Different types of packaging materials commonly used for raw and processed fruits and vegetables products, bulk and retail packages and packaging machines, handling and transportation of fruits and vegetables, Pack house technology.

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

PRESERVATION AND MINIMAL PROCESSING: Deterioration in food products and their controls, Preservation Technology, General methods of preservation of fruits and vegetables, Brief description and advantages and disadvantages of different physical/ chemical and other methods of preservation. Application of refrigeration in different perishable food products. Chilling requirements of different fruits and vegetables, freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic). Common methods of storage, Low temperature storage, evaporative cooled storage, Cold storage heat load calculations and cold storage design, refrigerated vehicle and cold chain system. Minimal processing. Controlled atmospheric storage, Modified atmospheric packaging.

SKILLS:

- ✓ *Compute quality control of fruits and vegetables.*
- ✓ *Develop value added products by the application of processing concept.*
- ✓ *Apply various processing concepts in post-harvest.*
- ✓ *Evaluate cooling load and freezing time required in cold storage plant of fruits and vegetables.*

PRACTICES:

- Study of cold storage and its design,
- Study of CAP and MAP storage,
- Minimal processing of vegetables,
- Visit to fruit and vegetable processing industry,
- Visit to spice processing plant.

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 effect of post-harvest losses of fruits and vegetables and minimize them by post-harvest practices.	Apply	1	1, 2, 7
2	Analyze composition of different value added products and develop suitable blanchers and dryers required.	Analyze	1	1, 2, 3, 4, 11
3	Examine factors affecting deterioration or spoilage of fruits and vegetables during distribution and storage at packaging.	Evaluate	2	1, 2, 4, 7
4	Propose and design cold storage plant required for small pilot plant.	Evaluate	2	1, 2, 3, 4, 9, 11
5	Design and develop small freezer or chiller.	Create	2	1, 2, 3, 4, 9, 11

TEXT BOOKS:

1. Pandey, R.H. "Postharvest Technology of fruits and vegetables" (Principles and practices). Saroj Prakashan, Allahabad, 1999.
2. Arthey, D. and Ashurst, P. R. "Fruit Processing. Chapman and Hall" New York, 1996.

REFERENCE BOOKS:

1. Pantastico, E.C.B. "Postharvest physiology, handling and utilization of tropical and subtropical fruits and vegetables" AVI Pub. Co., New Delhi, 1997.
2. Sudheer, K P. and Indira, V. Post Harvest Engineering of horticultural crops. New India Publishing House, 2007.

22SWCE302 WATER HARVESTING AND SOIL CONSERVATION STRUCTURES

Source:
https://i.etsystatic.com/7199052/r/il/46c584/771879763/il_794xN.771879763_szb0.jpg

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of soil and water conservation measures .

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with water harvesting techniques, runoff harvesting techniques and design of different farm ponds, embankments and spillways. It also helps student to acquaint knowledge in designing and constructing different permanent gully control structures.

MODULE-1

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

WATER HARVESTING:

Water harvesting-principles, importance and issues. Water harvesting techniques- classification based on source, storage and use. Runoff harvesting – short-term and long-term techniques. Short-term harvesting techniques-terracing and bunding, rock and ground catchments. Long-term harvesting techniques - purpose and design criteria. Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes.

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

FARM POND AND EMBANKMENTS:

Farm pond - components, site selection, design criteria, capacity, embankment, mechanical and emergency spillways, cost estimation and construction. Percolation pond - site selection, design and construction details. Design considerations of nala bunds. Soil erosion control structures - introduction, classification and functional requirements.

PRACTICES:

- Study of different types of farm ponds.
- Computation of storage capacity of embankment type of farm ponds.
- Design of dugout farm ponds.
- Design of percolation pond and nala bunds. Runoff measurement using H-flume. Exercise on hydraulic jump.
- Exercise on energy dissipation in water flow.
- Hydrologic, hydraulic and structural design of drop spillway and stability analysis.

MODULE-2

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

PERMANENT GULLY CONTROL STRUCTURES:

Permanent structures for soil conservation and gully control – check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures-hydrologic, hydraulic and structural design and stability analysis. Hydraulic jump and its application. Drop spillway-applicability, types-straight drop, box-type inlet spillways-description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components and functions.

SKILLS:

- ✓ *Design prototype models of drop spillway, drop inlet spillway and chute spillway withstandard procedures.*

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

DESIGN OF PERMANENT GULLY STRUCTURES:

Loads on head wall, variables affecting equivalent fluid pressure, triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension. Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway-description, functional use and design criteria.

PRACTICES:

- Design of SAF stilling basins in chute spillway.
- Hydrologic, hydraulic and structural design of drop inlet spillway.
- Design of small earthen embankment structures.
- Practice on software's for design of soil and water conservation structures.
- Field visit to watershed project areas treated with soil and water conservation measures/ structures

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 knowledge of short term and long term water harvesting techniques to conserve water.	Apply	1	1, 2, 4, 7
2	Analyse runoff in watershed and different forces acting on different gully control structures.	Analyse	2	1, 2, 3, 4, 5, 6, 7
3	Design and develop farm pond and embankments and optimize its cost.	Evaluate	1	1, 2, 4, 5, 7, 11, 12
4	Propose and estimate hydrologic design and structural design of different gully control structures.	Create	2	1, 2, 3, 4, 5, 6, 7, 12

TEXT BOOKS:

1. Suresh, R. "Soil and Water Conservation Engineering" Standard Publisher Distributors, New Delhi, 2014.
2. Michael, A.M. and T.P. Ojha. "Principles of Agricultural Engineering" Volume II. 4th Edition, Jain Brothers, New Delhi, 2003.
3. Murthy, V.V.N. "Land and Water Management Engineering" 4th Edition, Kalyani Publishers, New Delhi, 2002.

REFERENCE BOOKS:

1. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. "Manual of Soil and Water Conservation Practices" Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1996.
2. Schwab, G.O., D.D. Fangmeier, W.J. Elliot, R.K. Frevert "Soil and Water Conservation Engineering" 4th Edition, John Wiley and Sons Inc. New York, 1993.
3. Samra, J.S., V.N. Sharda and A.K. Sikka. "Water Harvesting and Recycling: Indian Experiences" CSWCR&TI, Dehradun, Allied Printers, Dehradun, 2002.
4. Theib Y. Oweis, Dieter Prinz and Ahmed Y. Hachum. "Rainwater Harvesting for Agriculture in the Dry Areas. CRC Press" Taylor and Francis Group, London, 2013.
5. Studer Rima Mekdaschi and Hanspeter Liniger. "Water Harvesting - Guidelines to Good Practice. Centre for Development and Environment" University of Bern, Switzerland, 2013.

22PAFE304 DAIRY AND FOOD ENGINEERING

Source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTgv9 QL06PgpQyGOrAXop7GE2AJ4 qCjm0SnYn7wu4NZxfA8WADrFg

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of milk composition and properties of milk and thermal operation involved in food processing industry.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to evaluate performance of different thermal operations involved in dairy industry based on milk composition and properties. It also helps us to examine different mechanical operation and develop equipment. It illustrates about benefits of minimal processing and application of same in food industry over primitive process.

MODULE-1

UNIT-1 **4L+8T+8P=20 Hours**

PROPERTIES OF MILK & UNIT OPERATIONS:

Dairy development in India. Milk and its composition. Properties of milk and milk composition. Engineering, thermal and chemical properties of milk and milk products, Unit operation of various dairy and food processing systems. Principles and equipment related to receiving of milk. Pasteurization, sterilization, homogenization, centrifugation and cream separation. Deterioration in food products and their controls, Physical, chemical and biological methods of food preservation.

UNIT-2 **4L+8T+8P=20 Hours**

PERFORMANCE EVALUATION OF DAIRY EQUIPMENT:

Process flow charts for product manufacture, Pasteurization, sterilization, homogenization, centrifugation and cream separation – Classification and different equipments and performance evaluation. Preparation methods and equipment for manufacture of cheese, paneer, butter and ice cream. Filling and packaging of milk and milk products; Dairy plant design and layout, Plant utilities.

PRACTICES:

- Study of pasteurizers.
- Study of sterilizers.
- Study of homogenizers.
- Study of cream separators.
- Study of butter churns.
- Design of food processing plants & preparation of layout.
- Estimation of steam requirements.
- Estimation of refrigeration requirements in dairy & food plant.

MODULE-2

UNIT-1 **4L+8T+8P=20 Hours**

MECHANICAL AND THERMAL OPERATIONS: Principles of operation and equipment for thermal processing. Evaporation of food products – principle. Drying of liquid and perishable foods: principles of drying. Filtration: principle, types of filters; Membrane separation, RO, Nano-filtration, Ultra filtration and Macro-filtration, equipment and applications.

SKILLS:

- ✓ *Compute different processing parameters required to develop dairy produc.*
- ✓ *Evaluate performance of dairy equipment involved and design a small dairy plant.*
- ✓ *Examine operations of different filtration techniques.*
- ✓ *Investigate problems caused due to thermal processing of food product and determine application of novel technologies.*

UNIT-2 **4L+8T+8P=20 Hours**

PERFORMANCE EVALUATION OF OPERATIONS: Canning, Aseptic processing, types of evaporators, steam economy, multiple effect evaporation, vapour recompression. Spray drying, drum drying, freeze drying. Non-thermal and other alternate thermal processing in Food processing. Nanotechnology: History, fundamental concepts, tools and techniques nanomaterials, applications in food packaging and products, implications, environmental impact of nanomaterials and their potential effects on global economics, regulation of nanotechnology.

