आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

BACHELOR OF TECHNOLOGY

AGRICULTURAL ENGINEERING

[*w.e.f.* ACADEMIC SESSION 2018 – 19]

IFTM UNIVERSITY

N.H.-24, Lodhipur Rajput, Delhi Road, Moradabad, Uttar Pradesh-244102

Website: www.iftmuniversity.ac.in

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SCHOOL OF AGRICULTURAL SCIENCES & ENGINEERING

DEPARTMENT OF AGRICULTURAL ENGINEERING

Study and Evaluation Scheme

of

Bachelor of Technology

Agricultural Engineering

[*w.e.f.* Academic Session 2018 – 19]

Summary

Programme:	**Bachelor of Technology**
	Agricultural Engineering
Programme Level:	**Degree (Under Graduation)**
Duration:	**Four Years (Eight semesters) Full time**
Medium of Instruction:	**English**
Minimum Required Attendance:	**75%**
Maximum Credits:	**242**

IFTM UNIVERSITY
MORADABAD

NAAC ACCREDITED

N.H-24 Lodhipur Rajput , Delhi Road, Moradabad, Uttar Pradesh-244001

www.iftmuniversity.ac.in

Effective from 2018-2019

Programme: **B. Tech. Agricultural Engineering**

Programme Outcomes (POs):
Students completing this programme will be able to-

1. Apply the Knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Design solutions for complex engineering problems and design system components or process, and engineering sciences.
3. 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
4. Analytical and critical thinking abilities for data- based decision making.
5. Ability to develop value based leadership ability.
6. Determine the entrepreneurial.
7. 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.
8. 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
9. Ability to understand, analyze and communicate global, economic, legal ethical aspects of Technology.
10. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME **B. Tech. Biotechnology Engineering/ Agricultural Engineering**

YEAR I, SEMESTER- I

S.N	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA-102/ EBT-107	Elementary Mathematics-I Elementary Biology-I	3	1	0	20	10	30	70	100	4
2.	EPH-101	Engineering Physics-I	3	1	0	20	10	30	70	100	4
3.	ECH-101/201	Engineering Chemistry	3	1	0	20	10	30	70	100	4
4.	EME-101	Engineering Mechanics	3	1	0	20	10	30	70	100	4
5.	EEC-101	Electronics Engineering	3	1	0	20	10	30	70	100	4
6.	ECS-101	Computer Fundamentals & Programming	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	ECH-151	Engineering Chemistry Lab	0	0	2	20	10	30	70	100	1
8.	EEC-151	Electronics Engineering Lab	0	0	2	20	10	30	70	100	1
9.	ECS-151	Computer Lab	0	0	2	20	10	30	70	100	1
10.	EME-151	Mechanical Engineering Lab	0	0	2	20	10	30	70	100	1
11.	GP-101	General Proficiency	-	-	-	-	-	100	-	100	1
		Total Credit	**18**	**06**	**08**	**-**	**-**	**480**	**620**	**1100**	**29**

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	EMA-202/EBT-209	Elementary Mathematics-II/Elementary Biology-II	3	1	0	20	10	30	70	100	4
2.	EPH-201	Engineering Physics-II	3	1	0	20	10	30	70	100	4
3.	ECE-201/101	Environmental Science	3	1	0	20	10	30	70	100	4
4.	PSD-201	Professional Skill Development-I	3	1	0	20	10	30	70	100	4
5.	EEE-201	Electrical Engineering	3	1	0	20	10	30	70	100	4
6.	EBT-102/EBT-202	Introduction to Biotechnology	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
7.	EPH-251	Physics Lab	0	0	2	20	10	30	70	100	1
8.	EBT-252	Introduction to Biotechnology Lab	0	0	2	20	10	30	70	100	1
9.	EEE-251	Electrical Engineering Lab	0	0	2	20	10	30	70	100	1
10.	EME-253	Engineering Graphics Lab	0	0	2	20	10	30	70	100	1
11.	GP-201	General Proficiency	-	-	-	-	-	100	-	100	1
		Total Credit	**18**	**06**	**08**	**-**	**-**	**480**	**620**	**1100**	**29**

School of Agricultural Sciences & Engineering, IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

YEAR II, SEMESTER-III

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**EAG302**	**Principle of Soil Science, Agronomy and Horticulture Crops**	3	0	0	20	10	30	70	100	3
2.	**EME308**	**Fluid Mechanics and Open Channel Hydraulics**	3	1	0	20	10	30	70	100	4
3.	**ECE306**	**Surveying practices**	3	1	0	20	10	30	70	100	4
4.	**EME306**	**Heat & Mass Transfer**	3	1	0	20	10	30	70	100	4
5.	**EMA303**	**Analytical Mathematics**	3	1	0	20	10	30	70	100	4
6.	**PSD301**	**Professional Skill Development -II**	3	1	0	20	10	30	70	100	4
7.	**EEE306**	**Electrical Machines & Power Utilization**	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
						IA	**AT**				
8.	**EAG352**	**Soil Science, Agronomy and Horticulture Lab**	0	0	2	20	10	30	70	100	1
9.	**EME358**	**Fluid Mechanics Lab**	0	0	2	20	10	30	70	100	1
10.	**ECE356**	**Surveying Lab**	0	0	2	20	10	30	70	100	1
11.	**ECE357**	**Auto CAD Applications lab**	0	0	2	20	10	30	70	100	1
12.	**EEE356**	**Electrical Machines & Power utilization Lab**	0	0	2	20	10	30	70	100	1
13	**GP301**	**General Proficiency**	-	-	--	-	-	-	-	100	1
TOTAL			**21**	**06**	**10**	**-**	**-**	**-**	**-**	**1300**	**33**

School of Agricultural Sciences & Engineering, IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

YEAR II, SEMESTER-IV

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**EAG404**	**Farm Machinery and Equipments-I**	3	0	0	20	10	30	70	100	3
2.	**EAG405**	**Soil Mechanics**	3	0	0	20	10	30	70	100	3
3.	**EAG406**	**Dairy & Food Engineering**	3	0	0	20	10	30	70	100	3
4.	**EME405**	**Strength of Materials**	3	1	0	20	10	30	70	100	4
5.	**EME406**	**Thermal Engineering**	3	1	0	20	10	30	70	100	4
6.	**EEC408**	**Basic Electronics and Instrumentation**	3	1	0	20	10	30	70	100	4
7.	**EME407**	**Theory of Machines**	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
						IA	**AT**				
8.	**EAG454**	**Farm Machinery & Equipment-I Lab**	0	0	2	20	10	30	70	100	1
9.	**EAG455**	**Soil Mechanics Lab**	0	0	2	20	10	30	70	100	1
10.	**EAG456**	**Dairy and Food Engineering Lab**	0	0	2	20	10	30	70	100	1
11.	**EME456**	**Thermal Engineering Lab**	0	0	2	20	10	30	70	100	1
12.	**EEC458**	**Electronics and Instrumentation Lab**	0	0	2	20	10	30	70	100	1
13.	**GP401**	**General Proficiency**	-	-	-	-	-	-		100	1
TOTAL			**21**	**04**	**10**	**-**	**-**	**-**	**-**	**1300**	**31**

Note: Skill Development Training-I during summer break June-July after 4th Semester

School of Agricultural Sciences & Engineering, IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

YEAR III, SEMESTER-V

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**EAG506**	**Tractor System & Control**	3	0	0	20	10	30	70	100	3
2.	**EAG507**	**Soil & Water Conservation Engineering**	3	0	0	20	10	30	70	100	3
3.	**EAG508**	**Tractor and Automotive Engines**	3	0	0	20	10	30	70	100	3
4.	**EAG509**	**Watershed Hydrology, Planning and Management**	3	0	0	20	10	30	70	100	3
5.	**EAG510**	**Bio-Energy systems: Design and Applications**	3	0	0	20	10	30	70	100	3
6.	**EHU501**	**Human values and professional ethics**	3	1	0	20	10	30	70	100	4
7.	**EME506**	**Machine Design**	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
						IA	**AT**				
8.	**EAG556**	**Tractor System & Control Lab**	0	0	2	20	10	30	70	100	1
9.	**EAG557**	**Soil & Water Conservation Engg. Lab**	0	0	2	20	10	30	70	100	1
10.	**EAG558**	**Tractor and Automotive Engines Lab**	0	0	2	20	10	30	70	100	1
11.	**EAG559**	**Hydrology Lab**	0	0	2	20	10	30	70	100	1
12.	**EAG550**	**Bio-energy Lab**	0	0	2	20	10	30	70	100	1
13.	**EAG560**	**Skill Development Training-I (Student READY) Registration only 5(0+5)/** Seminar based on industrial training	0	0	-	-	-	100	-	100	5
14.	**GP501**	**General Proficiency**	-	-	-	-	-	-	-	100	1
TOTAL			**21**	**02**	**10**	**-**	**-**	**-**	**-**	**1400**	**34**

School of Agricultural Sciences & Engineering, IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

YEAR III, SEMESTER-VI

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**EAG607**	**Irrigation & Drainage Engineering**	3	0	0	20	10	30	70	100	3
2.	**EAG608**	**Ground Water, Well & Pumps**	3	0	0	20	10	30	70	100	3
3.	**EAG609**	**Post Harvest Engineering of Horticultural crops**	3	0	0	20	10	30	70	100	3
4.	**EAG610**	**Farm Machinery and Equipments-II**	3	0	0	20	10	30	70	100	3
5.	**EAG611**	**Engineering Properties of Agricultural Produce**	3	0	0	20	10	30	70	100	3
6.	**EAG612(A/B/C)**	**Elective I**	3	0	0	20	10	30	70	100	3
7.	**EHU601**	**Disaster Management**	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT											
						IA	**AT**				
8.	**EAG657**	**Irrigation & Drainage Engineering lab**	0	0	2	20	10	30	70	100	1
9.	**EAG658**	**Ground Water, Well & Pump Engineering Lab**	0	0	2	20	10	30	70	100	1
10.	**EAG659**	**Post Harvest Engineering of Horticultural crops Lab**	0	0	2	20	10	30	70	100	1
11.	**EAG660**	**Farm Machinery and Equipments-II lab**	0	0	2	20	10	30	70	100	1
12.	**GP601**	**General Proficiency**	-	-	-	-	-	-	-	100	1
TOTAL			**21**	**00**	**08**	**-**	**-**	**-**	**-**	**1200**	**26**

Note: Industrial Training of 4 – 6 Weeks after VI Semester (during summer break June-July) which will be evaluated in VII Semester. (*Skill Development Training-II)*

School of Agricultural Sciences & Engineering, IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

YEAR IV, SEMESTER-VII

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**EAG708**	**Post Harvest Engineering of Cereals, Pulses and Oil Seeds**	3	0	0	20	10	30	70	100	3
2.	**EAG709**	**Water Harvesting and Soil Conservation Structures**	3	0	0	20	10	30	70	100	3
3.	**EAG710**	**Agricultural Structures & Environmental Control**	3	0	0	20	10	30	70	100	3
4.	**EAG711**	**Sprinkler and Micro Irrigation Systems**	3	0	0	20	10	30	70	100	3
5.	**EAG712(A/B/C)**	**Elective II**	3	0	0	20	10	30	70	100	3
6.	**EAG713**	**Renewable Energy Sources and Management**	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT											
						IA	**AT**				
7.	**EAG758**	**Post Harvest Engineering of Cereals, Pulses and Oil Seeds Lab**	0	0	2	20	10	30	70	100	1
8.	**EAG760**	**Experiential Learning I (Process & Food Engineering)**	0	0	4	20	10	30	70	100	2
9.	**EAG761**	**Experiential Learning II (Farm Machinery & equipments)**	0	0	4	20	10	30	70	100	2
10.	**EAG762**	**Experiential Learning III (Soil & Water conservation Engineering and Irrigation)**	0	0	4	20	10	30	70	100	2
11.	**EAG763**	**Seminar (Project based special problem)**	0	0	-	20	10	30	70	100	1
12.	**EAG764**	**Skill Development Training-II (Student READY) Registration**	0	0	-	-	-	100	-	100	5
13.	**GP701**	**General Proficiency**	-	-	-	-	-	-	-	100	1
TOTAL			**18**	**00**	**14**	**-**	**-**	**-**	**-**	**1300**	**32**

***Educational tour during VII Semester**

School of Agricultural Sciences & Engineering, IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

B. Tech. Agricultural Engineering

YEAR IV, SEMESTER-VIII

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total	Credits
						Mid Term Exam			External Exam		
			L	T	P	CT	AS +AT	Total			
THEORY											
1.	**EAG802**	**Industrial Management**	3	0	0	20	10	30	70	100	3
2.	**EAG803**	**Entrepreneurship Development and Business Management**	3	0	0	20	10	30	70	100	3
3.	**EAG804**	**Fundamentals of Remote Sensing & GIS Applications**	3	0	0	20	10	30	70	100	3
4.	**EAG805(A/B/C)**	**Elective course III**	3	0	0	20	10	30	70	100	3
5.	**EAG806**	**Agri-Informatics**	3	0	0	20	10	30	70	100	3
PRACTICALS / PROJECT											
6.	**EAG854**	**Remote Sensing Lab**	0	0	2	20	10	30	70	100	1
7.	**EAG856**	**Agri-Informatics Lab**	0	0	2	20	10	30	70	100	1
8.	**EAG852**	**Project**	0	0	10	-	200	200	300	500	10
9.	**GP801**	**General Proficiency**	-	-	-	-	-	-	-	100	1
TOTAL			**15**	**00**	**14**	**-**	**-**	**-**	**-**	**1300**	**28**

Elective Courses

S.N.	Course Code	Course Name
	Elective I	
1.	**EAG612A**	Wasteland Development
2.	**EAG612B**	Information Technology for Land and Water Management
3.	**EAG612C**	Precision Farming Techniques for Protected Cultivation
	Elective II	
4.	**EAG712A**	Plastic Applications in Agriculture
5.	**EAG712B**	Human Engineering and Safety
6.	**EAG712C**	Waste and By-products Utilization
	Elective III	
7.	**EAG805A**	Food Quality and Control
8.	**EAG805B**	Photovoltaic Technology and Systems
9.	**EAG805C**	Food Plant Design and Management

EMA – 102 Elementary Mathematics - I

Objective: - The main aims of this course calculus are to find the instantaneous rate of change of a function with respect to an independent variable in calculus. Integrals are used to evaluate such quantities as area, volume, work and area of a curve. Coordinate geometry identify a shape within a shape, discriminate *geometric shapes* from one another based on the number of sides and corners.

UNIT – 1 (12 Sessions)

Calculus: Limits and Derivatives: Derivative introduced as rate of change both as that of distance function and geometrically intuitive idea of limit, Definition of derivative, Relate it to slope of tangent of the curve, Derivative of sum, difference, Product and quotient of functions, Derivatives of polynomial and trigonometric functions.