PRACTICES:

- Study of evaporators.
- Study of milk dryers.
- Study of freezers.
- Study of filtration.
- Visit to multi-product dairy plant.
- Visit to Food industry.

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 different milk processing unit operations on the concept of physico chemical property of milk.	Apply	1	1, 2, 7
2	Analyze knowledge of milk processing and acquired knowledge to design several equipments in dairy industry.	Analyze	1	1, 2, 3, 4, 6, 9
3	Examine problems which rises during thermal processing and also determine remedies by designing aseptic or minimal processing.	Evaluate	2	1, 2, 6, 7, 9
4	Propose application of novel technologies in food industry over thermal or mechanical processing.	Evaluate	2	1, 2, 3, 4, 7, 9, 11
5	Design filtration equipment used in food processing industry.	Create	2	1, 2, 3, 4, 6, 7, 9, 11

TEXT BOOKS:

1. Sukumar De. “Outlines of Dairy Technology” 45th Ed. Oxford University Press, 1991.
2. Walstra, P., Wouters, T.M. & Geurts, T.J. “Dairy Science and Technology” Taylor & Francis, 2006.
3. Toledo, R. T. “Fundamentals of Food Process Engineering” CBS Publisher, 1997.

REFERENCE BOOKS:

1. Ahmed, T. “Dairy Plant Engineering and Management” 4th Ed. Kitab Mahal, 1997.
2. McCabe, W.L. and Smith, J. C. “Unit Operations of Chemical Engineering” McGraw Hill.
Rao, D.G. Fundamentals of Food Engineering. PHI learning Pvt. Ltd. New Delhi, 1999.

22REE302 BIO-ENERGY SYSTEMS: DESIGN AND APPLICATIONS

Source: https://www.devalt.org/knowledgebase/case_study/Bio-energy%20to %20Enterprise.png

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Fundamentals of biomass production, biomass preparation techniques.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to provide the knowledge and apply the same for bio-energy production and its industrial application.

MODULE-1

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

FERMENTATION PROCESSES AND ITS GENERAL REQUIREMENTS:

An overview of aerobic and anaerobic fermentation processes and their industrial application. Heat transfer processes in anaerobic digestion systems, land fill gas technology and potential.

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

BIOMASS PRODUCTION:

Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting. Harvesting of biomass and coppicing characteristics.

Biomass preparation techniques for harnessing (size reduction, densification and drying). Thermochemical degradation. History of small gas producer engine system. Chemistry of gasification

PRACTICES:

- Study of anaerobic fermentation system for industrial application.
- Study of gasification for industrial process heat.
- Study of biomass densification technique (briquetting, pelletization, and cubing)

MODULE-2

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

GAS PRODUCER:

Types, operating principle. Gasifier fuels, properties, preparation, conditioning of producer gas. Application, shaft power generation, thermal application and economics.

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

TRANSESTERIFICATION FOR BIODIESEL PRODUCTION:

A range of bio-hydrogen production routes. Environmental aspect of bio-energy, assessment of greenhouse gas mitigation potential.

SKILLS:

- ✓ *Biogas design for small scale farmers.*
- ✓ *Biomass preparation techniques.*

PRACTICES:

- Study of biodiesel production unit.
- Integral bio energy system for industrial application.
- Study of bio energy efficiency in industry and commercial buildings.
- Study and demonstration of energy efficiency in building.
- Measuring efficiency of different insulation technique.
- Study of Brayton, Striling and Rankine cycles.
- Study of modern greenhouse technologies.

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 their knowledge and Understand methods of Cultivation of bio-mass	Apply	1	1, 2, 3, 9
2	Analyze the problems and principle of different types of biomass gasifier	Analyze	1	1, 2, 9, 12
3	Apply and develop new type of models of gasifiers	Apply	2	1, 2, 9, 12

TEXT BOOKS:

1. British BioGen. “Anaerobic digestion of farm and food processing practices”- Good practice guidelines, London, 1997 available on www.britishbiogen.co.UK.

REFERENCE BOOKS:

1. Butler, S “Renewable Energy Academy”: Training wood energy professionals, 2005.
2. Centre for biomass energy. “Straw for energy production”; “Technology- Environment-Ecology”, 1998. Available: www.ens.dk.

22BEAS303 WEB DESIGNING AND INTERNET APPLICATIONS

Source:
https://aplihs.in/web-designing/

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of computer languages.

COURSE DESCRIPTION AND OBJECTIVES:

The basic of this course is to familiarize the students with the basic concepts of web, animation modules and to impart knowledge about basic design process of animation.

MODULE-1

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

BASIC PRINCIPLES:

Basic principles in developing a web designing, Planning process, Five Golden rules of web designing.

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

WEB DESIGN:

Designing navigation bar, Page design, Home Page Layout, Design Concept. Basics in Web Design.

PRACTICES:

- FLASH: Animation concept FPS.
- Understanding animation for web, Flash interface.
- Working with tools, DREAM WEAVER.
- Exploring Dreamweaver Interface, Planning & Setting Web Site Structure.
- Working with panels, Understanding and switching views, Using property inspector.
- Formatting text, JAVA SCRIPT: Working with alert, confirm and prompt.

MODULE-2

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

INTERNET HISTORY:

Brief History of Internet, World Wide Web , creation of a web site, Web Standards.

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

WEB PAGES: **:**

Audience requirement. Introduction to Java Script, variables & functions, working with alert, confirm and prompt, Connectivity of Web pages with databases; Project.

SKILLS:

- ✓ *Design basic html pages required for desired application.*
- ✓ *Create animation projects.*

PRACTICES:

- Understanding loop, arrays, Creating rollover image.
- Working with operator, GIF ANIMATION: Learning to use FTP Setting FTP.
- Uploading of site, Using Control panel, FTP UPLOADING SITE.
- Understanding gif animation interface, Knowing GIf file format.
- Creating basic web banners.
- Creating web banners with effects.
- Creating animated web buttons.

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 aspects of internet application	Analyze	1	1, 2, 4, 7
2	Apply the syntax of different java script programming	Apply	1	1, 2, 4, 5, 7, 11, 12
3	Create the various agricultural need using flash software for review	Create	2	1, 2, 3, 4, 5, 6, 7, 12
4	Apply with latest technologies related to internet	Apply	2	1, 2, 4, 6, 7

TEXT BOOKS:

1. Jennifer Niederst Robbins “Developing web design” latest edition, 2006.

REFERENCE BOOKS:

1. Frain and Ben Responsive Web Design with HTML5, 2008.
2. Nicholas c. Zakas. Java Script for Web Developers, 2009.
3. George Q. Huang, K. L Mak. “Internet Applications in Product Design and Manufacturing” 2009.

22IADE302 DRAINAGE ENGINEERING

Source:
http://www.icid.org/images/drainage_pic.jpg

Hours Per Week :

L	T	P	C
1	0	2	2

PREREQUISITE KNOWLEDGE: Basics of runoff and fluid flow characteristics and soil characteristics.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with water logging causes and impact, drainage problems, different type of drainage systems, design and their management. It also helps students to impart knowledge in reclaiming problematic soil through different methods and installing drainage systems.

MODULE-1

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

INTRODUCTION TO DRAINAGE:

Water logging- causes and impacts; drainage, objectives of drainage, familiarization with the drainage problems of the state; surface drainage coefficient, types of surface drainage, sub-surface drainage: purpose and benefits.

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

SURFACE DRAINAGE SYSTEM:

Design of surface drains; investigations of design parameters-hydraulic conductivity, drainable porosity, water table; derivation of Hooghoudt's and Ernst's drain spacing equations.

PRACTICES:

- In-itumeasurementofhydraulicconductivitybysingleaugerholeandinverseaugerhole method.
- Estimation of drainage coefficients.
- Installation of piezometer and observation wells.
- Preparation of iso-bath and isobar maps.
- Determination of drainable porosity.
- Design of surface drainage systems.

MODULE-2

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

SUBSURFACE DRAINAGE SYSTEM:

Design of subsurface drainage system; drainage materials, drainage pipes, drain envelope; layout, construction and installation of drains.

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

DRAINAGE STRUCTURES & SOIL RECLAIMATION:

Drainage structures; vertical drainage; bio - drainage; mole drains; salt balance, reclamation of saline and alkaline soils, leaching requirements, conjunctive use of fresh and saline water.

SKILLS:

- ✓ *Estimation of drainage coefficients.*
- ✓ *Installation of piezometer and observation wells.*

PRACTICES:

- Design of gravel envelop.
- Design of subsurface drainage systems;
- Determination of chemical properties of soil and water;
- Study of drainage tiles and pipes.
- Installation of sub-surface drainage system.
- Cost analysis of surface and sub-surface drainage system.