UNIT – 2 (10 Sessions)

Continuity and Differentiability : Continuity and Differentiability, Derivative of composite functions, Chain rule, Derivatives of inverse trigonometric functions, Derivative of implicit function, Concept of exponential, logarithmic functions and their derivative, Logarithmic differentiation, Derivative of functions expressed in a parametric forms, Second order derivatives, Rolle's and Lagrange's Mean Value theorems (without proof) and their geometric interpretations.

Applications of derivatives: Applications of derivatives: Rate of change, Increasing /Decreasing functions, Tangents and normals, Approximation, Maxima and minima of one variable (first derivative test motivated geometrically and second derivatives test given as a provable tool),Simple problems (that illustrate basic principles and understanding of the subject as well as real –life situations)

UNIT – 3 (10 Sessions)

Integrals: Integration as inverse process of differentiation, Integration of a variety of functions by substitution by partial fraction and by parts, Only simple integrals of the type to be evaluated, Definite integrals as a limit of a sum, Fundamental Theorem of calculus (without proof), Basic properties of definite integral and evaluation of definite integrals, Applications of the integrals; Applications in finding the area under simple curves, Lines, Area of Circles/parabola/ellipse (Standard form only), Area between the two curves.

UNIT – 4 **(10 Sessions)**

Differential Equations : Definitions order and degree, General and particular solutions of differential equation, Formation of differential equation whose general solution is given, Solution of differential equations by method of separation of variables, Homogeneous differential equation of first order and first degree, Solution of linear differential equation of the type $\frac{dy}{dx} + Py = Q$, where P and Q are the function of x.

UNIT – 5 **(10 Sessions)**

Coordinate Geometry: Straight line : Brief recall of 2D from earlier classes; Slope of a line, angle between two lines and Various forms of equations of a line parallel to axes, Point slope form, Slope intercept form, Two point form, Intercept form and normal form, General equation of a line, Distance of a point from a line.

Conic Sections: Circle, Ellipse, Parabola, Hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section, Standard equations and simple properties of parabola, Ellipse and Hyperbola, Standard equation of a circle.

Course Outcomes:

The student is able to

- Remember terminologies and formulae of differential, integral Calculus and Coordinate Geometry.
- Understand and interpret the concepts of differential, integral Calculus and Coordinate Geometry.
- Compare and analyze the methods in differential, integral Calculus and Coordinate Geometry.
- Predict and evaluate the problems in differential, integral Calculus and Coordinate Geometry.

References:

1. R.D. Sharma: Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. NewDelhi, India.
2. R.D. Sharma: Mathematics (I& II-XII):Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. NewDelhi, India.
3. Gorakh Prasad: Differential Calculus, Pothishala Private Limited, Allahabad.
4. GorakhPrasad: Integral Calculus, Pothishala Private Limited, Allahabad.
5. B.S. Grewal Engg.: Mathematics, Khanna publishers, New Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- www.onlinecourses.nptel.ac.in
- https://en.wikipedia.org

EBT-107: ELEMENTARY BIOLOGY-I

Objective: The main objective of this course:

- Emphasize the basic principles that are common to animals, plants and microorganisms as well as high lighting the relationship of Biology with other areas of knowledge.

UNIT I: **(10 Sessions)**

The Cell: Concept and Cell theory. Structure of prokaryotic cells, eukaryotic cells, plant cells and animal cells. Structure and function of cell membrane and cell wall. Brief introduction of cell organelles.

UNIT II: **(10 Sessions)**

Structural Organization: Tissues in animals and plants. Morphology, anatomy and functions of different parts of plants- Root, stem, leaf, inflorescence, flower, fruit and seed. Concepts of botanical garden, herbaria, zoological park and museums.

UNIT III: **(10 sessions)**

Classification of living organisms: Five kingdom classification, major groups and principles of classification in each kingdom. Systematic and binomial system of nomenclature. Concept of animal and plant classification.

UNIT IV: **(5 Sessions)**

Concept of alleles and genes: Mendelian Experiments, Cell cycle (Elementary Idea), mitosis and meiosis.

UNIT V: **(5 Sessions)**

Plant Physiology: Concept of diffusion, osmosis, imbibitions. Movement of water, food, nutrients and gases. Plant growth and development.

Course Outcomes:

At the end of the course students will able to:

- Define cell biology and gain some basic concept of functioning of various specific systems of humans, plants and animals.
- Learn the basic concepts of biology and its importance in analyzing the principles of human development
- Develop the knowledge of genes and hereditary.
- Demonstrate medical implications of developmental biology

Suggested Readings:

1. Biology - Textbook for Class XI, NCERT Publication.
2. Biology - Textbook for Class XII, NCERT Publication.
3. Biology by Peter H Raven, George B Johnson, Kenneth A. Mason, Jonathan Losos, Susan Singer(Macgraw Hill).
4. Concepts in Biology By E.D.Enger & F.C.Ross, 9th Ed Tata McGraw Hill.

Website Sources:

- https://www.britannica.com/science/fermentation
- https://nptel.ac.in/courses/102/105/102105064/
- https://www.khanacademy.org

EPH-101 Engineering Physics-I

Objective: The aim of this course is to impart knowledge of statistical mechanics, quantum mechanics, Laser system and their applications. The broad education is necessary to understand special theory of relativity.

UNIT- I (8 sessions)

Relativistic Mechanics: Frame of reference, Michelson-Morley Experiment, Lorentz transformation equation, Length contraction & Time dilation, Addition of velocities, Variation of mass with velocity and Mass energy relation.

UNIT- II (10 sessions)

Statistical Mechanics: Concept of phase space, Density of states as a function of energy, Maxwell- Boltzmann statistics, Distribution law and its application in case of ideal gas, Energy and velocity distribution.

Bose -Einstein statistics Distribution Law and its application to Black body radiation to obtain Plank's law of radiation.

Fermi –Dirac statistics, Distribution law and its application to electrons in metals, Calculation of Fermi energy and average energy of electrons in metals.

UNIT- III (10 sessions)

Quantum Mechanics: De-Broglie Hypothesis, Davisson -Germer Experiment, wave function and its properties, Uncertainty principle. Time Dependent & Time Independent Schrodinger Equation, Particle in one dimensional box, Eigen values and eigen function

UNIT- IV (8 sessions)

Laser: Principle of Laser, Stimulated and spontaneous emission, Population inversion, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers.

UNIT- V (8 sessions)

Fibre Optics: Fundamental ideas of optical Fiber, Propagation Mechanism, Numerical aperture, Acceptance angle and Acceptance cone, Single and multi mode fibers, Applications of optical fibres.

Course Outcomes:

The students completing this course will be able to:

- Learn Frame of reference, Lorentz transformation equation

- Understand Statistical Mechanics, Maxwell- Boltzmann statistics and its applications.
- Study Bose -Einstein statistics and Fermi –Dirac statistics
- Understand De-Broglie Hypothesis, Davisson -Germer Experiment
- Study Time Dependent & Time Independent Schrodinger Equation and applications of these equations.
- Attain basic knowledge on different types of LASERs and their applications.
- Gain knowledge of optical fibre.

References:

1. A. Beiser, "Concepts of Modern Physics
2. C. Kittel, "Mechanics", Berkeley Physics Course, Vol.- I.
3. W.T. Silf vast, "Laser Fundamental" Cambridge University Press (1996).
4. G. Keiser "Optical Fiber Communication" New york.
5. K.M. khanna" Statistical Mechanics"
6. C.Kittel" Elementary Statistical Mechanics"

Website Sources:

- https://web.stanford.edu
- https://sites.google.com
- https://en.wikipedia.org
- https://www.khanacademy.org
- https://www.rp-photonics.com
- https://nptel.ac.in
- https://www.eatm.in

ECH-101/201 **Engineering Chemistry**

OBJECTIVES:

1. To emphasize the relevance of fundamentals and applications of chemistry in the field of engineering.
2. To take into account appropriate combinations of old and new emerging concepts for the potential uses in engineering.
3. To address the principles of general chemistry and specific topics relevant to various engineering disciplines.
4. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
5. To bring potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT-I:

MATTER - CHEMICAL BONDING AND ITS STATES :

Types of bonds (Ionic, covalent and chemical bonds), valence bond theory, molecular orbital theory and its applications to homo and hetero (CO & NO) diatomic molecules. Solid state- Types of unit cells, space lattice (only cubes) calculation of density of the unit cell, two dimensional solids such as graphite and its conduction properties. Fullerenes and their applications.

UNIT-II:

CHEMICAL KINETICS AND ELECTROCHEMISTRY:

Molecularity and order of reactions, zero, first and second order reactions, theories of reaction rates, electrode potential, electrochemical cells (galvanic and concentration), Nernst equation, electrochemical and galvanic series, definition, significance and classification of corrosion, electrochemical corrosion.

UNIT-III:

REACTION MECHANISM AND SPECTROSCOPY:

Electrophile, Nucleophile (SN^1 and SN^2reactions)

Mechanism of the following reactions:

(i) Aldol condensation (ii) Beckmann rearrangement (iii) Cannizaro reaction

(iv) Hoffmann rearrangement (v) Diels-Alder reaction and ((vi) Friedel craft reaction

Basic principle, instrumentation and general application of UV, Visible, IR/ FTIR & ^{1H}NMR spectroscopy (excluding specific applications).

UNIT-IV:

POLYMERS:

Polymers, classification and applications, polymerization (addition and condensation), Thermoplastic and Thermosetting polymers, preparation, properties and uses of PVC, Dacron, nylon66 and Bakelite. Elastomers (Natural rubber, buna-N, buna-S) vulcanization, conducting polymers (Intrinsic & Extrinsic), doping, ion exchange resins, biodegradable polymers.

UNIT-V:

WATER TREATMENT AND FUELS :

Hardness of water, calculation on hardness and its determination by EDTA method, sludge and scale formation, causes and prevention of scale formation (colloidal, phosphate, and calgon conditioning), removal of hardness (Soda lime process, zeolite process & ion-exchange process), calculations based on lime soda process.

Definition of fuels, classification of fuels, calorific value, determination by Dulong's formula, analysis of coal (Proximate and ultimate analysis), petroleum, important fractions of petroleum and their uses, gaseous fuels (CNG & LPG)

COURSE OUTCOMES:

- Demonstrate knowledge of science behind common impurities in water and methods to treat them and also different methods to remove hardness of water .
- Students will also be able to understand and relate electrochemistry and corrosion.
- to analyze the basic knowledge of various types of Fuels, their properties and Industrial Applications ALONG WITH THE determination OF the calorific value of fuels .
- Apply the science for understanding corrosion and its prevention.
- Demonstrate knowledge of superconducting and organic electronic materials.
- Students will be able to understand about different polymers.

REFERENCES:

1. Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.
2. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.

3. Corrosion Engineering by M.G. Fontana McGraw Hill Publications
4. Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)
5. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.

Website Sources:

- http://www.commonchemistry.org/
- https://uri.idm.oclc.org/login?url=https://www.engineeringvillage.com/search/quick.url?CID=quickSearch&database=1
- https://www.technicalsymposium.com/

ECH 151/251 ENGINEERING CHEMISTRY LAB

List of Experiments:

1. Determination of alkalinity of the given sample of water.
2. Determination of temporary and permanent hardness of water sample by Versinate method
3. Determination of available chlorine in bleaching powder.
4. Determination of quantity of dissolve oxygen in given sample of water.
5. Determination of iron content in the given water sample by Mohr's methods.
6. Determination of ion exchange capacity of given sample of ion-exchange material.
7. Determination of Equivalent weight of iron by the chemical displacement method. The equivalent weight of copper is 63.5.
8. Determination of viscosity of polystyrene by Ostwald Viscometer.
9. Preparation of Bakelite resin.
10. Element detection and functional group identification in organic**.**

EME –101/201 ENGINEERING MECHANICS L T P 3 1 0

Objective: The primary purpose of the study of engineering mechanics is to develop the capacity to predict the effects of force and motion while carrying out the creative design functions of engineering. This capacity requires more than a mere knowledge of the physical and mathematical principles of mechanics; also required is the ability to visualize physical configurations in terms of real materials, actual constraints ,and the practical limitations which govern the behavior of machines and structures.

Unit-1 (10 Sessions)

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and non-concurrent force systems, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications.

Unit-2 (08 Sessions)

Trusses: Introduction, Simple Truss and solution of simple truss, Method of Joints and Method of Sections.

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application.

Unit-3 (08 Sessions)

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorem, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

Unit-4 (06 Sessions)

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams.

Unit-5 (08 Sessions)

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion. Relative Velocity.

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium.

Course outcome: Students completing this course will be able to:

- Recognize different force systems, moments and couple.
- To draw Free Body Diagram and label the reactions on it.
- Apply equilibrium equations in statics.
- Understand Newton's law in motion, and recognize different kinds of particle motions.

References:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Engineering Mechanics by R.K. Bansal, Laxmi Publications, New Delhi.
4. Engineering Mechanics by SS Bhavi Katti, New age International Publisher, New Delhi.

Website Sources:

- https://nptel.ac.in/courses/122/104/122104014/
- https://www.coursera.org/learn/engineering-mechanics-statics
- https://www.edx.org/course/engineering-mechanics-2
- https://www.youtube.com/watch?v=ADR04oYgpAM

EEC 101 / 201 ELECTRONICS ENGINEERING L T P 3 1 0

Objective: The objective of the course is to familiarize the students with concepts of semiconductor and its working along with their applications in real life.

UNIT – I (08 Sessions)

Theory of Semiconductor material: Energy band Theory of crystals, Insulators, Semiconductors and Metals, classification of semiconductors, Mobility and Conductivity, Donor and Acceptor Impurities, Mass- Action law, Variation in semiconductor parameters with Temperature, Hall – Effect.

UNIT – II (08 Sessions)

Semiconductor Diodes and Applications: p-n junction, depletion layer, V-I characteristics, diode resistance, capacitance, p-n junction as rectifiers, filter (Shunt capacitor filter), clipping circuits, clamping circuits, breakdown mechanism, breakdown characteristics, zener resistance, zener diode application as shunt regulator. Introduction of LED, and Photo diode.

UNIT– III (08 Sessions)

Bipolar Junction Transistor (BJT): construction, transistor action, CB, CE and CC configurations, concept of voltage gain, current gain. Field Effect Transistor (FET): JFET: construction, principle of working, concept of pinch-off, drain saturation current, characteristics, characteristic equation, CG, CS and CD configurations, MOSFET: depletion and enhancement type, construction.