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 problems faced by the farmers cultivating various crops in drainage affected fields and the causes for occurring drainage affect in agriculture in view of increasing yields and reducing cost of cultivation.	Analyze	1 & 2	1,2,4,7
2	Examine problematic soil and measure reclamation of soil.	Analyze	2	1,2,4,6,7
3	Create and develop innovative drainage field network systems for overcoming the water logged conditions and salt affected problems in various fields of Indian agriculture.	Create	1 & 2	1,2,4,5,7,11,12
4	Create and take up the various projects on the present research gaps in agricultural drainage systems to promote and address the demands and needs of the farming community.	Create	1 & 2	1,2,3,4,5,6,7,12

TEXT BOOKS:

1. Bhattacharya AK and Michael AM. Land Drainage, Principles, Methods and Applications. Vikas Publication House, 2013 Noida (UP).

REFERENCE BOOKS:

1. Ritzema H.P. “Drainage Principles and Applications” ILRI Publication 16, Second Edition, 1994 (Completely Revised).
2. Michael AM. and Ojha TP. “Principles of Agricultural Engineering” Vol-II 5th Edition. Jain Brothers Publication, 2014 New Delhi.
3. Kadam U.S., Thokal R.T., Gorantiwar S.D. and Powar A.G. 2007. Agricultural Drainage-Principles and Practices, Westville Publishing House, 2008.

22FMPE304 TRACTOR SYSTEMS AND CONTROLS

Source: https://www.agrihub.org.in/courses/tractor-systems-and-controls/

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basic concept of Transmission System, Clutch System, Gear Box, Differential and Final Drive, Brakes, Steering System, Hydraulics, Power Transmission, Traction, Tractor Mechanics, Ergonomics.

COURSE DESCRIPTION AND OBJECTIVES:

This course aims to impart the knowledge on the basic prime mover of farming activities, its types, functions and capabilities in connecting various implements

MODULE-1

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

BASICS OF TRANSMISSION SYSTEM, CLUTCH SYSTEM AND GEAR BOX:

Study of need for transmission system in a tractor: Transmission system - types, major functional systems.

Study of clutch - need, types, functional requirements, construction and principle of operation. Familiarization with single plate, multi-plate, centrifugal and dual clutch systems.

Study of Gear Box: Gearing theory, principle of operation, gear box types, functional requirements and calculation for speed ratio

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

DIFFERENTIAL SYSTEM, FINAL DRIVE AND BRAKES :

Study of differential system - need, functional components, construction, calculation for speed reduction. Study of need for a final drive. Study of Brake system: Types, principle of operation, construction, calculation for braking torque.

PRACTICES:

- Introduction to transmission systems and components.
- Study of clutch functioning and parts.
- Design problem on clutch system.
- Study of different types of gear box, calculation of speed ratios, design problems on gear box.

MODULE-2

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

STEERING SYSTEM AND HYDRAULIC SYSTEM :

Study of steering system – requirements, steering geometry characteristics, functional components, calculation for turning radius. Familiarization with Ackerman steering. Steering systems in track type tractors

Study of Hydraulic system in a tractor - Principle of operation, types, main functional components, functional requirements. Familiarization with the Hydraulic system adjustments and ADDC. Study of tractor power outlets - PTO. PTO standards, types and functional requirements.

SKILLS:

- ✓ *Design of gearbox, clutch assembly and final drive for tractors.*
- ✓ *Apply ergonomics for better comfort and safety in tractor operation wells.*
- ✓ *Operate tractor for field and haulage operations.*

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

TRACTION, TRACTOR MECHANICS, ERGONOMICS, TRACTOR TESTING:

Introduction to traction: Traction terminology. Theoretical calculation of shear force and rolling resistance on traction device. Study of wheels and tyres - Solid tyres and pneumatic tyres, tyre construction and tyre specifications. Study of traction aids. Study of tractor mechanics - forces acting on the tractor. Determination of CG of a tractor. Determination and importance of moment of inertia of a tractor.

Study of tractor static equilibrium: Tractor stability especially at turns. Determination of maximum drawbar pull. Familiarization with tractor as a spring-mass system. Ergonomic considerations and operational safety. Introduction to tractor testing, Deciphering the engine test codes.

PRACTICES:

- Study of differential system.
- Study of final drive system.
- Study of planetary gears.
- Study of brake systems and some design problems.
- Steering geometry and adjustments.
- Study of hydraulic systems in a tractor, hydraulic trainer and some design problems.
- Appraisal of various controls in different makes tractors in relation to anthropometric measurements.
- Determination of location of CG of a tractor.
- Determination of Moment of Inertia of a tractor.
- Traction performance of a traction wheel.

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 their knowledge and be able to identify the correct size of transmission system for different field operations.	Apply	1	2, 4
2	Apply and develop different components using ergonomic principles.	Apply	2	5, 7, 9
3	Implement the safety aspects in farm operations.	Apply	2	5, 6, 7, 9
4	Analyze the problems and solved the same relating to hydraulic system and three point hitch system.	Analyze	2	2, 3
5	Evaluate the trend for use of different power outlets of tractor for different field operations for safety and economy.	Evaluate	2	3, 4, 5

TEXT BOOKS:

1. Liljedahl J B and Others “Tractors and Their Power Units” 2016.
2. Rodichev V and G Rodicheva “Tractors and Automobiles” 2011.

REFERENCE BOOKS:

1. Singh Kirpal. “Automobile Engineering” – Vol I, 2008.
2. Heitner Joseph. “Automotive Mechanics: Principles and Practices” 2009.
3. C.B.Richey. “Agricultural Engineering Handbook” 2007.
4. John Deere “Fundamentals of Service Hydraulics” 1999.
5. Relevant BIS Test Codes for Tractors, 2015.

IV

YEAR

AGRICULTURAL ENGINEERING

B.Tech.

I SEMESTER

22SDT401	-	Skill Development Training-I
22SDT402	-	Skill Development Training-II
22ELP401	-	Experiential Learning on Campus

II SEMESTER

22IAP401	-	Internship
22ET401	-	Educational Tour
22PPRW401	-	Project Planning and Report Writing

COURSE CONTENTS

I SEM & II SEM

22ELP401 EXPERIENTIAL LEARNING ON CAMPUS

Hours Per Week :

L	T	P	C
0	2	18	10

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

EL provides the students an excellent opportunity to develop analytical and entrepreneurial skills, and knowledge through meaningful hands on experience, confidence in their ability to design and execute project work. To promote professional skills and knowledge through meaningful hands on experience. To build confidence and to work in project mode. To acquire enterprise management capabilities Experiential learning helps the student to develop competence, capability, capacity building, acquiring skills, expertise and confidence to start their own enterprise and turn job creators instead of job seeker. This step forward for earning while learning concept. Experiential learning is major step forward for high quality professional competence, practical work experience in real life situation to graduate, production-oriented courses, production to consumption project working, facilitates producing job providers rather than job seeker and entrepreneurial orientation. Student has to undergo on compas experiential learning for 10 Weeks in VII semester with the credit load of 0+10.

A) CONCEPT:

The word 'experiential' essentially means that learning and development are achieved through personally determined experience and involvement, rather than on received teaching or training, typically in group, by observation, study of theory or hypothesis, and bring in innovation or some other transfer of skills or knowledge. Experiential learning is a business

curriculum-related endeavour which is interactive. EL is for building (or reinforcing) skills in project development and execution, decision making, individual and team coordination, approach to problem solving, accounting, marketing and resolving conflicts, etc. The programme has end to end approach. Carefully calibrated activities move participants to explore and discover their own potential. Both activities and facilitation play a critical role in enhancing team performance.

B) DURATION:

The experient the programme is enterprise oriented, students and faculty are expected to attend the activities of the enterprise even on institutional holidays with total commitment, and without any time limit or restriction of working hours for ELP. The Experiential Learning Programme shall be run for full year by making two groups and rotating activities of the final year in two groups.

C) ATTENDANCE:

The minimum attendance required for this programme is 85%. The attendance of a student will be maintained at the EL unit. The attendance particulars shall be communicated to the Chief Executive Officer (Associate Dean) by the Manager of the EL unit every week. The students will be eligible for the final evaluation of EL only when the attendance requirement is met with. Any student in the event of recording shortage of attendance has to re-register the EL when offered next by paying the assigned fee.

D) STUDENTS' ELIGIBILITY:

To get the eligibility for registering for the EL programme, the students should have completed all the courses successfully. The assignment/allotment of the EL programme shall be based on merit of the student at the end of 5th semester. A separate certificate should be issued to the students after successful completion of EL course. Allotment of EL programmes amongst students to different modules should be done strictly on the basis of merit at the end of fifth semester.

22BEAS202 INTERNSHIP

Hours Per Week :

L	T	P	C
0	2	18	10

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

To expose the students to industrial environment, which cannot be simulated in the university. To familiarize the students with various materials, machines, processes, products and their applications along with relevant aspects of shop management. To make the students understand the psychology of the workers, and approach to problems along with the practices followed at factory. To make the students understand the scope, functions and job responsibilities in various departments of an organization. Exposure to various aspects of entrepreneurship during the programme period. Student has to undergo in-plant training for a short period of time in relevant to gain the knowledge and experience of work culture. In-plant training by reputed organisation either MNC's or organised sectors provide and industrial exposure to students as well as to develop their career in high-tech industrial requirements. Student is attached to industry for 10 Weeks in VII semester with a credit load of 0+10 credits Technology and globalization are ushering an era of unprecedented change. The need and pressure for change and innovation is immense. To enrich the practical knowledge of the students, In-plant Training shall be mandatory in the last semester for a period of up to 10 weeks. In this training, students will have to study a problem in industrial perspective and submit the reports to the university. Such In-plant Trainings will provide an industrial exposure to the students as well as to develop their career in the high-tech industrial requirements. In-plant Training is meant to correlate theory and actual practices in the industries. It is expected that sense of running an industry may be articulated in right way through this type of industrial attachment mode.