UNIT – IV (08 Sessions)

Number system: conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, Boolean algebra, logic gates, concept of universal gates. Canonical forms, minimization using K-map (Upto four variable, don't care conditions also)

UNIT – V (08 Sessions)

Operational Amplifier (Op-Amp): concept of ideal operational amplifier, parameters. Inverting, non-inverting and unity gain configurations, Op-amp as adder, subtractor, Block diagram of Communication Systems, Introduction to Modulation, Need for modulation, Definition of AM and FM.

Course Outcomes:

- Understand the basic of semiconductor technology
- Define the purpose of different diodes used in several applications
- Develop understanding and impact of resistance regions
- Discuss how basic communication occurs over wireless medium
- Discuss the benefits of transistors over conventional vacuum tubes

References:

1. S. Salivahanan, N Suresh Kumar, "Electronic Devices and circuits" 2nd Edition, TMH
2. Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education
3. Jacob Millman, Christos C. Halkias, "Integrated Electronics", TMH
4. Morris Mano "Digital Computer Design", PHI 2003
5. Kennedy, Davis, "Electronics Communication System" 4th Edition, TMH.

Website sources:

- www.sanfoundary.co.in
- Grade up online course on transistors (www.gradeup.org)
- www.nptel.ac.in
- https://en.wikipedia.org

EEC 151/251 ELECTRONICS ENGINEERING LAB

Objective: The objective of this lab is to familiarise the students with the basic working of diodes and also help them calculate voltage and currents through simple devices such as multimeter.

Experiments:

1. To study of Digital Multimeters (measurement of AC and DC voltage, measurement of current, measurement of resistance, capacitance), passive components (resistor, capacitor) and verify using colour code.
2. To Study Cathode Ray Oscilloscope (To study of controls of CRO, to measure amplitude, time period and frequency of time varying signals), function generator, power supply & Bread Board.
3. To study the Characteristics of a P-N Junction diode in forward & reverse bias connection.
4. To draw wave shape of the electrical signal at input and output points of the half wave rectifier.
5. To draw wave shape of the electrical signal at input and output points of the full wave rectifiers.
6. To study the Zener diode characteristic graphical measurement of forward and reverse resistance.
7. To Plot input / output characteristics for common base transistor.
8. To verify the truth table of basic logic gates (AND, OR, NOT)
9. To build and test the clipper circuit using diode.
10. To build and test the clamper circuit using diode

ECS-101 / 201 Computer Fundamentals and Programming L T P 3 1 0

Objective:

- This course introduces the concepts of computer basics & programming with particular attention to Engineering examples.
- The C programming language is used but the course will stress on fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.
- C is the easiest language to understand so basic constructs of C will be cleared.

Unit-I (08 Sessions)

Introduction: Introduction to Computer Systems, Generation of Computers, BIOS, Various types of memories, CPU organization, ALU, registers. Introduction to various operating Systems. Number systems: Binary, hexadecimal, octal and their inter conversions. Computer Languages and Software & hardware: High Level Languages and Low Level Language, Various types of software. Firmware, Compiler, Interpreter and Assembler. File Allocation Table, Hardware.

Unit –II (08 Sessions)

Input, Output and storage Units: Introduction to various Input and output Devices Printers: Various type of Impact and Non- Impact Printers. Introduction to algorithm and Flow chart: Representation of an algorithm, flowchart symbols and levels of flow chart, advantage and limitations of flowchart and pseudo code. Basics of programming: Introduction to the design and implementation of correct, efficient and maintainable programs. Use of high level programming languages for the development of programs.

Unit-III (08 Sessions)

Standard I/O in "C", Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associatively.

Unit-IV (08 Sessions)

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, Program Loops and

Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue.

Unit-V **(08 Sessions)**

Modular Programming: Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules. Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structure, union, enumerated data types, Functions: Introduction, types of functions, functions with array, recursive functions, Introduction to pointers, Introduction to file handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Course Outcomes: On completion of the course students will be able to:

- Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming
- Write, compile and debug programs in C language and use different data types for writing the programs.
- Design programs connecting decision structures, loops and functions.
- Explain the difference between call by value and call by address.
- Understand the dynamic behavior of memory by the use of pointers.
- Use different data structures and create or manipulate basic data files and developing applications for real world problems.

References:

1. "Let us C", Yashvant Kanitkar.
2. "Programming with C", Byron Gottfried
3. "Computer Fundamentals", Anita Goel, Pearson Education
4. "Computer Concepts and Programming in C", E Balaguruswami, McGraw Hill
5. "C programming", Kernighan and Ritchie, PHI
6. "Computer Fundamentals and Programming in C", Reema Thareja, Oxford Publication

Website Sources:

- www.nptel.ac.in
- www.toptal.com/c/the-ultimate-list-of-resources-to-learn-c-and-c-plus-plus
- www.learn-c.org

ECS-151/251 Computer Lab

Objective: The following student learning outcomes, goals, assessment methods and core competencies have been identified for the Learning Center computer lab:

- To provide students with an open access computer lab using up-to-date technology to complete their studies.
- To increase retention in reading, study skills, English, foreign language, nursing, psychology and other academic classes by providing a lab where students can make use of software products to supplement instruction.

List of Experiments: (Minimum 10 experiments are required to be performed)
(20 Sessions)

1. Object: Apply basic operations in windows on a folder.
2. Object: Design front page of your practical file
3. Object: Prepare a PERSONAL LETTER.
4. Object: Create your resume using given Templates.
5. Object: Create a report containing the pay details of the employee.
6. Object: Create a student result sheet
7. Object: create a pie chart for a sample data and give legends.
8. Object: Prepare a Time Table in MS-Excel.
9. Object: Prepare a presentation in MS-Power point about "Fundamentals of Computer".
10. Object: Create your E-Mail ID on Gmail
11. Object: Search any topic related to your syllabi using any search.
12. Object: Write a program in C to print "I am a student of IFTM University".
13. Object: Write a program in C to take input from user using scanf.
14. Object: Write a program to add, subtract, multiplication and division of two numbers.
15. Object: Write a program in C to calculate Factorial of a Number
16. Object: Write a program in C to print a Table.
17. Object: Program to compute the compute the average.
18. Object: Write a program to check whether a number is even or odd.
19. Object: Write a program to check whether a number is prime number or not.
20. Object: Write a program to check whether a year is leap year or not.
21. Object: Write a program to find largest of three numbers.
22. Object: Program to compute the factorial of a given number.

EME – 151 / 251: Mechanical Engineering Lab L T P 0 0 2

Objective: The objective of the course is to introduce students to different engineering material and create an understanding of different mechanical properties by using Destructive testing methods. Also the students will be familiar with the basic working of IC engines & boilers.

List of Experiments:(Minimum 08 experiments are required to be performed)

(16 Sessions)

1. To conduct tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen using UTM Machine.
2. To conduct compression test and determine the ultimate compressive strength for a specimen using UTM Machine.
3. To conduct Impact-tests (Izod / Charpy) on Impact-testing machine to find the toughness.
4. To determine the hardness of the given specimen using Brinell/Rockwell hardness testing machine.
5. To study 2-stroke & 4-stroke I.C. Engine models.
6. To study Lancashire, Babcock Wilcox and Locomotive boiler models.
7. To study Steam Engine & Steam Turbine models.
8. To study vapor compression Refrigerator unit tutor / refrigerator.
9. To study window type Air conditioner.
10. To conduct torsion test on mild steel or cast iron specimens to find out modulus of rigidity.

EMA – 202 **Elementary Mathematics- II**

Objective: -The main aims of this course are to recall and remember basics of algebra, probability theory, vectors and three dimensional geometry. The focus of the subject to understand the concepts of basic mathematical methods to solve engineering problems, analyze engineering problems and evaluate the solutions.

UNIT – 1 **(12 Sessions)**

ALGEBRA: Fundamental theorem of algebra , Solution of quadratic equations in the complex number system, Linear inequalities, Algebraic solutions of linear inequalities in one variable and their representation on the number line, Graphical solution of linear inequalities in two variables, Solution of system of linear inequalities in two variables graphically.

UNIT – 2 **(08 Sessions)**

SEQUENCES, SERIES, PERMUTATION & COMBINATION: Sequence and series, Arithmetic progression (A.P.), Arithmetic mean(A.M.), Geometric progression(G.P.), General term of a G.P., Sum of n terms of a G.P., Geometric mean (G.M), Relation between A.M. and G.M., Fundamental principle of counting, Factorial n (n!), Permutation and combinations formulae and their connections, Simple applications, Sum of n terms of the special series n, n^2 and n^3.

UNIT – 3 **(10 Sessions)**

PROBABILITY THEORY: Random experiments, Outcomes, Sample spaces(set representation), Events , Occurrence of events, 'and' and 'or' events, Exhaustive events, Mutually exclusive events , Connections with the theories of earlier classes, Probability of an event , Multiplication theorem on probability , Bays theorem , Binomial distribution , Poisson distribution and Normal distribution.

UNIT – 4 **(10 Sessions)**

VECTOR AND SCALARS: Vectors and Scalars, Magnitude and direction of a vector, Direction cosines / ratios of vectors, Type of vectors (equal , unit, zero, Parallel and collinear vectors), Position vector of a point , Negative of a vector , Components of a vector, Addition of a vectors, Multiplication of a vector by a scalar, Position vector of a point dividing a line segment in a given ratio, Scalar product of vectors, Projection of a vector on a line, Cross product of vectors.

UNIT – 5 **(12 Sessions)**

THREE-DIMENSIONAL GEOMETRY: Introduction to three- dimensional geometry coordinate axes and coordinate planes in three dimensions, Coordinates of a point, Distance between two points and section formula, Direction cosines / ratios of a line joining two points, Cartesian and vector equation of a line, Coplanar and skew lines, Shortest distance between two lines, Cartesian and vector equation of a plane, Angle between (i) two lines, (ii) two planes (iii) a line and a plane, Distance of a point from a plane.

Course Outcomes:

The student is able to

- Remember equations, inequalities, and systems of equations to represent situations and find solutions via symbolic, numeric and graphic methods.
- Understand and calculate probabilities by applying probability laws and theoretical results.
- Compare and analyze the methods by using coordinates to represent and work with ***vectors***.
- Understand the concepts & advance topics related to *three dimensional geometry* and study the applications of conics.

References:

1. R.D. Sharma: Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. New Delhi, India.
2. R.D. Sharma: Mathematics (I& II-XII):Mathematics (I& II-XI), Dhanpat rai publication (Pvt.) Ltd. New Delhi, India.
3. Gorakh Prasad: Differential Calculus, Pothishala Private Limited, Allahabad.
4. Gorakh Prasad: Integral Calculus, Pothishala Private Limited, Allahabad.
5. B.S. Grewal: Engg. Mathematics, khanna publishers, New Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- onlinecourses.nptel.ac.in
- en.wikipedia.org

EBT-209: ELEMENTARY BIOLOGY-II

Objective(s): The objectives of this course:

- Provide necessary knowledge of the microbial world, structure and functions of microbes and their relationship to environment and human health.
- Emphasizes on imparting basic construction of a living organism, its metabolism and relation to diseases.

UNIT I: **(8 Sessions)**

Microbiology: Brief history of microbiology**,** Types of microorganisms, Basic idea of domain bacteria, proteobacteria, non proteobacteria Gram –ve and Gram +ve bacteria, lichens, algae, protozoa, helminthes, viral structures, viral multiplication, Role of microorganisms in the production of industrial chemicals and pharmaceuticals.

UNIT II: **(8 Sessions)**

Cells: Functional Anatomy of Prokaryotic and Eukaryotic Cells: Size, shape, and arrangement of bacterial cells. Structure and function of cells.

UNIT III: **(8 Sessions)**

Metabolism: Catabolic &anabolic reactions: enzymes, energy production and carbohydrate metabolism. Lipid & protein catabolism, Energy production mechanism, metabolic diversity & amp; pathways of energy use. Integration of metabolism.

UNIT IV: **(8 Sessions)**

Energy Utilization: Structure of mitochondria, cellular respiration, relationship of carbohydrate metabolism to other compounds, Glycolysis, formation of acetyl co-A, Krebs cycle, Electron Transport System and Oxidative Phosphorylation, ATP, factors affecting respiration.

UNIT V: **(8 Sessions)**

Reproductive health and human welfare: Population and birth control, sexually transmitted diseases, infertility, Cancer and AIDS, Basic concepts of immunology, vaccines.

Course Outcomes:

At the end of the course students will able to:

- Define the science of microbiology, its development and importance in human welfare.
- Acquire knowledge about the organizational and functional aspects of cell and cell organelles.
- Learn about the interactions of the cells with outside environment.
- Learn about the classical genetics and transmission of characters.

Suggested Readings:

1. Biology-Textbook of Class XI, NCERT Publication
2. Biology-Textbook of Class XII, NCERT Publication
3. Microbiology- Pelzer, Tata Mcgraw- Hill Publishing Com. Ltd., 2002
4. An introduction to immunology by C.V. Rao, Narosa publishing house

5. Biology by Peter H Raven, George b Johnson, Kenneth A., Mason, Jonathan Losos, Susan
6. Singer (MacGraw Hill Publication)
7. General Microbiology: Stainer, Adelberg and Ingraham

Website Sources:

- https://routledgetextbooks.com/textbooks/9780815345138/lecture-notes.php
- https://www.slideshare.net
- https://lecturenotes.in/
- https://www.shomusbiology.com/

EPH-201 Engineering Physics-II L T P 3 1 0

Objective: The goal of this course is to familiarize students about electromagnetic theory, magnetic materials, solid state Physics, superconductors and their applications.

UNIT- I (10 Sessions)

Electromagnetic Theory Gauss law, continuity equation, Ampere's Law, Maxwell's equations (differential and integral forms), Pointing vector and Pointing Theorem , propagation of plane electromagnetic waves in free space Non conducting and in conducting media, Skin depth.

UNIT- II (08 sessions)

Dielectric and Magnetic Properties of Materials Dielectric Properties: Dielectric constants, Polarization of dielectric materials, Polarizability, Claussius- Mossotti Equation, Application of dielectric. Magnetic Properties: Magnetization, Magnetic moment, Dia, Para and Ferro magnetism, Langevin theory for diamagnetic material, Hysteresis Curve.

UNIT - III (08 Sessions)

Solid State Physics Energy bands in metals, Semiconductors and insulators, Intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors, P-N junction, Tunnel diode, Zener diode.

UNIT- IV (08 Sessions)

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory (Qualitative only), London's Equation, Properties of superconductors & applications of superconductors.

Nano Materials: Basic principle of nano science and technology, Structure, properties and uses of Fullerene and carbon nano tubes, Application of nano technology.

Unit- V (08 Sessions)

X-Rays: Diffraction of X-rays, Production and properties, Bragg's Law, Bragg's spectrometer, Applications of X-rays.

Ultrasonics: Introduction, Production of Ultrasonics (Magneto striction and piezoelectric methods), properties & applications of Ultrasonic waves.