22ELT401 EDUCATIONAL TOUR

Hours Per Week :

L	T	P	C
0	0	4	2

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

Student has to undergo “Student Ready Educational tour” to various industries within or outside state of universities and submission of report on educational tour caring a weightage of 0+4 credit hours.

22PPRW401 PROJECT PLANNING AND REPORT WRITING

Hours Per Week :

L	T	P	C
0	2	18	10

PREREQUISITE KNOWLEDGE:

COURSE DESCRIPTION AND OBJECTIVES:

Project planning, work and report writing is undertaken in the VIII semester with credit load of 20 credit hours.

DEPT.
ELECTIVES

B.Tech.

DEPARTMENT ELECTIVES

I SEMESTER

22ELCT201	-	Floods and Control Measures
22ELCT202	-	Wasteland Development
22ELCT203	-	Remote Sensing and GIS Applications
22ELCT204	-	Management of Canal Irrigation System
22ELCT301	-	Precision Farming Techniques for Protected Cultivation
22ELCT302	-	Hydraulic Drives and Controls
22ELCT303	-	Tractor Design and Testing
22ELCT304	-	Farm Machinery Design and Production
22ELCT305	-	Food Quality and Control
22ELCT306	-	Food Packaging Technology
22ELCT307	-	Development of Processed Products
22ELCT308	-	Process Equipment Design

22ELCT201 FLOODS AND CONTROL MEASURES

Source : http://www.circleofblue.org/wp-content/uploads/2017/03/Ecuador-1030x687.jpg

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of Floods.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the fundamental knowledge to analyze the flood problems with various hydrological and meteorology data. The main objectives of this course is to familiarize the students with the relevance of different flood control measures and to impart the knowledge about planning of flood control projects and their economics.

MODULE-1

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

FLOOD OCCURRENCE:

Floods: Causes of occurrence, flood classification, probable maximum flood, standard project flood, design flood, flood estimation, methods of estimation, estimation of flood peak, rational method, empirical methods, unit hydrograph method. Statistics in hydrology, flood frequency methods - log normal, Gumbel's extreme value, log-Pearson type-III distribution; depth-area-duration analysis. Flood forecasting.

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

FLOOD ROUTING:

Flood routing: Channel routing, Muskingum. method, reservoir routing, modified Pul's method. Flood control, history of flood control, structural and non-structural measures of flood control, storage and detention reservoirs, levees and channel improvement.

PRACTICES:

- Determination of flood stage-discharge relationship in a watershed.
- Determination of flood peak-area relationships.
- Determination of frequency distribution functions for extreme flood values using Gumbel's method.
- Determination of confidence limits of the flood peak estimates for Gumbel's extreme value distribution.
- Determination of frequency distribution functions for extreme flood values using log-Pearson Type-III distribution.
- Determination of probable maximum flood, standard project flood and spillway design flood.
- Design of levees for flood control.
- Design of jetties. Study of vegetative and structural measures for gully stabilization.

MODULE -2

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

GULLY CONTROL STRUCTURES :

Gully erosion and its control structures - design and implementation. Ravine control measures. River training works, planning of flood control projects and their economics. Earthen embankments - functions, classification - hydraulic fill and rolled fill dams - homogeneous, zoned and diaphragm type, foundation requirements, grouting, seepage through dams, flow net and its properties, seepage pressure, seepage line in composite earth embankments, drainage filters, piping and its causes.

SKILLS:

- ✓ *Analyze flood related problems such as soil erosion and damage of crop.*
- ✓ *Determine flood stage-discharge relationship in a watershed.*

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

EARTHEN DAM:

Design and construction of earthen dam, stability of earthen embankments against failure by tension, overturning, sliding etc., stability of slopes - analysis of failure by different methods. Subsurface dams - site selection and constructional features. Check dam - Small earthen embankments - types and design criteria. Subsurface dams - site selection and constructional features.

PRACTICES:

- Design of gully/ravine control structures and cost estimation.
- Designing, planning and cost- benefit analysis of a flood control project.
- Study of different types, materials and design considerations of earthen dams.
- Determination of the position of phreatic line in earth dams for various conditions, stability analysis of earthen dams against head water pressure, foundation shear, sudden draw down condition etc.
- Stability of slopes of earth dams by friction circle and other methods.
- Construction of flow net for isotropic and anisotropic media.
- Computation of seepage by different methods.
- Determination of settlement of earth dam.
- Input-output-storage relationships by reservoir routing.
- Visit to sites of earthen dam and water harvesting structures.

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 knowledge of gully control to prevent soil erosion.	Apply	2	1, 2, 4
2	Analyze the seepage characteristics of earthern and embankments and their construction work planning for flood control methods and their economics.	Analyze	2	1, 2, 4, 7
3	Analyze and prepare graph by using various software for flood forecasting.	Analyze	1	1, 2, 4, 7
4	To route the flood application of flood routing methods.	Evaluate	1	1, 2, 4, 6, 7
5	Creative planning management of flood control projects and their economics.	Create	2	1, 2, 4, 6, 7, 11, 12

TEXT BOOKS:

1. Suresh, R. “Soil and Water Conservation Engineering. Standard Publisher Distributors” New Delhi, 2014.
2. Arora, K.R. “Soil Mechanics and Foundation Engineering” (Geotechnical Engineering). Standard Publishers Distributors, Delhi, 2014.
3. Subramanya, K. “Engineering Hydrology” 3rd Edition, Tata McGraw-Hill Publishing Co., New Delhi, 2008.

REFERENCE BOOKS:

1. Michael, A.M. and T.P. Ojha. “Principles of Agricultural Engineering” Volume II. 4th Edition, Jain Brothers, New Delhi, 2003.
2. Murthy, V.V.N. “Land and Water Management Engineering” 4th Edition, Kalyani Publishers, New Delhi, 2002.
3. Mutreja, K.N. “Applied Hydrology” Tata McGraw-Hill Publishing Co., New York, 1999 Delhi.
4. Bureau of Reclamation. “Design of Small Dams” US Department of Interior, 2008 Washington DC, USA.

22ELCT202 WASTELAND DEVELOPMENT

Source: https://i2.wp.com/www.theindianiris.com/wp-content/uploads/2017/04/leadImage_preview.jpg ?fit=627%2C333&ssl=1

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of agricultural sustainability.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the fundamental knowledge to familiarize the students with the relevance of wasteland development and its socio economic perspectives and to impart the knowledge about the planning and design of engineering measures for reclamation of wasteland.

MODULE-1

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

LAND DEGRADATION:

Land degradation – concept, classification - arid, semiarid, humid and sub-humid regions, denuded range land and marginal lands. Wastelands - factors causing, classification and mapping of wastelands, planning of wastelands development - constraints, agro climatic conditions, development options, contingency plans.

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

CONSERVATION STRUCTURES:

Conservation structures – gully stabilization, ravine rehabilitation, sand dune stabilization, water harvesting and recycling methods. Afforestation - agro-horti-forestry-silvipasture methods, forage and fuel crops - socioeconomic constraints. Shifting cultivation, optimal land use options.

PRACTICES:

- Mapping and classification of wastelands.
- Identification of factors causing wastelands.
- Estimation of vegetation density and classification.
- Planning and design of engineering measures for reclamation of wastelands.

MODULE-2

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

RECLAIAMATION OF WASTE LAND:

Wasteland development – hills, semi-arid, coastal areas, water scarce areas, reclamation of waterlogged and salt-affected lands. Mine spoils- impact, land degradation and reclamation and rehabilitation, slope stabilization and mine environment management.

UNIT-2 **08L+0T+8P=16 Hours**

SUSTAINABLE DEVELOPMENT:

Micro-irrigation in wastelands development. Sustainable wasteland development - drought situations, socio-economic perspectives. Government policies. Participatory approach. Preparation of proposal for wasteland development and benefit-cost analysis.

SKILLS:

- ✓ *Mapping of wastelands.*
- ✓ *Identification of factors causing wastelands.*
- ✓ *Estimation of vegetation density and classification.*

PRACTICES:

- Design and estimation of different soil and water conservation structures under arid, semiarid and humid conditions.
- Planning and design of micro-irrigation in wasteland development.
- Cost estimation of the above measures / structures.
- Visit to wasteland development project sites.