Course outcome: The students completing this course will be able to:

- Understand Gauss law, Ampere's Law, Maxwell's equations and their applications.
- Study of Propagation of plane electromagnetic waves in free space.
- Understand Dielectric and magnetic properties of the materials.
- Explain Intrinsic and extrinsic semiconductors.
- Construction, Operation and characteristics of diodes.
- Understand concepts of superconductors, Properties of superconductors & applications of superconductors.
- Gain basic knowledge on the properties, production and applications of X-rays.
- Basic principle of nano science and technology and applications of nanotechnology.

References:

1. Concept of Modern Physics: A. BEISER
2. Atomic Physics: Rajam
3. Greiner : Quantum Physics
4. Griffth : Introduction to Electrodynamics
5. S. K. Gupta: Engineering Physics
6. Beiser : Perspective of Modern Physics

Website Sources:

- https://www2.ph.ed.ac.uk
- http://web.mit.edu
- http://pcwww.liv.ac.uk
- http://sites.science.oregonstate.edu
- https://eng.libretexts.org
- https://shodhganga.inflibnet.ac.in
- https://www.electrical4u.com
- https://vardhaman.org

EPH-151/251 **Physics Lab** **L T P 0 0 2**

Objective: To achieve perfectness in experimental skills. The study of practical applications will bring more confidence and to learn the usage of electrical and optical systems for various measurements.

List of Experiments: (Minimum 10 experiments are required to be performed)
(20 Sessions)

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and thento estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter.
10. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up.
11. To determine energy bank gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of thegiven specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

ECE-201/101: Environmental Science

Objective(s): The objectives of this course:

- Provide every student with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment.
- Develop and reinforce new patterns of environmentally sensitive behavior among individuals, groups and society as a whole for a sustainable environment.
- Understand the trans-national character of environmental problems such as global warming, climate change, ozone layer depletion etc. and ways of addressing them, including interactions across local to global scales.

UNIT I: **(12 Sessions)**

Environment: Definition of environment. Environmental education. Need for the public awareness. : Concept of Ecology: Ecosystem, energy and nutrients flow in ecosystem food chain. Environmental segment: Atmospheric structure. Classification of air pollutants, sources of air pollution and their effect on human health and property.

UNIT II: **(10 Sessions)**

Air quality and standard: Meteorological phenomenon and their influence on air quality, lapse rates, dispersion of pollutants. Air pollution control: Introduction to particulates and gaseous pollutants such as SOx, NOx & CO, and their effects.

UNIT III: **(10 Sessions)**

Water quality: Physical. Chemical & biological parameters. Water quality standard, BOD. COD and BOD COD calculations. : Environmental Analysis: pH, alkalinity, conductivity, ammonia, fluoride, sulphate, chloride. Analysis and measurement of gaseous pollutants.

UNIT IV: **(8 Sessions)**

Pollution: Pollution from industry and agriculture. Polymers and plastic, food additives, fertilizers, insecticides, fungicides and herbicides. Heavy metal and energy their environmental implications. Solid waste and its managements. Pollution and public health aspect Environmental Protection- Role of government, initiatives by non-governmental organizations (NGO).

Course Outcomes:

At the end of the course students will able to:

- Understand the issues and challenges related to environmental and ecosystem due to some human activities.
- Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Suggested Readings:

- "Environmental studies" Benny Joseph, Tata McgrawHill-2005.
- "Environmental studies"-Dr D.L. Manjunath, Pearson Education-2006.
- "Environmental studies" R. Rajagopalan, Oxford Publication-2005.
- "Text book of environment science & Technology", M. Anji Reddy, BS Publication.

Website Sources:

- https://www.india.gov.in/official-website-ministry-environment-and-forests-0
- https://www.earthshare.org/environews/

PSD-201: PROFESSIONAL SKILL DEVELOPMENT-I

Objective(s): The objective of this course:

- Develop knowledge and understanding of grammar.
- Develop abilities to make use of the grammar in own writing English.
- Increase understanding and recall of what read and listen is including facts and main idea.
- Enhance competencies in writing paragraph, gist or abstract/précis of the passage in own words/ language and in writing resume, bio-data, letters and applications of different kinds.
- Develop all the four skills of English language.

UNIT I: (8 Sessions)

Basic Applied Grammar and Usage: The Sentences: Parts – Subject and Predicate; Kinds of Sentences and their Transformation. Parts of Speech. Noun: Kinds; Gender; Case; Number; Usage**.** Pronouns: Definition; Kinds; Usage. Adjectives: Kinds, Degrees of Comparison, Transformation of Degrees. Determiners: Kinds: many, many a, a great many; less and fewer; each and every; elder, eldest and older, oldest; much, many; little, a little, the little. Articles: Kinds, Articles and Number system, Articles and Gender system, Omission of Articles, Repetition of Articles**.** Verbs: Kinds; Auxiliaries: Principal Auxiliaries; Modal Auxiliaries; Semi-Modals; Usage.

UNIT II: (8 Sessions)

Basic Applied Grammar Continued: Non-Finite Verbs: Kinds; Infinitives; Gerund; Participle. Adverbs: Kinds and Usage. Prepositions: Kinds and Usage. Conjunctions: Kinds; Usage. Interjections: Definition; Usage.

UNIT III: (10 Sessions)

Clauses and Phrases: Tenses, Active and Passive Voice, Direct and Indirect Speech

UNIT IV: (6 Sessions)

Précis Writing: Techniques of Précis Writing; examples**.** Paragraph Writing: Structure of Paragraph, Construction of Paragraphs; Techniques of Paragraph Writing: Unity, Coherence, Emphasis. Reading Comprehension. Listening Comprehension.

UNIT V: **(8 Sessions)**

Writing of Resume: Bio-Data. Writing of Letters and Applications: Formats; Elements; Kinds: Leave Applications, Job Applications, Order Letters, Letters of Claims and Complaints, Letters of Adjustment.

Course Outcomes:

At the end of the course students will able to:

- Write paragraph, gist or abstract/précis of the passage in own words/ language and resume, bio-data, letters and applications of different kinds.
- Use targeted grammatical structures meaningfully and appropriately in oral and written production.
- Enhance competence in the four modes of literacy: writing, speaking, reading & listening.
- Understand and recall of what read and listen is including facts and main idea.

Suggested Readings:

1. Remedial English Language by Malti Agarwal, Krishna Publications, Meerut.
2. Professional Communication by Malti Agarwal, Krishna Publications, Meerut.
3. High School English Grammar & Composition by Wren & Martin, S. Chand & Company LTD., New Delhi.

Website Sources:

- www.wikipedia.com
- www.englishgrammar.org
- www.usingenglish.com
- www.grammarly.com

EEE-101 / 201 ELECTRICAL ENGINEERING L T P 3 1 0

Objective:

- To provide comprehensive idea about AC and DC circuits and its analysis
- To provide the working principles and applications of basic machines in electrical engineering.

UNIT-I (08 Sessions)

D.C. Circuit Analysis: Network, Active And Passive Elements, Concept of Linearity And Linear Network, Unilateral And Bilateral Elements, Sources, Source Transformation, Kirchhoff's Laws, Star-Delta Transformation, **Network Theorems:** Thevenin's Theorem, Superposition Theorem, Norton's Theorem, Maximum Power Transfer Theorem.

UNIT-II (08 Sessions)

Single Phase AC Circuits:AC Waveforms, Average and Effective Values, Form and Peak Factors, Analysis of Series, Parallel and Series-Parallel RLC Circuits, Active, Reactive and Apparent Powers, Power Factor, Causes of Low Power Factor, Resonance in Series and Parallel Circuits.

UNIT-III (08 Sessions)

Three Phase AC Circuits: Three Phase System, Advantages, Phase Sequence, Star and Delta Connections, Balanced Supply and Balanced Load, Three-phase Power and its Measurement,

Measuring Instruments: Types of Instruments, PMMC and Moving Iron Instrument, Single-Phase Dynamometer Wattmeter, Induction Type Energy Meter

UNIT-IV (08 Sessions)

Magnetic Circuits: Magnetic Circuit Concepts, Analogy between Electric & Magnetic Circuits, Magnetic Circuits with DC and AC Excitations, B-H Curve, Hysteresis and Eddy Current Losses,

Single Phase Transformer: Principle, Working, Construction, E.M.F. Equation, Power Losses, Efficiency, Introduction to Auto-Transformer (Excluding Numericals)

UNIT-V (08 Sessions)

Principles of Electro-Mechanical Energy Conversion,

DC Generator: Construction & Working, E.M.F. Equation of Generator, Types of D.C. Generator, Applications, **D.C. Motor:** Principle of operation, Torque Equation of a Motor, Types of D.C. Motor, Applications (Excluding Numericals)

Three Phase Induction Motor: Construction-(Squirrel cage and slip-ring motor), Principle of Operation, Applications (Excluding Numericals)

Course Outcome: On completion of the course students will be able to:

- Predict the behavior of any electrical and magnetic circuits.
- Formulate and solve complex AC, DC circuits.
- Identify the type of electrical machine used for that particular application.
- Realize the requirement of transformers in transmission and distribution of electric power and other applications.
- Function on multi-disciplinary teams.
- Awareness of general structure of power systems.
- Acquire knowledge about the single phase and three base electrical circuits

References:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, "Basic Electrical Engineering" Tata McGraw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc-Graw Hill
4. T.K. Nagsarkar & M.S. Sukhija, "Basic Electrical Engineering" Oxford University Press
5. W.H. HaytP, "Engineering Circuit Analysis" Mc Graw Hill

Website Sources:

- www.lecturenotes.in
- www.examupdates.in
- www.iare.ac.in
- www.notes.specworld.in
- www.ocw.mit.edu
- www.nptel.ac.in
- www.vlab.co.in

EEE-151/ 251 ELECTRICAL ENGINEERING LAB L T P 0 0 2

List of Experiments: (Minimum 08 experiments are required to be performed)

(16 Sessions)

1. Verification of Kirchhoff's current law.
2. Verification of Kirchhoff's voltage law
3. Verification of Superposition theorem.
4. Verification of Thevenin's Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. To study a Single phase induction motor and its various methods of starting.
7. To study running and speed reversal of a Three Phase Induction Motor and determine the slip.
8. To determine the transformation ratio and turns ratio and current ratio of a single-phase transformer.
9. To study the construction of a dc machine.
10. To study a single phase Induction type Energy meter.

EBT-102/ EBT-202: INTRODUCTION TO BIOTECHNOLOGY

Objective(s): The objectives of this course:

- Introduce students to the global significance of biotechnology, the categories of biotechnology processes and products, and in the context of "traditional" Vs "modern" biotechnology processes and its applications.
- Introduce the developments in the field of biotechnology, genomics and proteomics.
- Introduce to the bioinformatics which is one of the emerging fields in biotechnology.

UNIT I: (8 Sessions)

Introduction to Biotechnology: Fundamentals of Biochemical Engineering, Biotechnology and Society-Principles and Processes; Application in Health, food, medicine and Agriculture; genetically modified organisms (GMO); biosafety issues.

UNIT II: (8 Sessions)

Biomolecules: Building Blocks of Biomolecules-Structure and dynamics. Structure and function of Macromolecules (Carbohydrates, Proteins, Lipids). Classification of Enzymes-Purification and characterization of enzymes from natural sources. Comparison of chemical and enzyme catalysis.

UNIT III: (8 Sessions)

Cell as a basic unit of life: Introduction: Definition, Study of Microbes, Types of microbes, Classification of microbes. Origin of microbiology. Application of microbes in fermentation Biotechnology. Cellular Techniques including chromatography.

UNIT IV: (8 Sessions)

History of Bioinformatics: Introduction and application. Biological databases (nucleotide and protein data bases, Structure databases) and their retrieval. Sequence file formats. Information Sources Analysis using Bioinformatics tools.

UNIT V: (8 Sessions)

Genomics: Introduction Genome Sequencing Projects, Gene Prediction and counting, Genome similarity, SNP's and comparative genomics.

Course Outcomes:

At the end of the course students will able to:

- Understand basic concepts in components of cell, structure and biochemical functions.
- Acquire basic concepts of nucleic acids and its structures
- Search and retrieve information from genomic and proteomic databases (e.g. GenBank, Swiss-Prot), and to analyze their search results using software available on the internet (e.g. BLAST, ClustalW).
- Learn the theory of genome sequencing and other predictions.

Suggested Readings:

1. Introduction to Biotechnology by William J. Thieman, Michael A. Palladino, Publisher: Benjamin Cummings.
2. Basic Biotechnology by Colin Ratledge Publisher: Cambridge University Press.
3. Text book of Biotechnology by H.K.Dass (Wiley India publication).
4. Biotechnology by B.D.Singh (Kalyani Publishers).

5. Text book of Biotechnology by R.C.Dubey (S.Chand and company).

Website Sources:

- https://onlinecourses.nptel.ac.in/
- https://www.wikipedia.org/
- https://www.ncbi.nlm.nih.gov/books

EBT-252: Introduction to Biotechnology Lab

1.	Introduction of Laboratory Practices	
2.	Safety Measures	
3.	Do and Don't	
4.	About Equipments and Accessories: Principle and Working	
5.	Introduction to Laboratory Instruments	Experiment 1
6.	To learn the Preparation of media	Experiment 2
7.	Isolation of microbes from the given sample by spread plate technique	Experiment 3
8.	To characterize bacterial colony using gram staining	Experiment 4
9.	Preparation of buffers and measurement of pH	Experiment 5
10.	Identification of carbohydrates by Molisch's test	Experiment 6
11.	Estimation of reducing sugars by Benedict test	Experiment 7
12.	To distinguish between polysaccharides and other carbohydrates (Iodine test)	Experiment 8

EME 153/253 Engineering Graphics Lab L T P 0 0 2

1. Introduction (03 Sessions)

Introduction, Drawing Instruments and their uses, BIS conventions, Lines & Lettering, Dimensioning and free hand practicing. Coordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale.

2. Orthographic Projections (05 Sessions)

Introduction, Definitions- Planes of projection, reference line and conventions employed. Principle of Orthographic projections, First and Third Angle projections.

Projection of Points, Pictorial view.

Terms used in Projection of lines. Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems. **(First Angle Projection Only)**

3. Projections of Solids (First Angle Projection Only) (06 Sessions)

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. Sections and Development of Lateral Surfaces of Solids, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. Development of lateral surface of above solids, their frustums and truncations.

4. Isometric Projection (Using Isometric Scale Only) (06 Sessions)

Introduction, Principle of isometric projection, Terminology, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids.

EAG302 Principles of Soil Science, Agronomy & Horticulture Crops L:T:P 3:0:0

Objective: This course enables the Graduates to gain knowledge of basics of agriculture to improve the efficacy and sustainability of agricultural practices.