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 knowledge on selecting cereals, pulses, oilseeds and commercial crops to grow in wastelands.	Apply	1	1, 2, 4, 7
2	Evaluate the trend and current scenario of converting wastelands into productive lands in view of investments and returns.	Evaluate	1	1, 2, 4, 6, 7
4	Create on steps involved for transforming and translating the status and scenario of substance agriculture into sustainable agriculture waste land development activities.	Create	2	1, 2, 4, 7, 11, 12
5	Manifest the scientific aptitude and attitude of wasteland development at individual capacity and also with a team work approach for overall development of farmers in Indian agriculture.	Create	2	1, 2, 3, 4, 6, 7, 11, 12
5	Design small animal shelter in farm stead.	Create	2	1, 2, 3, 4, 6, 7, 9, 11

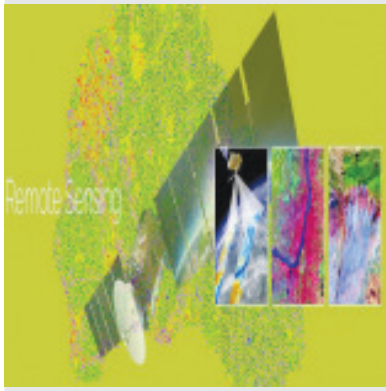
TEXT BOOKS:

1. Robert Malliva and Thomas Missimer. “Arid Lands Water Evaluation and Management. Springer Heidelberg, 2012, New York.
2. Hridai Ram Yadav. “Management of Wastelands” Concept Publishing Company, 2013 New Delhi.
3. Rattan Lal and B.A. Stewart (Ed.). “Soil Management of Smallholder Agriculture” Volume 21 of Advances in Soil Science. CRC Press, Taylor and Francis Group, Florida, 20154 USA.

REFERENCE BOOKS:

1. Abrol, I.P., and V.V. Dhruvanarayana. Technologies for Wasteland Development. ICAR, New Delhi, 2009.
2. Ambast, S.K., S.K. Gupta and Gurcharan Singh (Eds.) “Agricultural Land Drainage - Reclamation of Waterlogged Saline Lands” Central Soil Salinity Research Institute, Karnal, Haryana, 2008.
3. Swaminathan, M.S. “Science and Integrated Rural Development” Concept Publishing Company (P) Ltd., 2010 Delhi.
4. The Energy and Resources Institute. “Looking Back to Think Ahead-Green India 2047. Growth with Resource Enhancement of Environment and Nature” 2015, New Delhi.

22ELCT203 REMOTE SENSING AND GIS APPLICATIONS



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Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of remote sensing.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the basics of component of remote sensing, applications, principles, types of sensors used, aerial photography, different types of image processing and GIS application on land and water resources management.

MODULE-1

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

REMOTE SENSING:

Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth's surface; major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water; spectral signatures.

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

AERIAL PHOTOGRAPHY:

Different types of sensors and platforms: Contrast ratio and possible causes of low contrast, aerial photography, types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap, stereoscopic vision, requirements of stereoscopic photographs, air-photo interpretation- interpretation elements, photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method and ground control for aerial photography.

PRACTICES:

- Familiarization with remote sensing and GIS hardware.
- Use of software for image interpretation.
- Interpretation of aerial photographs and satellite imagery.
- Basic GIS operations such as image display.

MODULE-2

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

IMAGE PROCESSING :

Satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner, different types of resolutions, analysis of digital data- image restoration, image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices and microwave remote sensing.

SKILLS:

- ✓ *Prepare land use and land cover map using satellite image.*
- ✓ *Prepare elevation map using differential GPS survey.*

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

GIS AND BASIC COMPONENTS:

Different sources of spatial data, basic spatial entities, major components of spatial data, Basic classes of map projections and their properties, Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.

PRACTICES:

- Study of various features of GIS software package.
- Scanning, digitization of maps and data editing.
- Data base query and map algebra.
- GIS supported case studies in water resources management.

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 assess spectral data and sensors potential for spatial analysis.	Apply	1	1, 2, 7
2	Analyze image interpretation technique to interpret and DIP technique to correct remotely sensed image.	Analyze	1	1, 2, 4
3	Create image enhancement techniques to enhance and improve remotely sensed image.	Create	2	1, 2, 4, 6, 7, 11
4	Create remote sensing image interpretation technique for the advanced uses of agriculture.	Create	2	1, 2, 4, 6, 7, 11

TEXT BOOKS:

1. Jensen, J.R. “Remote Sensing of the Environment: An Earth Resource Perspective” Pearson Education Limited, 2013 UK.
2. Lillesand, T., R.W. Kiefer and J. Chipman. “Remote Sensing and Image Interpretation” 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., 2015 Singapore.

REFERENCES :

1. Elangovan, K. “GIS Fundamentals Applications and Implementations” New India Publication Agency, New Delhi, 2006.
2. George Joseph. “Fundamentals of Remote Sensing” 2nd Edition. Universities Press (India) Private Limited, Hyderabad, 2006.
3. Sabins, F.F. “Remote Sensing: Principles and Interpretation” Third Edition, Waveland Press Inc., Illinois, USA, 2007.
4. Sahu, K.C. “Text Book of Remote Sensing and Geographic Information Systems” Atlantic Publishers and Distributors (P) Ltd., New Delhi, 2008.

22ELCT204 MANAGEMENT OF CANAL IRRIGATION SYSTEM

Source : https://lh3.googleusercontent.com/CLFrHb-Riyekfk7mht2WXmQPotFt_6BxfCLOyFZWeelnF25y1B9J4hkyhcpA620eEA6FYA=s103

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of irrigation system and channel.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the basics of irrigation system, effect of canal irrigation system, estimation of water requirement of canal command area, duty, delta, silt theory, channel design and materials used in canal lining and design.

MODULE-1

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

IRRIGATION:

Purpose benefits and ill effects of irrigation: Typical network of canal irrigation system and its different physical components, canal classification based on source of water, financial output, purpose, discharge and alignment; canal alignment and general considerations for alignment.

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

CANAL IRRIGATION SYSTEM:

Performance indicators for canal irrigation system evaluation, Estimation of water requirements for canal command areas and determination of canal capacity, water duty and delta, relationship between duty, base period and delta, factors affecting duty and method of improving duty.

PRACTICES:

- Estimation of water requirement of canal commands.
- Determination of canal capacity.
- Layout of canal alignments on topographic maps.
- Drawing of canal sections in cutting, full banking and partial cutting and partial banking.

MODULE-2

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

CHANNEL DESIGN: Silt theory: Kennedy's theory, design of channels by Kennedy's theory, Lacey's regime theory and basic regime equations, design of channels by Lacey's theory, maintenance of unlined irrigation canals, measurement of discharge in canals, rostering (canal running schedule) and warabandhi.

UNIT-2 **08L+0T+8P=16 Hours**

CANAL LINING: Necessity of canal lining: Advantages and disadvantages, types of canal lining and desirable characteristics for the suitability of lining materials, design of lined canals; functions of distributary head and cross regulators, canal falls, their necessity and factors affecting canal fall, sources of surplus water in canals and types of canal escapes, requirements of a good canal outlet and types of outlet.

SKILLS:

- ✓ *Estimation of water requirement of canal commands.*
- ✓ *Determination of canal capacity and longitudinal section of canals.*

PRACTICES:

- Determination of longitudinal section of canals.
- Design of irrigation canals based on silt theories.
- Design of lined canals.
- Formulation of warabandhi.
- Study of canal outlets, regulators, escapes and canal falls.

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 their knowledge on selection of suitable materials for construction of canals and lining of canal network systems for increasing water conveyance efficiency and controlling losses.	Apply	1	1, 2, 7
2	Analyze the tools and components of optimum water use techniques in agriculture, horticulture, aquaculture, sericulture and veterinary in view of establishing integrated farming system.	Analyze	1	1, 2, 4
3	Create and take up the various projects on the present research gaps in management of canal irrigation systems to promote and address the demands and needs of the farming community.	Evaluate	2	1, 2, 4, 6, 7
4	Evaluate steps involved for transforming and translating the status and scenario of substance agriculture into sustainable agriculture through effective canal irrigation systems.	Evaluate	2	1, 2, 4, 6, 7

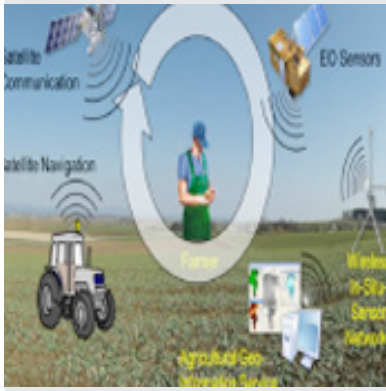
TEXT BOOKS:

1. Garg S. K. Irrigation Engineering and Hydraulic Structures, Khanna Publishers New Delhi, 2014.
2. Sahasrabudhe SR. “Irrigation Engineering and Hydraulic structures” SK Kataria & Sons Reprint, 2015.

REFERENCE BOOKS:

1. Arora, K.R. “Irrigation, Water Power and Water Resources Engineering. Standard Publishers Distributors” 2011 Delhi.
2. Michael A.M. “Irrigation: Theory and Practice” Vikas Publishing Vikas Publ.House New Delhi, 2012.

22ELCT301 PRECISION FARMING TECHNIQUES FOR PROTECTED CULTIVATION



Source : *https://electronicsforu.com/wp-contents/uploads/2019/04/3-500x275.jpg*

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Protected Cultivation, Green-house, Root media preparation, Planting Techniques, Irrigation, fogging and Fertilization system of Green house, Insect and disease management, Economical Analysis of post-harvest techniques

COURSE DESCRIPTION AND OBJECTIVES:

The main objective of this course is to familiarize the students with the relevance and scope of precision farming and protected cultivation and to impart knowledge about the various modern precision farming techniques and their application in protected cultivation.

MODULE-1

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

Protected cultivation: Introduction, History, origin, development, National and International Scenario.

Green House: components, perspective, Types of green houses, poly-houses /shed nets, Cladding materials.

Plant environment interactions - principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment.

Design and construction of Greenhouses - site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment.

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

Greenhouse cooling system: Necessity, methods - ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan-pad cooling system. Design of cooling system, maintenance of cooling and ventilation systems, pad care etc. Greenhouse heating – necessity, components, methods, design of heating system. Root media - types - soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Planting techniques in green house cultivation.

PRACTICES:

- Estimation of material requirement for construction of greenhouse.
- Determination of fertilization schedule and rate of application for various crops.
- Design of Active summer cooling system (Fan and Pad cooling system).
- Design of Active winter cooling system (Convection tube type cooling system).

MODULE-2

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

Irrigation in greenhouse and net house: Water quality, types of irrigation system, components, design, installation and material requirement.

Fogging system for greenhouses and net houses - introduction, benefits, design, installation and material requirement. Maintenance of irrigation and fogging systems.

Fertilization: Nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application.

SKILLS:

- ✓ *Use GIS software for precision agriculture.*
- ✓ *Design variable rate sprayer.*
- ✓ *Apply electronic principles in the design of precision fertilizer applicator.*
- ✓ *Perform economic analysis of land preparation.*

UNIT-2 **08L+0T+08P=16 Hours**

Greenhouse climate measurement, control and management.

Insect and disease management: In greenhouse and net houses Selection of crops for greenhouse cultivation.

Major crops in green-house - irrigation requirement, fertilizer management, cultivation, harvesting and post-harvest techniques; Economic analysis.

PRACTICES:

- Study of different planting techniques.
- Design and installation of irrigation system.
- Design and installation of fogging system.
- Greenhouse heating.
- Study of different nutrient deficiency symptoms in plants.
- Study of functions of essential nutrient elements in plants.
- Study of operation maintenance and fault detection in fogging system.
- Economic analysis of greenhouses and net houses.
- Visit to greenhouses.

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 estimation of material requirement for construction of greenhouse	Apply	1	1, 3, 5, 7, 8
2	Apply to design and construct green houses, installation of irrigation and fogging system	Apply	2	3, 5, 6, 7, 8, 9, 11
3	Apply the determination of fertilization schedule and rate of application for various crops	Apply	2	3, 5, 7, 8, 9, 10, 12
4	Analyze economic of greenhouses and net houses	Analyze	1	1, 2, 4, 6, 7

TEXT BOOKS:

1. Peter, K. V and Sing D.K., “Protected Cultivation of Horticulture Crops”, New India Publishing Company, 2013.
2. Sharma P. “Precision Farming. Daya Publishing House” 2017 New Delhi.
3. Singh Brahma and Balraj Singh. “Advances in protected cultivation”, New India Publishing Company, 2014.

REFERENCE BOOKS:

1. Ernst van Heurn and Kees Van der Post. “Protected Cultivation”. Digigrafi, Wageningan, The Netherlands, 2004.
2. Reddy P. P “Sustainable Crop Protection under Protected Cultivation”. Springer Singapore, 2014.

22ELCT302 HYDRAULIC DRIVES AND CONTROLS

Source : https://lh3.googleusercontent.com/Ymy8DGsRp70KSNRpdevt3gL3uPKSOLaS4ufjSoDqT8TSMQvYW6UkzhHFLUmQMPYSXxT-eul=s113

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Hydraulic – Basics and System, Hydraulic data measurement instruments, Pumps – Classification, operation, performance and design, Hydraulic Actuators, Hydraulic valves – Installation and troubleshoots and types of systems, Pneumatics systems and Robotics.

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to equip the student with the knowledge of fluids properties, hydraulic, pumps, valves and services used in agricultural machinery.

MODULE-1

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

HYDRAULIC – BASICS AND SYSTEM:

Hydraulic Basics: Pascal's Law, Flow, Energy, Work, and Power. Hydraulic Systems, Colour Coding, Reservoirs, Strainers and Filters, Filtering Material and Elements.

UNIT-2 **4L+8T+8P=20 Hours**

INSTRUMENTS AND PUMPS – CLASSIFICATION, OPERATION, PERFORMANCE AND DESIGN :

Accumulators, Pressure Gauges and Volume Meters: Hydraulic Circuit, Fittings and Connectors. Pumps, Pump Classifications, operation, performance, Displacement, Design of Gear Pumps, Vane Pumps, Piston Pumps.

PRACTICES:

- Introduction to hydraulic systems.
- Study of hydraulic pumps.

MODULE-2

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

HYDRAULIC ACTUATORS, HYDRAULIC VALVES – INSTALLATION AND TROUBLESHOOTS AND TYPES OF SYSTEMS:

Hydraulic Actuators: Cylinders, Construction and Applications, Maintenance, Hydraulic Motors. Valves, Pressure-Control Valves, Directional Control Valves, Flow-Control Valves, Valve Installation, Valve Failures and Remedies, Valve Assembly.

Troubleshooting of Valves: Hydraulic Circuit Diagrams and Troubleshooting, United States of American Standards Institute USASI Graphical Symbols Tractor hydraulics, nudging system, ADDC.

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

PNEUMATICS SYSTEMS AND ROBOTICS:

Pneumatics: Air services, logic units, Fail safe and safety systems Robotics: Application of Hydraulics and Pneumatics drives in agricultural systems, Programmable Logic Controls (PLCs).

SKILLS:

- ✓ *Troubleshoot the valves in a hydraulic system .*
- ✓ *Apply the use of hydraulic system in operation of various machinery.*

PRACTICES:

- Hydraulic actuators.
- Study of hydraulic motors, hydraulic valves, color codes and circuits.
- Building simple hydraulic circuits, hydraulics in tractors.
- Introduction to pneumatics, pneumatics devices, pneumatics in agriculture
- Use of hydraulics and pneumatics for robotics.

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 their knowledge in using hydraulics and pneumatics in agriculture.	Apply	2	1, 3, 5
2	Analyze the problems and troubleshooting of different types of valves.	Analyze	2	1, 3, 4, 5, 6
3	Evaluate the trend and current scenario of investments and returns on use of pumps for irrigation.	Evaluate	1	4, 6, 9, 11

TEXT BOOKS:

1. Kepner RA, Roy Barger & EL Barger. “Principles of Farm Machinery” 2018.
2. Anthony E. Fluid Power and Applications, 2008.
3. Majumdar. Oil Hydraulic System,2009.

REFERENCE BOOKS:

1. John Deere “Fundamentals of Service Hydraulics” 2008.
2. Merit. “Hydraulic Control Systems” 2007.

22ELCT303 TRACTOR DESIGN AND TESTING

Source : https://lh3.googleusercontent.com/oUTwGje8c5Q iSDKclFsordWNy6iWZVu8 7CqUQG8J4PXZ9CTxbdvkjUForn-9QaVurdwQ=s151

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Design procedure of tractor and design parameters of tractor stability and weight distribution, Traction, hitching system and hydraulic lift system, Design of power transmission, steering of Tractor, Design of engine and material selection, Tractor seat and control and tractor testing

COURSE DESCRIPTION AND OBJECTIVES:

The objective of this course is to equip the students with the design procedures of tractor systems and testing procedures.

MODULE-1

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

DESIGN PROCEDURE OF TRACTOR AND DESIGN PARAMETERS OF TRACTOR STABILITY AND WEIGHT DISTRIBUTION:

Procedure for design and development of agricultural tractor.Study of parameters for balanced design of tractor for stability & weight distribution.

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

TRACTION, HITCHING SYSTEM, HYDRAULIC LIFT SYSTEM AND DESIGN OF POWER TRANSMISSION:

Traction theory, hydraulic lift and hitch system design.Design of mechanical power transmission in agricultural tractors: single disc, multi disc and cone clutches. Rolling friction and anti-friction bearings

PRACTICES:

- Design and selection of hydraulic pump.
- Design problem of tractor clutch – (Single/ Multiple disc clutch).
- Design of gear box (synchromesh/constant mesh), variable speed constant mesh drive.

MODULE-2

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

STEERING OF TRACTOR AND DESIGN OF ENGINE AND MATERIAL SELECTION:

Design of Ackerman Steering and tractor hydraulic steering. Study of special design features of tractor engines and their selection viz. cylinder, piston, piston pin, crankshaft, etc.

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

DESIGN OF ENGINE AND MATERIAL SELECTION, TRACTOR SEAT AND CONTROL AND TRACTOR TESTING:

Design of seat and controls of an agricultural tractor. Tractor Testing.

SKILLS:

- ✓ *Design of hydraulic system for tractor.*
- ✓ *Design of ergonomical seat for agricultural tractor.*

PRACTICES:

- Selection of tractor tires – Problem solving.
- Problem on design of governor.
- Engine testing as per BIS code.
- Drawbar performance in the lab.
- PTO test and measure the tractor power in the lab/field
- Determining the turning space and turning radius and brake test,
- hydraulic pump performance test
- Air cleaner Test
- Noise measurement test
- Visit to tractor testing centre/ industry.