UNIT-I

Soils: Nature and origin of soil; soil forming rocks and minerals, their classification and composition, soil forming processes, classification of soils – soil taxonomy orders; soil physical properties; and their importance; soil particle distribution; soil inorganic colloids – their composition, properties and origin of charge; ion exchange in soil and nutrient availability

UNIT- II

Soil Organic Matter: Composition and decomposition of soil organic matter, effect on soil fertility; soil reaction – acid, saline and sodic soils; quality of irrigation water; essential plants nutrients – their functions and deficiency symptoms in plants; important inorganic fertilizers and their reactions in soils.

UNIT- III

Agronomy: Definition and scope of agronomy, classification of crop and the effect of different weather parameters on the growth and development of crop. Principles of tillage, tilth and it's characteristics. Soil water plant relationship and water requirement of crops, weeds and their control, crop rotation, cropping systems, Relay cropping and mixed crop.

UNIT- IV

Horticulture: Scope of horticultural and vegetable crops. Soil and climatic requirements for fruits, vegetables and floriculture crops, improved varieties,

UNIT- V

Criteria for site selection: layout and planting methods, nursery raising, macro and micro propagation methods, plant growing structures, pruning and training, fertilizer application, fertigation, irrigation methods. Harvesting, grading and packaging, Post harvest practices, Garden tools, management of orchard, Extraction and storage of vegetables seeds.

Course Outcomes:

The Students will understand the different types of soils, rocks, characteristics and Identifications.

- The Students will understand the layout and planting methods of horticultural crops.
- Identify the different types of soil and organic matters.
- Identify the different types of equipment for tillage operations.
- The students will able to understand about the essential plants nutrients.

References:

1. Nyle C. Brady, The Nature and Properties of Soils, Pearson Prentice Hall, 2007
2. T.D. Biswas, Text Book of Soil Science, TMH, 2006
3. P. Balasubramaniyan, Principles and Practices of Agronomy, 2004
4. T. Yellamandra Reddy, Principles of Agronomy, Kalyani Publications, 2007

Website Source:

- www.onlineecourses.nptel.ac.in
- http://ecoursesonline.iasri.res.in/
- www.agrimoon.com

EAG352 Soil Science, Agronomy and Horticulture Lab L:T:P 0:0:2

List of Experiments: Minimum 08 experiments out of the following:

1. Identification of rocks and minerals.
2. Examination of soil profile in the field.
3. Determination of bulk density.
4. Determination particle density and porosity of soil.
5. Identification of crops and their varieties seeds and weeds.
6. Different weed control methods.
7. Judging maturity time for harvesting of crop.
8. Study of seed viability and germination test.
9. Identification and description of important fruit; flowers and vegetables crops,
10. Study of different garden tools.
11. Preparation of nursery bed.
12. Practices of pruning and training in some important fruit crops.

EME 308 Fluid Mechanics and Open Channel Hydraulics L:T:P 3:0:0

Course Objective: The objective of this course is to familiarize the students with the properties of fluids and the applications of fluid mechanics. To formulate and analyze the problems related to fluid flow. To understand the concept of flow measurement, types of flows and dimensional analysis.

UNIT I: (8 Sessions)

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

UNIT II: (8 Sessions)

Kinematics of fluid flow: Lagrangian and Eulerian description of fluid motion, continuity equation, path lines, streak lines and stream lines, stream function and velocity potential. Types of fluid flow, translation, rotation, circulation and vorticity.

UNIT III: (8 Sessions)

Dynamics of fluid flow: Bernoulli's theorem, venturimeter, orifice meter and pitot tube. Flow through orifices and mouthpieces, flow over notches and weirs, flow through open channels.

UNIT IV: (8 Sessions)

Flow through pipes: Chezy's formula for loss of head in pipes, flow through simple and compound pipes, minor and major hydraulic losses through pipes and fittings, flow through siphon.

UNIT V: (8 Sessions)

Dimensional analysis and similitude: Rayleigh's method and Buckingham's `Pi' theorem, types of similarities, dimensional analysis, dimensionless numbers. Introduction to fluid machinery, Hydraulic pumps.

Course Outcomes:

Students completing this course will be able to:

- Understand stress-strain relationship in fluids, classify their behavior and also establish force balance in static systems.
- To apply Bernoulli principle and compute pressure drop in flow systems of different configurations.

- To describe function of flow measuring devices and apply Bernoulli equation to determine the performance of these devices.
- To measure the fluid pressure using various types of pressure measuring devices.

References:

1. Som, S K & Biswas, G: Introduction of fluid mechanics and fluid machines, TMH, 2000.
2. Das, M M: Fluid mechanics & turbomachines , Oxford University Press.
3. Agarwal, S K: Fluid mechanics and machinery, TMH.
4. Rouse, H: Elementary mechanics of fluids, John Wiley & Sons, 1946.
5. Gupta, V and Gupta, S K: Fluid Mechanics and its Applications, Wiley Eastern Ltd, 1984.

Website Sources:

- www.nptel.ac.in/course.html
- www.nsf.gov
- en.wikipedia.org
- www.sciencedirect.com
- www.slideshare.net
- www.researchgate.net

EME358 Fluid Mechanics Lab L:T:P 0:0:2

List of Experiments: Minimum 08 experiments out of the following:

1. Study of manometers and pressure gauges.
2. Verification of Bernoulli's theorem.
3. Determination of coefficient of discharge of Venturi-meter.
4. Determination of coefficient of discharge of orifice meter.
5. Determination of coefficient of friction in pipeline.
6. Determination of coefficient of discharge for triangular notch.
7. Determination of coefficient of discharge, coefficient of velocity and coefficient of contraction for flow through orifice.
8. Determination of coefficient of discharge for mouth piece.
9. Measurement of force exerted by water jets on flat.
10. Determination of meta-centric height.
11. Determination of efficiency of hydraulic ram.
12. Performance evaluation of Pelton and Francis turbine.
13. Study of current meter.

ECE306 Surveying Practices L:T:P 3:1:0

Objective: The objective of this course is to introduce the students about the basic concept of measurement such as distance, direction and elevation and to explore the knowledge of instruments used for measurement such as Auto level, theodolite, compass, total station.The objectives of surveying may vary depending on the type of project such as roads, public transit systems, bridges, power plants, dams, pipelines and waste management systems.

UNIT - I

Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys. Linear measurement, compass survey, bearing, meridian, survey station and survey line.

UNIT – II

Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction, automatic levels, Contouring-methods and uses.

UNIT – III

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves.

Principles, plane table equipments, methods, resection by three point problem

UNIT – IV

Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, inter-visibility of stations, triangulation field work.

UNIT – V

Global Positioning Systems: GPS Overview, Satellite Constellation, Equipment Segment, Principle of Position Determination via Satellite Generated Ranging Signals, GPS Surveying Techniques, GPS Accuracy, Uses and Applications of GPS

Total Station: Introduction and application

Course Outcomes:

At the end of the course, the student will be able to:

- Apply the principle and knowledge of surveying for civil Engineering Applications

- Calculation of areas, Drawing plans and contour maps using different measuring equipment.
- Use and operate measurement related traditional and modern instruments.

Reference Books:

1. "Surveying Vol 1 & 2", S K Duggal; TMH
2. "Surveying & Leveling"; R Subramanian; Oxford University Press
3. "Surveying & Leveling"; B C Punamia
4. "Text Book of Surveying"; C Venkatramaih University Press

Website resources:

- https://nptel.ac.in/courses/105/107/105107122/
- http://ecoursesonline.iasri.res.in/course/view.php?id=523
- https://freevideolectures.com/course/98/surveying

ECE356 Surveying Practices Lab L: T:P 0:0:2

1. To find out the angle with the help of Compass.
2. Study of different types of topographical maps and to prepare conventional symbols chart
3. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
4. To find out reduced levels of given points using dumpy/Auto level
5. To study parts of a vernier / Electronic theodolite and practice for taking angle measurements.
6. To measure vertical and horizontal angle of given points by Electronic theodolite.
7. To determine the height of wall using theodolite.
8. To carry out the general study of GPS
9. Demonstration & Study of Total Station

EME306 Heat & Mass Transfer L:T:P 3:1:0

Objective: This course is designed to introduce a basic study of the phenomena of heat transfer such as conduction convection and radiation, and to provide useful information concerning the performance and design of particular heat exchanger systems and processes. A knowledge-based design problem requiring the formulations of solid conduction and fluid convection and the technique of numerical computation progressively elucidated in different chapters will be assigned and studied in detail.

UNIT – I

Concept, modes of heat transfer, thermal conductivity of materials, measurement. General differential equation of conduction. One dimensional steady state conduction through plane and composite walls, tubes and spheres with and without heat generation. Electrical analogy. Insulation materials.

.**UNIT-II**

Free and forced convection. Newton's law of cooling, heat transfer coefficient in convection. Dimensional analysis of free and forced convection. Useful non dimensional numbers. Equation of laminar boundary layer on flat plate and in a tube. Laminar forced convection on a flat plate and in a tube. Combined free and forced convection.

UNIT-III

Introduction Absorptivity, reflectivity and transmissivity of radiation. Black body and monochromatic radiation, Planck's law, Stefan-Boltzman law, Kirchoff's law, grey bodies and emissive power, solid angle, intensity of radiation. Radiation exchange between black surfaces, geometric configuration factor. Heat transfer analysis involving conduction, convection and radiation by networks.

UNIT-IV

Types of heat exchangers, fouling factor, log mean temperature difference, heat exchanger performance, transfer units. Heat exchanger analysis restricted to parallel and counter flow heat exchangers.

UNIT-V

Steady state molecular diffusion in fluids at rest and in laminar flow, Flick's law, mass transfer coefficients. Reynolds's analogy.

Course outcomes: Students completing this course will be able to

- Understand the basic laws of heat transfer.
- Analyze problems involving steady state heat conduction in simple geometries.
- Understand the fundamentals of convective heat transfer process.
- Evaluate heat transfer coefficients for natural convection and forced convection inside ducts.

- Calculate radiation heat transfer between black body surfaces & heat exchange between gray body surfaces

References:

1. Heat Transfer, by J.P. Holman, McGraw-Hill International edition.
2. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
3. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt). Ltd.
4. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers

Suggested Readings:

- https://www.brighthubengineering.com/hvac/5231-what-is-heat-transfer/
- https://www.researchgate.net/profile/Md_Washim_Akram/post/Good_books_on_Fluid_mechanics_and_Heat_Transfer/attachment/5ab22ae44cde266d5892d50a/AS%3A606556357918729%401521625713296/download/heat-transfer-a-practical-approach-by-y-a-cengel.pdf
- https://scholars.unh.edu/day20/33/
- https://nptel.ac.in/courses/112/107/112107211/

EMA – 303 ANALYTICAL MATHEMATICS

Objective: -The main aims of this course are to provide suitable and effective methods by numerical analysis, for obtaining approximate representative numerical results of the problems. To have a proper understanding of Laplace transforms for solve engineering problems and its applications in the field of Agricultural engineering.

UNIT – 1 (12 Sessions)

Finite difference: Various difference operators and their relationships factorial notation.

Interpolation with Equal Intervals: Newton's forward and Newton's backward interpolation formulae, Bessel's and Stirling's Central difference interpolation formulae.

Interpolation with Unequal Intervals: Introduction, Divided differences, divided difference table, Newton's divided difference formula, Lagrange's interpolation formula, Lagrange's inverse formula, Hermite interpolation formula.

UNIT – 2 (10 Sessions)

Numerical Differentiation: Numerical differentiation based on equal interval interpolation, First and Second order derivatives by using Newton's forward , Backward interpolation formulae, Bessel's and Stirling's formulae. Numerical Integration by using Trapezoidal rule, Simpson's one-third and three-eighth rules, Weddle's rule**.**

UNIT – 3 (10 Sessions)

Numerical Solution of Ordinary Differential Equations by Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge–Kutta's method.

UNIT – 4 (10 Sessions)

Laplace Transforms: Definition of Laplace transform, Laplace transforms of elementary functions, Properties of Laplace transform, Inverse Laplace transforms, Transforms of derivatives, Integrals, Transform of function multiplied by t^n, Transform of function divided by t, Convolution theorem, Laplace transforms of unit step function, Unit impulse function, Periodic function.

UNIT – 5 (10 Sessions)

Applications of Laplace transform to solve ordinary differential equations and simultaneous differential equations.

Course Outcomes:

The student is able to

- Apply Numerical analysis which has enormous applications in the field of Science and engineering.
- Understand numerical integration and differentiation, numerical solution of ordinary differential equations.
- Know the use of Laplace transform solving Boundary Value problems.
- Evaluate the problems of Laplace transform and its applications in engineering.

References:

1. V. Raja Raman: Computer Oriented Numerical Methods, PHI.
2. Gupta & Malik: Numerical Analysis. Krishna Prakashan media, Meerut.
3. B. S. Grewal: Numerical methods in Engineering and Science, Khanna Publishers, Delhi.
4. Pradip Niyogi : Numerical Analysis and Algorithms, TMH.
5. R.K. Jain,Iyenger: Numerical Analysis. New Age International Publisher, New Delhi.

Website Sources:

- www.pdfdrive.com
- www.dmi.gov.in
- www.yourarticlelibrary.com
- www.onlinecourses.nptel.ac.in
- en.wikipedia.org

PROFESSIONAL SKILL DEVELOPMENT-II

(ECR-301/ECR-401/MCA-301)

Followed in B. Tech. & MCA

II Year, III/IV Semester

w.e.f. July, 2018 **Credit: 04**

Objectives: The objectives of Professional Skill Development-IIare:

- To develop critical thinking, creativity and effective communication.
- To provide the essential foundational elements for leadership skill-building and student success.
- To explore self-awareness that involves identification and articulation of various facets – cultural, social, and familial that contribute to the formation of one's identity.
- To develop mutually beneficial relationships through communication and cooperation with others, collaborate to achieve group goals, practice living and leading with integrity, and learn about issues of local and global significance in order to become active members of their communities.

Unit I: Communicative Skills (Session-05)

Communication: Concept, Classification, Purpose, Process, Importance, Flow & Level of Communication, Barriers & Gateways in Communication, 7 C's of Communication, Types of Communication & communication without words

Unit II: Intrapersonal Relationship Skills (Session-07)

Personality: Characteristics of Healthy & Sick Personality

Self Awareness

Self Esteem

Self Confidence

Assertiveness V/S Aggressiveness

Values: Types & Importance

Unit III: Interpersonal Relationship Skills (Session-08)

Group: Concepts, Types, Stages

Team: Concepts, Elements, Types, Stages

Presentation Skills& strategies

Interview: Concepts, Types, Process, Interview Preparation Checklist, Interview Handling Skills, Common Interview mistakes

Unit IV: Argumentative Skills (Session-10)

Debate

Role Play

Speeches

Elocution

Group Discussion

Unit V: Campus to Company Skills (Session-08)

The corporate Fit: Dressing and Grooming

Basic Etiquette: Office (Do's and Don'ts for men and women), Telephone, Email

Dealing with People in Corporate

Course Outcomes:

Students completing this course will be able to:

- Apply the comprehensive set of skills and knowledge for life success.
- understand the communication process, its benefits and challenges
- Learn to effectively lead others on a project or in an organization
- Develop and articulate respect for the diversity of talents, ways of knowing and learning.