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 their knowledge and acquired principles on selection of different tractor sizes for different fields operation for better productivity and economy.	Apply	2	1, 3, 5, 6, 7
2	Analyze the problems faced in emission and its hazard and be able investigate in its reduction for better environment.	Analyze	2	2, 3, 4, 6, 7, 8
3	Evaluate the problems in steering using hydraulic system and solve the same for better performance.	Evaluate	2	1, 2, 4, 6, 7, 8, 9, 10
4	Create and develop different hitching system for different sizes of tractor.	Create	1	1, 3, 5, 6, 7, 8, 9, 10, 12

TEXT BOOKS:

1. Liljedahl J B & Others. Tractors and Their Power Units, 2005.
2. Raymond N, EA Yong and S Nicolas. Vehicle Traction Mechanics, 2007.
3. Mehta ML, SR Verma, SK Mishra, VK Sharma. Testing & Evaluation of Agricultural Machinery, 2012.
4. Maleev VL. Internal Combustion Engines, 2002.

REFERENCE BOOKS:

1. Kirpal Singh. Automobile Engineering, 2016 – Vol I and Vol II.
2. Richey C.B. Agricultural Engineering Handbook, 2009.

22ELCT304 FARM MACHINERY DESIGN AND PRODUCTION

Source: https://lh3.googleusercontent.com/KN_tu9MmVAL_-DGqSIPzFR5G9XMqdb6suT3hc4kVI7N_FrjUBhWw5hQvHxkm2OVjrUem=s170

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Design – Parameters, Procedure and Research Aspects, Power transmission design, Machinery production, Advance cutting techniques, Geometric Dimensions and tolerances, Industrial layouts, Quality production and Reliability.

COURSE DESCRIPTION AND OBJECTIVES:

To familiarize and orient the students in theory, planning, designing, technological development, modification and exploitation of small & medium scale farm machinery.

MODULE-1

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

DESIGN – PARAMETERS, PROCEDURE AND RESEARCH ASPECTS:

Introduction to design parameters of agricultural machines and design procedure: Characteristics of farm machinery design. Research and development aspects of farm machinery.

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

POWER TRANSMISSION DESIGN – COMPONENTS, SAFETY AND APPLICATION:

Design of standard power transmission components used in agricultural machines: Mechanical & hydraulic units. Introduction to safety in power transmission. Application of design principles to the systems of selected farm machines.

PRACTICES:

- Familiarization with different design aspects of farm machinery and selected components.
- Solving design problems on farm machines & equipment
- Visit to Agricultural machinery manufacturing industry.

MODULE-2

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

MACHINERY PRODUCTION, MATERIAL SELECTION, PREPARATION OF PROJECT REPORTS AND ADVANCE CUTTING TECHNIQUES:

Introduction to design parameters of agricultural machines and design procedure: Characteristics of farm machinery design. Research and development aspects of farm machinery.

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

HEAT TREATMENT OF STEELS, GEOMETRIC DIMENSIONS AND TOLERANCES, INDUSTRIAL LAYOUTS, QUALITY PRODUCTION AND RELIABILITY:

Heat Treatment of steels including pack carburizing: Shot pining process, etc. Limits, Fits & Tolerances, Jigs & Fixtures. Industrial lay-out planning. Quality production management. Reliability.

SKILLS:

- ✓ *Design of farm implements.*
- ✓ *Planning of a small scale industry.*

PRACTICES:

- Tractor manufacturing industry Jigs and Fixtures study in relation to agricultural machinery.
- Fits, tolerances and limits
- Layout planning of a small scale industry
- Problems on Economics of process selection
- Preparation of a project report
- Case study for manufacturing of simple agricultural machinery.

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 to design standard power transmission components, mechanical & hydraulic units used in agricultural machines.	Apply	1	1, 3, 5
2	Apply principles to the systems of selected farm machines.	Apply	1	1, 3, 5, 6
3	Apply material substitution in agricultural machinery production.	Apply	2	4, 6, 9, 11
4	Analyze and operate various production tools.	Analyze	2	3, 5, 9, 10, 11

TEXT BOOKS:

1. Sharma PC and DK Aggarwal, “Machine Design” 2008.
2. Richey, C.B, “Agricultural Engineering Handbook” 2012.
3. Adinath M and AB Gupta, “Manufacturing Technology, 2003.
4. Narula V, “Manufacturing process” 2011.

REFERENCE BOOKS:

1. Singh S, “Mechanical Engineer’s Handbook” 2005.
2. Chakraborty NR, “Data book for Machine Design” 2003.

22ELCT305 FOOD QUALITY AND CONTROL

Source: https://www.arenanews.am/wp-content/uploads/2017/10/1508246382-2.jpeg

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of food science and food laws.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with basics of food science, quality control of food, different sampling techniques food laws and regulations. It helps student to acquaint and equip them with the latest standards to maintain food quality as well as to study food laws and regulations FSSAI and HACCP protocol.

MODULE-1

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

FOOD SCIENCE:

Basics of Food Science and Food Analysis, Concept, objectives and need of food quality. Measurement of colour, flavour, consistency, viscosity, texture and their relationship with food. quality and composition.

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

SAMPLING TECHNIQUES:

Sampling; purpose, sampling techniques, sampling procedures for liquid, powdered and granular materials.

PRACTICES:

- Visit to quality control laboratory.
- Case study of statistical process control in food processing industry.
- Study of registration process and licensing procedure under FSSAI.
- Study of sampling techniques from food processing establishments.
- Visit to food processing laboratory and study of records and reports maintained by food processing laboratory.

MODULE–2

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

QUALITY CONTROL:

Quality control, Quality control tools, Statistical quality control, Sensory evaluation methods, panel selection methods, Interpretation of sensory results. Instrumental method for testing quality. Food adulteration and food safety. TQM and TQC, consumer preferences and acceptance, Food Safety Management Systems GAP, GHP, GMP, Hazards and HACCP (Hazard analysis and critical control point).

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

FOOD LAWS & REGULATIONS:

Sanitation in food industry(SSOP), Food Laws and Regulations in India, FSSAI, Food grades and standards BIS, AGMARK, PFA, FPO, ISO 9000, 22000 Series. CAC (Codex Alimantarious Commission), Traceability and Quality Assurance system in a process plant, Bio safety and Bioterrorism.

SKILLS:

- ✓ *Identify the adulteration in food produce.*
- ✓ *Collect the samples from different variety of materials.*
- ✓ *Inspect the go-downs market shops in relation to FPO and BIS specifications. handling system.*

PRACTICES:

- Examination of cereals & pulses from one of go-downs and market shops in relation to FPO and BIS specifications.
- Detection of adulteration and examination of ghee for various standards of AGMARK & BIS standards.
- Detection of adulteration and examination of spices for AGMARK and BIS standards.
- Detection of adulteration and examination of milk and milk products for BIS standards.
- Detection of adulteration and examination of fruit products such as jams, jellys, marmalades for FPO specification.

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	Impart knowledge in food science to apply in evaluating food quality.	Apply	1	1, 2, 7
2	Analyze different sampling techniques to test quality of food product.	Analyze	1	1, 2, 4, 6, 7
3	Identify different food laws and regulation as per food product.	Analyze	2	1, 2, 4, 6, 7
4	Examine TQM, TQC and HACCP in industry.	Evaluate	2	1, 2, 4, 6, 7

TEXT BOOKS:

1. Ranganna S. “Hand book of Analysis and Quality Control for Fruit and Vegetable Products” 2015.
2. Sharma Avanthi “A text book of Food Science and Technology”, 2016.

REFERENCE BOOKS:

1. Mudambi Sumati R, Rao “Shalini M and Rajagopal M.V. Food Science”, 2013.
2. Potter NN and Hotchkiss JH “Food Science”, 2005.
3. Dev Raj, Rakesh Sharma and Joshi V.K, “Quality for Value Addition in Food Processing” 2013.
4. “The Food Safety and Standards Act along with Rules and Regulations” Commercial Law Publishers (India) Pvt. Ltd, 2009.
5. Srilakshmi B, Food Science, 2003.

22ELCT306 FOOD PACKAGING TECHNOLOGY

Source: https://www.packworld.com/sites/default/files/field/image/alqueria_roll_infeed.jpg

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of food product characteristics and different packaging materials.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with basics of packaging systems and different types of packaging materials and determination of strength or thickness of packaging material required. It also helps student to acquaint and equip them with different packaging materials, methods of packaging, packaging technology and packaging machineries used in food industry.

MODULE-1

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

PACKAGING SYSTEM: Factors affecting shelf life of food material during storage, interactions of spoilage agents with environmental factors as water, oxygen, light, pH, etc. and general principles of control of the spoilage agents; Difference between food infection, food intoxication and allergy. Packaging of foods, requirement, importance and scope, frame work of packaging strategy, environmental considerations, Packaging systems, types: flexible and rigid; retail and bulk; levels of packaging; special solutions and packaging machines, technical packaging systems and data management packaging systems.

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

PACKAGING MATERIAL: Different types of packaging materials, their key properties and applications, Metal cans, manufacture of two piece and three piece cans, Plastic packaging, different types of polymers used in food packaging and their barrier properties. manufacture of plastic packaging materials, profile extrusion, blown film/ sheet extrusion, blow molding, extrusion blow molding, injection blow molding, stretch blow molding, injection molding. Glass containers, types of glass used in food packaging, manufacture of glass and glass containers, closures for glass containers. Paper and paper board packaging, paper and paper board manufacture process, modification of barrier properties and characteristics of paper/ boards. Relative advantages and disadvantages of different packaging materials; effect of these materials on packed commodities.