References:

1. M.K. Sehgal & V. Khetrapal's Business Communication published by Excel Books.
2. Rajendra Pal's Business Communication published by Sultan Chand & Sons Publication.
3. P. D. Chaturvedi's Busines Communication published by Pearson Education, Delhi.
4. Elizabeth B. Hurlock's Personality Development by Tata McGraw Hills, Delhi.

Website Sources:

- www.wikipedia.com
- www.fluentu.com
- www.mindstool.com
- www.digitalcommons.pace.edu

EEE306 Electrical Machines & Power Utilization

Objective:

1. The educational objective of Electrical Machines & Power Utilization course is to provide in-depth understanding of Alternating Current & Magnetic Circuit and utilization of Electrical Energy.
2. In this course the different types of Transformer, DC motors & Induction Motor which are widely used in industry are covered and their performance aspects will be studied.
3. Fundamental Concept of Single Phase and Polyphaser Induction motor and working of DC generator along with basic knowledge of Alternating and Direct current are acquired.

UNIT-I (08Sessions)

Transformer: Principle of working, construction of single phase transformer, types of transformers, ratio of transformation, EMF equation, phasor diagram on load, leakage reactance, voltage regulation, losses and efficiency, open circuit and short circuit tests, Back to Back test, method of cooling transformers.

UNIT-II (08Sessions)

Polyphase Induction Motor: Synchronous speed & slip, construction, operation, phasor diagram, effect of rotor resistance, torque equation, starting and speed control methods. **Single Phase Induction Motor:** Double field revolving theory, equivalent circuit, characteristics, various methods of starting, phase split, shaded pole motors.

UNIT-III (08Sessions)

DC Machine: Principles, operation and performance of DC machine (generator and motor), types of D.C. machine, EMF and torque equations, armature reaction, commutation, excitation of DC generator and their characteristics, condition for self excitation, DC motor characteristics, starting of shunt and series motor, starters, speed control methods-field and armature control.

UNIT-IV (08Sessions)

A.C. Circuit: Various methods of three phase power measurement, power factor, reactive and apparent power, concept and analysis of balanced poly-phase circuits, series and parallel resonance.

UNIT-V **(08Sessions)**

Magnetic Circuit: Electro motive force, reluctance, laws of magnetic circuits, analogy between electric & magnetic circuits, determination of ampere-turns for series and parallel magnetic circuits, B-H Curve, hysteresis and eddy current losses.

Course Outcomes:

On completion of the course, student will be able to

- Acquire knowledge about the fundamental principles and classification of alternating current, magnetic circuit & electromagnetic machines.
- Acquire knowledge about the constructional details and principle of operation of transformer DC & AC machines.
- Acquire knowledge about the working of DC machines, induction machine and generators.
- Acquire knowledge about testing and applications of Single phase & polyphaser induction motor.
- Acquire knowledge about the constructional details, principle of operation, testing and applications of transformers.
- Develop the equivalent circuit and phasor diagram of different machines and analyze their performance using the equivalent circuit.

References:

1. D. P. Kothari & I. J. Nagrath, “Electric Machines”, Tata McGraw Hill
2. Fitzerald, A. E., Kingsley and S. D. Umans “Electric Machinery”, MC Graw Hill.
3. P. S. Bhimbhra, “Electrical Machinery”, Khanna Publisher
4. M. G. Say, “Alternating Current Machines”, Pitman & Sons
5. B. L. Thareja & A. K. Theraja “A text book of Electrical Technology” Vol. I S.Chand & Company LTD., New Delhi.
6. V. Del Toro, “Principles of Electrical Engineering” Prentice Hall International.

Website Sources:

- www.lecturenotes.in
- www.academia.edu
- www.electrical-engineering-portal.com
- www.nptel.ac.in
- www.newtondesk.com

EEE-356 Electrical Machines and Power Utilization Lab L:T:P 3:1:0

Minimum 08 experiments out of the following:

1. To determine the transformation ratio, turns ratio and current ratio of a transformer & prove that they are equal.
2. To determine efficiency and voltage regulation of a single phase transformer by load test.
3. To determine efficiency and voltage regulation of a single phase transformer by open circuit and short circuit test.
4. To perform load-test on three phase induction motor & to plot torque-speed characteristics.
5. To perform no-load & blocked-rotor tests on 3 ph. Induction motor to obtain equivalent circuit parameters.
6. To start a 3-phase slip-ring induction motor by inserting different levels of resistance in the rotor circuit and to plot torque-speed characteristics.
7. To perform load-test on single phase induction motor & plot torque–speed characteristics.
8. To control the speed of a D.C. shunt motor using (a) armature control method (b) field control method.
9. To plot load characteristics of a D.C. shunt generator.
10. To plot load characteristics of a D.C. series generator.

ECE357 **Auto CAD Applications lab** **L:T:P 0:0:2**

List of experiments

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing
2. Practice on setting up of drawing- SNAP, GRID, LIMITS, UNITS, etc.
3. Practice on drawing basic entities- Line, Circle, Arc, Rectangle, Ellipse, etc.
4. Practice on various edit / modify commands- COPY, MOVE, MIRROR, ROTATE, etc.
5. Layout drawing of a building using different layer and line colors indicating all Building details.
6. Draw 3D models by extruding simple 2D objects, dimension and name the objects
7. Draw a spiral by extruding a circle
8. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion

EAG404 Farm Machinery and Equipment-I L:T:P 3:1:0

Objective: To identify the need of farm mechanization in India. Also equip the students with technical knowledge and skills required for the operation, maintenance and evaluation of Tillage, Sowing and intercultural operational machinery needed for agricultural farms.

UNIT-I

Introduction to farm mechanization. Classification of farm machines. Unit operations incrop production. Identification and selection of machines for various operations on the farm. Hitching systems and controls of farm machinery.

UNIT-II

Calculation of field capacities and field efficiency. Calculations for economics of machinery usage, comparison of ownership with hiring of machines. Introduction to seed-bed preparation and its classification. Familiarization with land reclamation and earth moving equipment.

UNIT-III

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.

UNIT-IV

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.

UNIT-V

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.

Course Outcomes:

Students completing this course will be able to:

- The students will be able to understand the mechanization and various equipment used in the farm for different field operations.
- Familiar with farm mechanization, and able to identify the major functional components and forces acting on various tillage implements. Hitching systems,
- Machinery used for various tillage operations and analyze the measurement of draft and power requirement of tillage machineries.
- Understand and evaluate the Calibration of seed-drills and planters. Familiar with plant protection equipments. Evaluate the calibration of sprayers.

References:

1. Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.
2. Smith HP and LH Wilkey. Farm Machinery and Equipment.
3. Culpin Claude. Farm Machinery.
4. Srivastava AC. Elements of Farm Machinery.
5. Lal Radhey and AC Datta. Agricultural Engineering.

Website Source:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in

EAG454 Farm Machinery and Equipment Lab L:T:P 0:0:2

Minimum 08 experiments out of the following:

1. Familiarization with different farm implements and tools.
2. Identification of materials of construction in agricultural machinery and study of material properties.
3. Study of hitching systems, Problems on machinery management.
4. Study of primary and secondary tillage machinery
5. Calculations of power and draft requirements.
6. Study of sowing equipments.
7. Study of planting equipments.
8. Calibration of seed drill.
9. Study of Transplanters – paddy, vegetable, etc.

Study of heat treatment processes subjected to critical components of agricultural machinery.

EAG405 Soil Mechanics L:T:P 3:0:0

Objectives: To impart the knowledge of basic properties of soil, analysis of stresses, bearing capacity of soil etc.

UNIT- I

Introduction of soil mechanics, field of soil mechanics, phase diagram, physical and index properties of soil, classification of soils, elementary concept of Boussinesq and Western guards analysis, new mark influence chart.

UNIT- II

Seepage Analysis. Velocity potential and stream function, Flow net construction. Shear strength, Mohr stress circle, theoretical relationship between principle stress circle, theoretical relationship between principal stress, Mohr coulomb failure theory, effective stress principle.

UNIT- III

Determination of shear parameters by direct shear test. Numerical exercise based on various types of tests. Compaction, composition of soils standard and modified protector test, abbot compaction and Jodhpur mini compaction test field compaction method and control.

UNIT- IV

Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory, Laboratory consolidation test, calculation of void ratio and coefficient of volume change, Taylor's and Casagrande's method, determination of coefficient of consolidation.

UNIT- V

Earth pressure: plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure, active and passive earth pressure for cohesive soils, simple numerical exercises. Stability of slopes: introduction to stability analysis of infinite and fnite slopes friction circle method, Taylor's stability number.

Course Outcomes:

The student will be able to-

- At the end of the course, the students will be able to: Compute various engineering properties of different types of soil
- Apply the knowledge of soil mechanics to design various types of structures
- Select a particular type of soil for utilization under specific conditions in nature
- Develop a plan for suitability of soil conservation structures at a location

References:

1. Punmia B C, Jain A K and Jain A K. 2005. Soil Mechanics and Foundations. Laxmi Publications (P) Ltd. New Delhi.
2. Ranjan Gopal and Rao A S R. 1993. Basic and Applied Soil Mechanics. Welley Easters Ltd., New Delhi.
3. Singh Alam. 1994. Soil Engineering Vol. I. CBS Publishers and Distributions, Delhi.

Website Sources:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in

EAG455 Soil Mechanics Lab L:T:P 0:0:2

Minimum 08 experiments out of the following:

1. Determination of water content of soil;
2. Determination of specific gravity of soil.
3. Determination of field density of soil by core cutter method;
4. Determination of field density by sand replacement method;
5. Grain size analysis by sieving (Dry sieve analysis);
6. Determination of liquid limit by Casagrande's method;
7. Determination of liquid limit by cone penetrometer and plastic limit;
8. Determination of shrinkage limit;
9. Determination of permeability by constant head method;
10. Determination of permeability by variable head method;
11. Determination of compaction properties by standard proctor test;
12. Determination of shear parameters by Direct shear test;
13. Determination of unconfined compressive strength of soil;

EAG406 Dairy and Food Engineering L:T:P 3:0:0

Objectives: To acquaint the students with various dairy engineering operations such as homogenization, pasteurization, thermal processing, evaporation, freezing and drying of milk.

UNIT- I

Deterioration in food products and their controls, Physical, chemical and biological methods of food preservation. Nanotechnology: History, fundamental concepts, tools and techniques nonmaterial's, applications in food packaging and products, implications, environmental impact of nanomaterials and their potential effects on global economics, regulation of nanotechnology. Dairy development in India, thermal and chemical properties of milk and milk products

UNIT- II

Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Unit operation of various dairy and food processing systems. Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation.

UNIT- III

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; Principles of operation and equipment for thermal processing, Canning, Aseptic processing.

UNIT- IV

Evaporation: principle, types of evaporators, steam economy, multiple effect evaporation, vapour recompression, Drying of liquid and perishable foods: principles of drying, spray drying, drum drying, freeze drying.

UNIT- V

Filtration: principle, types of filters; Membrane separation, RO, Nano-filtration, Ultra filtration and Macro-filtration, equipment and applications, Non-thermal and other alternate thermal processing in Food processing.

Course Outcomes:

- The students will gain knowledge about Dairy and Food process engineering

- Understand the process of manufacturing of dairy products and thermal processing of food.
- The Students will understand the importance of quality control and food preservation and packaging.
- The students gain a good knowledge on the various processes and equipments used in the processing of milk and milk products.
- The student will discover the biotechnological approaches in the field of dairy.

References:

1. Brennan, J.G., Butters,J.r. Cowell, N.D. and Lilly, A.E.V. 1976. Food Engineering Operations Applied Science Publihers
2. Farrall, A.W. 1967. Engineering for Dairy and Food Products Wiley Eastern Pvt. Ltd. New Delhi.
3. Kessler, H.G. 1981. Food Engineering and Dairy Technology Verlag A. Kessler, Freising, F.R. Germany
4. Earle, R.L**.** Unit Operations in Food Processing. Pergamon Press, Oxford
5. McCabe, W.L., Smith, J.C. and Harriott, P. 1993. Unit Operations of Chemical Engineering McGraw Hill, Inc. New York.

Website Source:

- https://nptel.ac.in/courses/126/105/126105013/

EAG456 Dairy and Food Engineering Lab L:T:P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Determination of the composition of milk and its properties (fat content, total solids, specific gravity, acidity, pH, viscosity etc)
2. Study of milk plant.
3. Study of plate heat exchanger and tubular heat exchanger.
4. HTST pasteurization of milk.
5. Centrifugal separation of milk.
6. Study of vacuum pan and rising film evaporators
7. Visit to milk food factory.
8. Spray drying of milk
9. Study of drum dryer
10. Study of soya milk process and related equipments
11. Design of food processing plant and preparation of layout

EME405 Strength of Materials L:T:P 3:0:0

Objectives: To give the fundamental knowledge of deflection and bending of beam, column and struts under various type of loading. To understand the effect of combined (direct and bending) stresses on different members. To study welding joint and riveted joints and their failure. To understand how the analysis of statically indeterminate beams and stability of dams can be done.

UNIT –I

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

UNIT – II

Columns and Struts, Struts with different end conditions. Euler's theory and experimental results, Ranking Gardon Formula.

UNIT – III

Combined Direct and Bending Stresses, Load acting eccentrically to one axis, Condition for no Tension in the Section, Effect of Wind Pressure.

UNIT – IV

Riveted and welded connections, Type of riveted joints, Failure of riveted joints, Types of welds, Strength of butt welds.

UNIT – V

Stability of masonry dams. Analysis of statically intermediate beams. Propped beams. Fixed and continuous beam analysis using superposition, three moment equation and moment distribution methods.

Course Outcomes: The outcomes of this course for the students are as follows

- Will be able to design beams in respect deflection and slope in structures.
- Will be able to analyze the beams, column and strut used in various structures.
- Will understand the role of joining of solid members by welding and rivets and cause of failure.

References:

1. Strength of Materials by Ryder.
2. Strength of Materials by Dr. R.K. Bansal.
3. Strength of Materials by Timoshenko &Yσungs.
4. Strength of Materials by S. Ramamrutham.
5. Strength of Materials by R. K. Rajput.
6. Strength of Materials by Khurmi R.S., S. Chand & Co., Ltd., New Delhi.
7. Mechanics of Structures (Vo-I), by Junarkar S.B., Choratar Publishing House, Anand.

Website Resources:

- www.nptel.ac.in
- https://orioncbse.kces.in/pdf/tutorials/1547024773course_strength%20of%20materials.pdf
- https://drive.google.com/file/d/1OqMj6d-Uxbv1nWwQqth15YoctRYqq8S_/view

EME -406 Thermal Engineering L: T: P 3:0:0

Objective: The objective of this course is the study of energy and its transformation. Most studies of thermodynamics are primarily concerned with two forms of energy – heat and work. Thermodynamics study includes quantitative analysis of machine and processes for transformation of energy and between work and heat. In classical thermodynamics a macroscopic viewpoint is taken regarding such matters. The term thermodynamics was first introduced by Lord Kelvin in 1849. The term comes from the Greek words ***therme*** (heat) and **dynamics** (power).

Unit – I

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow processes. **(06 Session)**

Unit-II

Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamics process. Principles of refrigeration, - units, terminology, production of low temperatures, air refrigerators working on reverse Carnot cycle and Bell Coleman cycle. **(10 Session)**

Unit – III

Vapour refrigeration-mechanism, P-V, P-S, P-H diagrams, vapour compression cycles, dry and wet compression, super cooling and sub cooling. Vapour absorption refrigeration system. Common refrigerants and their properties. **(10 Session)**

Unit – IV

Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement, psychometric chart and its use, elementary psychometric process **(07 Session)**

Unit – V

Air conditioning – principles –Type and functions of air conditioning, physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers .**(07 Session)**

Course Outcomes:

Students completing this course will be able to:

- Identify and use units and notations in Thermodynamics.
- State and illustrate first and second laws of Thermodynamics

- Explain the concepts of entropy, enthalpy, reversibility and irreversibility.
- Apply the first and second laws of Thermodynamics to various gas processes and cycles.
- To get conversant with properties of steam, dryness fraction measurement, vapor processes and Thermodynamic vapor cycles, performance estimation.
- To get conversant with Psychometric Charts, Psychometric processes, human comfort conditions.

Suggest Readings:

1. Kothandaraman C P Khajuria P R and Arora S C. 1992. A Course in Thermodynamics and Heat Engines. Dhanpet Rai and Sons, 1682 Nai Sarak, New Delhi.
2. Khurmi R S. 1992. Engineering Thermodynamics. S Chand and Co. Ltd., Ram Nagar, New Delhi.
3. Mathur M L and Mehta F S. 1992. Thermodynamics and Heat Power Engineering. Dhanpat Rai and Sons 1682 Nai Sarak, New Delhi.
4. Ballney P. L. 1994. Thermal Engineering. Khanna Publishers, New Delhi.
5. Nag P K. 1995. Engineering Thermodynamics. Tata McGraw Hill Publishing Co.Ltd., 12/4 Asaf Ali Raod, New Delhi.

Website Sources:

- https://nptel.ac.in/courses/112/104/112104113/
- https://www.ohio.edu/mechanical/thermo/
- https://freevideolectures.com/course/2681/basic-thermodynamics
- https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/video-lectures/

EME456 Thermal Engineering Lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Tutorials on thermodynamic air cycles,
2. Study and application of P V and T S chart in refrigeration, P H chart (or) Mollier diagram in refrigeration,
3. Numerical on air refrigeration cycle systems,
4. Numerical on vapour compression cycle refrigeration system,
5. Study of domestic water cooler,
6. Study of domestic household refrigerator,
7. Study of absorption type solar refrigeration system,
8. Study of cold storage for fruit and vegetables, Freezing load and time calculations for food materials,
9. Determination of refrigeration parameters using refrigeration tutor – II,
10. Numerical on design of air conditioning systems,
11. Study of window air conditioner,
12. Study on repair and maintenance of refrigeration and air-conditioning systems.
13. Visit to chilling or ice making and cold storage plants.

EEC408 Basic Electronics and Instrumentation

(For B. Tech. AG 2nd Year IV Semester)

Course Objective:

- *Agriculture Graduates will have the fundamental knowledge in Basic electronics and instrumentation.*
- *Understand the equipment used in temperature, pressure, and velocity measurement*

Unit-I (8 Sessions)

Semiconductors, p-n junction, V-I characteristics of p-n junction, diode as a circuit element, rectifier, capacitive filter clipper, clamper circuit voltage multiplier, diode circuits for OR & AND (both positive and negative logic), Zener diode, Zener diode as a voltage regulator.

Unit-II (8 Sessions)

DC biasing of BJT: operating point, fixed-bias circuit, emitter-stabilized bias circuit, voltage-divider bias, hybrid equivalent model of BJT, graphical determination of the *h*-parameters; small signal analysis of BJT: CE fixed-bias configuration, CE emitter-bias configuration, emitter-follower configuration, power amplifiers: introduction, series-fed class A amplifier, class B, class C, class D amplifiers.

Unit-III (8 Sessions)

Operational amplifiers: Differential and common-mode operation, basic Op-AMP parameters, ideal OP-AMP characteristics differential; linear and non-linear applications of OP-AMP (adder, subtractor, integrator, active rectifier, comparator, differentiator)

Unit-IV (8 Sessions)

Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures. Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters.

Unit-V (8 Sessions)

Binary ladder D/A converter, Successive approximation A/D converter, generalized instrumentation, measurement of displacement, temperature, velocity, force and pressure

using potentiometer, Resistance thermometer, Thermocouples, Thermistor, Bourdon tube, LVDT, Strain gauge and tachogenerator.

Course Outcomes:

Students completing this course will be able to:

- To understand important and fundamental parameters of electronics engineering.
- To learn the basic concepts of measuring instruments such as: ammeter, voltmeter, galvanometer, multimeter etc.
- To develop the basic skills necessary for measuring various parameters such as current, voltage, temperature etc.
- To address the underlying concepts and methods behind Electronics measurements

References:

1. R.L Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", PHI Learning Pvt. Ltd, 9th Edition, 2008.
2. S. Salivahanan and N Suresh Kumar, "Electronic Devices and Circuit", TMH (India) Private Ltd, 3rd Edition, 2013
3. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons. 19th Edition, 2007.

Website Sources:

- www.ndl.iitkgp.ac.in
- www.onlinecourses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com

EEC458 Electronics and Instrumentation lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. To study the application of PN Junction Diode:-full wave rectifier-Measurement of V_{rms}, V_{dc}, ripple factor-use of filter-ripple reduction.
2. To study characteristics of BJT: BJT in CE configuration-Graphical measurement of h parameters from input and output Characteristics.
3. To study the operation of single-stage and multi-stage RC–Coupled Amplifier.
4. To calculate A_v , A_I , R_o and R_i of CE RC-Coupled amplifier with potential divider biasing.
5. To study an inverting and non-inverting amplifier using Op-Amp IC 741 Kit.
6. To study Op-Amp as adder and subtractor using Op-Amp IC 741 Kit.
7. To study Op-Amp as a differentiator and integrator using Op-Amp IC 741 Kit.
8. Study of Resistance Temperature Detector (RTD) and calculating various parameters.
9. To Study of Thermocouple and calculating its various parameters.
10. To Study of Thermistor and calculating its various parameters.

EME407 Theory of Machines L: T: P 3:1:0

Objective: The study of kinematics is an applied field of mechanical engineering that is concerned with understanding the relationship between the geometry and the motions of the parts of a machine and the forces that produce this motion. We have to learn how to analyze the motions of mechanisms, design mechanisms to have given motions, and analyze forces in machines. This includes relative motion analysis and design of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces.

UNIT – I

Introduction Elements, links, kinematics pairs-classification, Kinematics chain and mechanisms, Inversions of Four bar mechanism, slider crank chain.
Velocity Analysis Velocity of point in mechanism, Relative velocity method, Instantaneous centers method.
Acceleration Analysis Acceleration diagram (Graphical method), Coriolis component of acceleration.

UNIT – II
Gears
Classification& terminology of gear, Law of gearing, Velocity of sliding, Form of tooth (Involute and cycloidal), Spur gear, Interference and Undercutting, Introduction to helical, spiral, bevel and worm gear, Simple, compound, reverted, and epicyclic trains, Determining velocity ratio by tabular method.

UNIT – III

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, Chain drives.

UNIT – IV
Friction Types of friction, laws of dry friction, Friction of pivots and collars.
Clutches Introduction to friction clutch, Single disc, multiple disc, and cone clutches.
Bearings Rolling friction bearing, Anti friction bearings.

UNIT – V
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.
Static and dynamic balancing, Balancing of rotating masses in one and different planes.

Course outcomes:

Students completing this course will be able to

- Distinguish kinematic and kinetic motion
- Identify the basic relations between distance, time, velocity, and acceleration.
- Drawing velocity and acceleration diagrams for different mechanisms
- Selecting gear and gear train depending on application.

- Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers,

Books and References:

1. Theory of machines - Thomas Bevan
2. Theory of machines and mechanisms- Shigley
3. Theory of machines and mechanisms-Ghosh&Mallik
4. Theory of machines and mechanisms- Rao&Dukkipati
5. Theory of Machines – R. K. Bansal

Suggested Readings:

- https://www.youtube.com/watch?v=pTJWuvDlTNU
- https://www.youtube.com/watch?v=MJeRFzs4oRU
- https://www.springer.com/gp/book/9789400711556
- https://www.nature.com/articles/014213a0
- https://www.coursera.org/lecture/dynamics/module-1-course-introduction-v9YXCv

EAG506 Tractor System & Control L: T: P 3:0:0

Objective: Gaining knowledge about various tractor systems, their construction and working.

UNIT-I

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.

UNIT-II

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. 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.

UNIT-III

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.

UNIT-IV

Familiarization with the Hydraulic system adjustments and ADDC. Study of tractor power outlets – PTO. PTO standards, types and functional requirements. 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.

UNIT-V

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 aspring-mass system. Ergonomic

considerations and operational safety. Introduction to tractor testing. Deciphering the engine test codes.

Course Outcomes:

Students completing this course will be able to:

- Familiarization with different makes and models of tractors. And Identify the different tractor systems including fuel system, cooling system, transmission system, steering and hydraulic systems
- Understand hitching & de-hitching to the tractor and Introduction to trouble shooting in tractors.
- Replacement of broken components in tillage implements, Maintenance of cutter bar in a reaper.
- Adjustments in a thresher for different crops. Setting of agricultural machinery workshop.

References:

1. Liljedahl J B and Others. Tractors and Teir Power Units.
2. Rodichev V and G Rodicheva. Tractors and Automobiles.
3. Singh Kirpal. Automobile Engineering – Vol I.
4. Heitner Joseph. Automotive Mechanics: Principles and Practices.

Website Sources:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in/

EAG556 Tractor Systems and Controls Lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Introduction to transmission systems and components;
2. Study of clutch functioning.
3. Design problem on clutch system.
4. Study of different types of gear box, calculation of speed ratios, design problems on gear box;
5. Study on differential and final drive and planetary gears.
6. Study of brake systems and some design problems;
7. Steering geometry and adjustments;
8. Study of hydraulic systems in a tractor, hydraulic trainer and some design problems;
9. Appraisal of various controls in different makes tractors in relation to anthropometric measurements.
10. Determination of location of CG of a tractor, Moment of Inertia of a tractor.
11. Traction performance of a traction wheel.

EAG507 Soil and Water Conservation Engineering L: T: P 3:0:0

Objectives: To have understanding about the degradation of productive soil globally and its effect thereon, also to know about the causes about water scarcity and their solution to fight against the evil effects through soil and water conservation technologies.

UNIT- I

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.

UNIT- II

Gullies - Classification, stages of development. 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.

UNIT- III

Water erosion control measures - agronomical measures - contour farming, strip cropping, conservation tillage and mulching. Engineering measures– Bunds and terraces. Bunds - contour and graded bunds - design and surplus sing arrangements.

UNIT- IV

Terraces - level and graded broad base terraces, bench terraces - planning, design and layout procedure, contour, stonewall and trenching. Gully and ravine reclamation - principles of gully control - vegetative measures, temporary structures and diversion drains.

UNIT- V

Grassed waterways and design. Wind erosion- Factors affecting, mechanics, soil loss estimation and control measures - vegetative, mechanical measures, wind breaks and shelter belts and stabilization of sand dunes. Land capability classification. Rate of sedimentation, silt monitoring and storage loss in tanks.

Course Outcomes:

The student will be able to-

- Know about the causes about water scarcity and their solution to fight against the damage effects through soil and water conservation technologies.
- Recognize different types of erosion, rainfall and runoff.
- Design and construct a simple earth dam and ponds for farm use,
- Understand the concept of Universal Soil Loss Equation (USLE) with respect to soil loss.

References:

1. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water.
2. Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Mal, B.C. 2014. Introduction to Soil and Water Conservation Engineering. 2014. Kalyani Publishers.
4. Michael, A.M. and T.P. Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition, Jain Brothers, New Delhi.

Website Sources:

- www.onlineecourses.nptel.ac.in
- www.agrimoon.com
- http://ecoursesonline.iasri.res.in

EAG557 Soil and Water Conservation Engineering Lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Study of different types and forms of water erosion.
2. Exercises on computation of rainfall erosivity index.
3. Computation of soil erodibility index in soil loss estimation.
4. Exercises on soil loss estimation/measuring techniques.
5. Study of rainfall simulator for erosion assessment.
6. Estimation of sediment rate using Coshocton wheel sampler and multislot devisor.
7. Determination of sediment concentration through oven dry method.
8. Design and layout of contour bunds.
9. Design and layout of broad base terraces and
10. Design of vegetative waterways.
11. Exercises on rate of sedimentation and storage loss in tanks
12. Design of shelterbelts and wind breaks for wind erosion control.

EAG508 Tractor and Automotive Engines L: T: P 3:0:0

Objectives: Gaining knowledge about various tractor systems, their construction and working.

UNIT- I

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.

UNIT- II

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 and4-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.

UNIT- III

Study of importance of air cleaning system. Study of types of air cleaners and performance characteristics of various air cleaners. Study of 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 carburettors and their main functional components.

UNIT- IV

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. 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.

UNIT- V

Study of need and type of thermostat valves. Additives in the coolant. Study of radiator efficiency. Study of ignition system of SI engines. 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.

Course Outcomes:

Students completing this course will be able to:

- Identify the conventional & non-conventional energy sources for farm power. And understand thermodynamic principles of IC (CI & SI) engines and deviation from ideal cycle
- Understand the ignition, cooling electrical system of IC engines.
- Familiar with the basics of engine testing with reference to BIS code. Understand about tractors various systems, mechanism and power outlets
- To illustrate traction, its mechanics, basic Ergonomics and basic knowledge of tractor system testing.