PRACTICES:

- Identification of different types of packaging materials.
- Determination of water-vapour transmission rate.
- Shrink wrapping of various horticultural produce.
- Testing of chemical resistance of packaging materials.
- Determination of drop test of food package and visit to relevant industries.

MODULE-2

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

MODERN PACKAGING SYSTEM: Nutritional labelling on packages, CAS and MAP, shrink and cling packaging, vacuum and gas packaging; active packaging, smart packaging, packaging requirement for raw and processed foods, and their selection of packaging materials, factors affecting the choice of packaging materials, disposal and recycle of packaging waste, printing and labelling, lamination.

SKILLS:

- ✓ *Classify various types of packaging material on the basis of rigidity.*
- ✓ *Select suitable packaging materials for various food products.*
- ✓ *Calculate the shelf life of various food products.*

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

PACKAGING MATERIAL TESTING: Package testing: Testing methods for flexible materials, rigid materials and semi rigid materials; tests for paper(thickness, bursting strength, breaking length, stiffness, tear resistance, folding endurance, plybond test, surface oil absorption test, etc.), plastic film and laminates (thickness, tensile strength, gloss, haze, burning test to identify polymer, etc.), aluminium foil (thickness, pin holes, etc.), glass containers (visual defects, colour, dimensions, impact strength, etc.), metal containers (pressure test, product compatibility, etc.).

PRACTICES:

- Determination of tensile/ compressive strength of given material/package.
- To perform different destructive and non-destructive tests for glass containers.
- Vacuum packaging of agricultural produces.
- Determination of tearing strength of paper board.
- Measurement of thickness of packaging materials.
- To perform grease-resistance test in plastic pouches.
- Determination of bursting strength of packaging material.

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 their knowledge and acquired principles in different packaging strategies by considering several intrinsic factorsand extrinsic factors.	Apply	1	1, 2, 4, 7
2	Analyze the problems of deterioration of food products which take place in current method of preservation and solve it by new and advanced technology.	Analyze	1	1, 2, 4, 6, 7
3	Evaluate the trend and current scenario of different packaging materials which are readily available in industries and develop new technology also.	Evaluate	1 &2	1, 2, 4, 6, 7, 11, 12
4	Apply and develop new package of practices by considering all the limitations of primitive packaging and storage methods.	Apply	1 &2	1, 2, 4, 6, 7, 11, 12
5	Creative technology to identify problem of packaging materials which are already availed and overcome those problems by newand advanced technology.	Create	1 &2	1,2,4,6,7,11,12

TEXT BOOKS:

1. Coles, R., McDowell, D., Kirwan, M .J. Food Packaging Technology. Blackwell Publishing Co, 2001.
2. John, P.J. “A Handbook on Food Packaging” Narendra Publishing House, 1999.
3. Mahadevia, M., Gowramma, R.V. “Food Packaging Materials” Tata McGraw Hill, 2001.

REFERENCE BOOKS:

1. Gosby, N.T. “Food Packaging Materials. Applied Science Publication”, 2008.
2. Robertson, G. L. “Food Packaging and Shelf life: A Practical Guide” Narendra Publishing House, 2001.
3. Robertson, G. L. “Food Packaging: Principles and Practice” Second Edition. Taylor and Francis Publication, 2005.

22ELCT307 DEVELOPMENT OF PROCESSED PRODUCTS

Source: https://cdn.shopify.com/s/files/1/1176/6366/products/food_preserving_1024x 1024.jpg?v=1552408498

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of of unit operations in food industry and food product characteristics. .

COURSE DESCRIPTION AND OBJECTIVES:

This course helps students to acquire basic knowledge about food processing and also to study the processing methods of various food materials like fruits & vegetables, dairy products, cereals, meat, poultry, fish and bakery products. This course gives idea about importance of value addition in different types of food products.

MODULE-1

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

UNIT OPERATION:

Process design, Process flow chart with mass and energy balance, unit operations and equipment's for processing, new product development.

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

VALUE ADDITION:

Technology for value added products from cereal, pulses and oil seeds, milling, puffing, flaking, roasting, bakery products, snack food, extruded products, oil extraction and refining.

PRACTICES:

- Visit to milk plant.
- Visit to daland oil mill.
- Visit to fruit/vegetable processing plants.
- Study of processing operations and equipment/machinery.
- Process flow diagram and study of various models of the machines used in a sugar mill.

MODULE-2

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

VALUE ADDED PRODUCTS:

Technology for value added products from fruits, vegetables and spices, Canned foods, frozen foods, dried and fried foods, fruit juices, sauce, sugar based confection, candy, fermented food product, spice extracts.

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

ANIMAL PRODUCE:

Technology for animal produce processing, meat, poultry, fish, egg products, health food, nutraceuticals and functional food, organic food.

SKILLS:

- ✓ *Develop various food products by acquiring strong basic knowledge about food processes.*
- ✓ *Design and modify food processing techniques.*
- ✓ *Analyze the food processes based on material and energy balance.*
- ✓ *Apply emerging technologies for development of new food products.*

PRACTICES:

- Process design and process flow chart preparation.
- Preparation of different value added products.
- Visit to roller wheat flour milling.
- Visit to rice milling.
- Visit to spice grinding mill.

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 knowledge of unit operation in calculation of mass balance or energy balance in different food processing operations.	Apply	1	1, 2, 4, 7
2	Apply and develop different process equipments for animal produce, meat, fish and egg products.	Apply	2	1, 2, 4, 6, 7, 11, 12
3	Analyze the problems which rises during processing of value added products, extruded products or different milled, refined, bakery products, roasted or ready to eat products.	Analyze	1	1, 2, 4, 6, 7
4	Evaluate the trend and current scenario of frozen food products, canned food products or fermented products and detect arising problems.	Evaluate	2	1, 2, 4, 6, 7, 11, 12
5	Creative Study of current products due to proper maintenance of diet and come out with new idea of product development and proper maintenance of diet.	Create	2	1, 2, 4, 6, 7, 11, 12

TEXT BOOKS:

1. Geankoplis C. J. “Transport processes and unit operations” Prentice-Hall, 2009.
2. Rao, D. G. “Fundamentals of Food Engineering PHI Learning Pvt. Ltd” New Delhi, 2011.

REFERENCE BOOKS:

1. Norman N. Potter and Joseph H. “Hotchikss. Food Science” Chapman and Hall Pub, 2009.
2. Acharya, K T “Everyday Indian Processed foods” National Book Trust, 2015.
3. MudambiSumati R., Shalini M. Rao and M V Rajgopal, “Food Science” New Age InternationalPublishers, 2003.
4. Negi H.P.S., Savita Sharma, K. S. Sekhon. “Hand book of Cereal technology” Kalyani Pub.

22ELCT308 PROCESS EQUIPMENT DESIGN

Source: https://www.epicmodularprocess.com/wp-content/uploads/2018/07/Process-Equipment-

Hours Per Week :

L	T	P	C
1	2	2	3

PREREQUISITE KNOWLEDGE: Basics of unit operations in food industry and design specification.

COURSE DESCRIPTION AND OBJECTIVES:

Thcis ourse helps to equip the students to study the design aspects of the food processing equipments and also to understand the relationship between process design and safety.

MODULE-1

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

BASIC ON EQUIPMENT DESIGN:

Introduction on process equipment design, Application of design engineering for processing equipments, Design parameters and general design procedure.

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

SPECIFICATION & DESIGN CODES:

Material specification, Types of material for process equipments, Design codes, Pressure vessel design, Design of cleaners.

PRACTICES:

- Design of pressure vessel.
- Design of cleaners.
- Design of belt conveyor.
- Design of bucket elevator.
- Design of screw conveyor.

MODULE-2

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

HEAT EXCHANGER:

Design of tubular heat exchanger, shell and tube heat exchanger and plate heat exchanger, Design of belt conveyer, screw conveyer and bucket elevator.

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

DRYERS:

Design of dryers, design of milling equipments, optimization of design with respect to process efficiency, energy and cost, computer aided design.

SKILLS:

- ✓ *Develop various food products by acquiring strong basic knowledge about food processes.*
- ✓ *Design and modify food processing equipments.*
- ✓ *Apply emerging technologies for development of new equipment.*

PRACTICES:

- Design of milling equipments.
- Design of tubular heat exchanger.
- Design of shell and tube type heat exchanger.
- Design of plate heat exchanger.
- Design of dryer.

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 knowledge in designing different process equipments which are used in industries	Apply	1	1, 2, 4, 7
2	Analyse the problems which rises during choosing of materials used for equipments and even designing equipments	Analyse	1	1, 2, 4, 7
3	Design pressure vessel, homogenizers, cleaners, storage vessels	Create	1	1, 2, 4, 7, 11, 12
4	Develop different heat exchangers and material handling equipment's	Create	2	1, 2, 4, 7, 11, 12
5	Creative Study on existing problems to dry food material using primitive dryers and come out with new idea of developed technologies	Create	2	1, 2, 4, 7, 11, 12

TEXT BOOKS:

1. Mahajani, V. V. and Umarji, S. B., "Process equipment design" Macmillan, 2008.

REFERENCE BOOKS:

1. Geankoplis C. J. "Transport processes and unit operations" Prentice-Hall, 2012.
2. Rao, D. G. "Fundamentals of Food Engineering PHI Learning Pvt. Ltd" New Delhi, 2011.