References:

1. Liljedahl J B and Others. Tractors and Teir Power Units.
2. Rodichev V and G Rodicheva. Tractors and Automobiles.
3. Mathur ML and RP Sharma. A course in Internal Combustion Engines.
4. Singh Kirpal. Automobile Engineering – Vol II.

Website Source:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in/

EAG558 Tractor and Automotive Engines Lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Introduction to different systems of CI engines; Engine parts and functions, working principles etc.
2. Valve system – study, construction and adjustments;
3. Oil & Fuel – determination of physical properties;
4. Air cleaning system;
5. Fuel supply system of SI engine;
6. Diesel injection system & timing;
7. Cooling system, and fan performance,
8. thermostat and radiator performance evaluation;
   Part load efficiencies & governing;
9. Lubricating system & adjustments;
10. Starting and electrical system; Ignition system;
11. Tractor engine heat balance and engine performance curves.
12. Visit to engine manufacturer/ assembler/ spare parts agency.

EAG509 Watershed Hydrology, Planning and Management L: T: P 3:0:0

Objectives: To acquaint the students about the preparation of the detail report of the problems and causes related to the water, land, vegetation and social aspects of specific area and their remedies through watershed planning and management.

UNIT- I

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 and intensity-duration-frequency relationship.

UNIT- II

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

UNIT- III

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

UNIT- IV

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- V

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. Integrated watershed management concept, components, arable lands - agriculture and horticulture, non-arable lands - forestry, fishery and animal husbandry.

Course Outcomes:

At the end of the course, the students will be able to-

- Understand different components of hydrologic cycle and their importance
- Compute areal rainfall and runoff on a watershed scale
- Develop rainfall-runoff relationship for a watershed for prediction purpose
- Apply the knowledge on hydrology for planning watershed management projects

References:

1. Chow, V.T., D.R. Maidment and L.W. Mays. 2010. Applied Hydrology,McGraw Hill Publishing Co., New York.
2. Mutreja, K.N. 1990. Applied Hydrology. Tata McGraw-Hill Publishing Co., New Delhi.
3. Subramanya, K. 2008. Engineering Hydrology. 3rd Edition, Tata McGraw-Hill Publishing Co. New Delhi.
4. Suresh, R. 2005. Watershed Hydrology. Standard Publishers Distributors, Delhi.
5. Ghanshyam Das. 2008. Hydrology and Soil Conservation Engineering: Including Watershed
6. Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.

Website Sources:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in

EAG559 **Hydrology Lab** **L: T: P 0:0:2**

List of Experiment: Minimum 08 experiments out of the following:

1. Visit to meteorological observatory.
2. Analysis of rainfall data and estimation of mean rainfall by different methods.
3. Exercise on frequency analysis of hydrologic data and estimation of missing data
4. Computation of runoff volume by SCS curve number method.
5. Study of stream gauging instruments.
6. Exercise on morphological parameters of watershed.
7. Exercise on unit hydrograph.
8. Quantitative analysis of watershed characteristics.
9. Watershed investigations for planning and development.
10. Analysis of hydrologic data for planning watershed management.
11. Techno-economic viability analysis of watershed projects.
12. Visit to watershed development project areas.

EAG510 Bio-Energy Systems: Design and Applications L: T: P 3:0:0

Objectives: The course is designed to generate awareness on recycling and energy recovery from different wastes. The student will incline towards conservation of energy through application of efficient devices and practices.

UNIT-I

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-II

Biomass Production: Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting.

UNIT-III

Harvesting of biomass and coppicing characteristics. Biomass preparation techniques for harnessing (size reduction, densification and drying). Thermo- chemical degradation.

UNIT-IV

History of small gas producer engine system. Chemistry of gasification. Gas producer – type, operating principle. Gassifier fuels, properties, preparation, conditioning of producer gas. Application, shaft power generation, thermal application and economics.

UNIT-V

Trans- esterification for biodiesel production. A range of bio-hydrogen production routes. Environmental aspect of bio-energy, assessment of greenhouse gas mitigation potential.

Course Outcomes:

Students completing this course will be able to:

- Identify the non conventional resources and understand solar cell material, array, power plant and its limitations.
- Understand about Geothermal Energy, Principle of working of MHD Power plant and Fuel Cells.
- Familiar with Wind energy and energy conversion system.

- Understand about solar thermal energy, collectors and analyze solar thermal power
- Plant for power generation, energy storage for heating and cooling purposes

References:

1. British BioGen. 1997, Anaerobic digestion of farm and food processing practices-Good
2. practice guidelines, London, available on www.britishbiogen.co.UK.
3. Butler, S. 2005. Renewable Energy Academy: Training wood energy professionals.
4. Centre for biomass energy. 1998. Straw for energy production; Technology-Environment Ecology. Available: www.ens.dk.

Website Source:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in/

EAG550 Bio-Energy Systems Lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Study of anaerobic fermentation system for industrial application, Study of gasification for industrial process heat
2. Study of biodiesel production
3. Study of biomass densification technique (briquetting, pelletization, and cubing).
4. Integral bio energy system for industrial application,
5. Study of bio energy efficiency in industry and commercial buildings.
6. Study and demonstration of energy efficiency in building.
7. Measuring efficiency of different insulation technique.
8. Study of Brayton, Striling and Rankine cycles.
9. Study of modern greenhouse technologies.

EHU501 Human values and professional ethics L: T: P 3:1:0

Objectives:

• To create awareness on Engineering Ethics and Human Values.

• To understand social responsibility of an engineer.

• To appreciate ethical dilemma while discharging duties in professional life.

UNIT I

HUMAN VALUES: Morals, Values and Ethics – Integrity – Work Ethic – Service – Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing - Honesty – Courage – Valuing Time – Co-operation – Commitment - Empathy – Self-Confidence – Character - Spirituality.

UNIT II

ENGINEERING ETHICS: Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - custom and religion - uses of ethical theories. Valuing Time – Co-operation – Commitment.

UNIT III

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV

SAFETY, RESPONSIBILITIES AND RIGHTS: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property rights (IPR) – Discrimination.

UNIT V

GLOBAL ISSUES: Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers and engineers as expert witness and advisors -moral leadership – Sample code of Ethics like ASME, ASCE, IEEE, IETE etc.

Course Outcomes:

- After completing this course student will be able to understand human values.
- Inculcate ethics in professional life.

References:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. Jayshree Suresh and B.S.Raghavan, "Human values and Professional Ethics",S.Chand& Company Ltd., New Delhi.

Website Sources:

- https://bit.ly/33lvGaO
- https://bit.ly/2KBxkye
- https://bit.ly/2JdYsD5

School of Engineering& Technology
(Running in School of Agricultural Sciences & Engineering)
IFTM University, Moradabad
Bachelor of Technology (B. Tech) Agricultural Engineering

EME506 **Machine Design** **L: T: P 3:0:0**

Objectives: To familiarize the students how to apply the concepts of stress analysis, Data book techniques in the analysis, theories of failure and material science to analyze, design and/or select commonly used machine components.

Unit- I

Meaning of design, Phases of design, design considerations. Common engineering materials and their mechanical properties. Types of loads and stresses, theories of failure, factor of safety, selection of allowable stress. Stress concentration. Elementary fatigue and creep aspects.

Unit- II

Cotter joints, knuckle joint and pinned joints, turnbuckle. Design of welded subjected to static loads. Design of threaded fasteners subjected to direct static loads, bolted joints loaded in shear and bolted joints subjected to eccentric loading.

Unit- III

Design of shafts under torsion and combined bending and torsion.Design of keys. Design of muff, sleeve, and rigid flange couplings. Design of helical and leaf springs.

Unit- IV

Design of flat belt and V-belt drives and pulleys.Design of gears.

Unit- V

Design of screw motion mechanisms like screw jack, lead screw, etc.Selection of anti-friction bearings.

Course Outcomes:

- The students will demonstrate the ability to apply the fundamentals of stress analysis, theories of failure

and material science in the design of machine components.

- The students will demonstrate the ability to make proper assumptions, perform correct analysis while drawing upon various mechanical engineering subject areas.
- Specifically, the students will demonstrate the preceding abilities by performing correctly:
- The design, analysis and sizing of shafts, Keys and Coupling.
- Student will Learn how to design a power screw, rivet joint and welded joint.
- The selection, sizing and analysis of springs and other mechanical components/systems.
- Students will learn the use of data book.

Suggested Readings

- Jain R K. 2013. Machine Design. Khanna Publishers, 2-B Nath Market, NaiSarak, New Delhi.
- Khurmi R S and Gupta J K. 2014. A Text Book of Machine Design. S. Chand & Company Ltd., New Delhi.
- Design of machine element (B.V.Bhandri)
- Machine Design (R.S.khurmi)
- Machine Design (Sharma &Agrawal)
- Machine Design (Sadhu Singh)

Website Sources:

- https://www.machinedesign.com
- http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125510
- https://www.autodesk.in/solutions/3d-mechanical-engineering
- https://onlinecourses.nptel.ac.in

EAG607 Irrigation & Drainage Engineering L: T: P 3:0:0

Objectives: To train the students about the reclamation of the agricultural lands suffering from excessive water application and problematic soils.

UNIT- I

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 deferent water resources of the country; measurement of irrigation water: weir, flume and orifice.

UNIT- II

Design and lining of irrigation field channels, land grading: criteria for land levelling, land levelling design methods, estimation of earth work; soil water plant relationship: soil properties, irrigation management practices, soil water movement, infiltration, soil water potential.

UNIT- III

Measurement of soil moisture, 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.

UNIT- IV

Water logging- causes and impacts; drainage, objectives of drainage, types of drainage system, drainage coefficient, design of surface drains: purpose and benefits, hydraulic conductivity, drainable porosity, water table; derivation of Hooghoudt's equation.

UNIT- V

Layout, construction and installation of drains; vertical drainage; bio-drainage; mole drains; reclamation of saline and alkaline soils, leaching requirements, conjunctive use of fresh and saline water.

Course Outcomes:

At the end of this course, the student will be able to-

- Remember about the irrigation schemes and present status of water resources in India. Also understand the various methods for the measurement of irrigation water.
- Analyze the design of open channel water conveyance system, underground pipe conveyance system & control and distribution of on-farm structures for water conveyance.

- Solve the real world problem of land grading and understand the soil-water-plant relationship
- Apply the concept of ET to determine the water requirement of crops. Also able to remember the adaptability, merits, demerits, specification and analyze the design considerations of border, check basin, furrow irrigation, drip and sprinkler irrigation methods
- Analyze agricultural land drainage problems and suggest scientific remedial measures for them

References:

1. Michael A.M. 2012. Irrigation: Teory and Practice. Vikas Publishing House New Delhi.
   Majumdar D. K. 2013. Irrigation Water Management Principles. PHI learning Private Limited New Delhi 2nd Edition.
2. Allen R. G., L. S. Pereira, D. Raes, M. Smith. 1998. Crop Evapotranspiration guidelines for computing crop water requirement. Irrigation and drainage Paper 56, FAO of United Nations, Rome.

Website Sources:

- www.onlineecourses.nptel.ac.in
- www.agrimoon.com
- http://ecoursesonline.iasri.res.

EAG657 Irrigation & Drainage Engineering L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Measurement of soil moisture.
2. Measurement of irrigation water.
3. Measurement of soil infiltration.
4. Determination of bulk density and field capacity of soil.
5. Estimation of irrigation efficiencies.
6. *In-situ* measurement of hydraulic conductivity.
7. Estimation of drainage coefficients.
8. Design of surface drainage systems.
9. Design of subsurface drainage systems.
10. Study of drainage tiles and pipes.
11. Installation of sub-surface drainage system.
12. Cost analysis of surface and sub-surface drainage system.

EAG608 Groundwater, Wells and Pumps L: T: P 3:0:0

Objectives: To enable the students to know about the ground water potential, its dynamic behaviour and exploration manual and mechanically.

UNIT- I

Occurrence and movement of ground water; aquifer and its types; classification of wells, tubewells and open wells, familiarization of various types of bore wells; design of openwells; groundwater exploration techniques.

UNIT- II

Methods of drilling of wells: percussion, rotary, reverserotary; design of tubewell and gravel pack, installation of well screen, development of well; groundwater hydraulics-determination of aquifer parameters by different method suchas Theis, Jacob and Chow's, Theis recovery method.

UNIT- III

Well interference, multiple well systems, estimation of ground water potential, artificial groundwater recharge techniques; pumping systems and water lifting devices.

UNIT- IV

Classification of pumps, components of centrifugal pump, priming, pump selection, installation and troubleshooting, pump performance curves.

UNIT- V

Effect of change of impeller dimensions on performance characteristics; hydraulic ram, propeller pumps, mixed flow pumps and their performance characteristics; turbine pump and submersible pump.

Course Outcomes:

The student will be able to-

- Apply knowledge of Occurrence and movement of ground water, types of aquifers, classification of wells, steady and transient flow into partially, fully and non-penetrating and open wells, well interference, multiple well systems, surface and subsurface exploitation of ground water ground, construction of wells using different drilling methods of wells i.e percussion, rotary, reverse rotary, etc. completion and development of well and installation of well screen.
- Compute aquifer parameters by different method such as Theis, Jacob and Chow's Theis recovery method etc.
- Analyze well test data for determination of aquifer parameters in steady and unsteady state conditions and estimation of ground water potential, quality of ground water, modeling, ground water & project formulation

- Design of open wells, wells in confined and unconfined aquifers using different aquifer conditions including design of assembly and gravel pack

References:

1. Michael AM, Khepar SD. and SK Sondhi. 2008. Water Well and Pumps, 2nd Edition, TataMc-Graw Hill.
2. Todd David Keith and Larry W. Mays. 2004. Groundwater Hydrology, 3rd Edition, John
   Wiley & Sons, New York (International Book Distributing Company Lucknow).
3. Michael AM. and Ojha TP. 2014. Principles of Agricultural Engineering Vol-II, 5th Edition.Jain Brothers Publication, New Delhi.

Website Sources:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri

EAG658 Groundwater, Wells and Pumps Lab L: T: P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Verification of Darcy's Law
2. Study of different drilling equipments.
3. Sieve analysis for gravel and well screens design.
4. Estimation of aquifer parameters by Theis method.
5. Estimation of aquifer parameters by Coopers-Jacob method.
6. Estimation of aquifer parameters by Chow method.
7. Estimation of aquifer parameters by Theis Recovery method.
8. Well design under confined and unconfined conditions.
9. Study of artificial ground water recharge structures.
10. Study of centrifugal pumps.
11. Study of turbine, propeller pumps.
12. Study of submersible pump.

EAG609 Post Harvest Engineering of Horticultural Crops L: T: P 3:0:0

Objectives: To acquaint the students with various post harvest operations of horticultural crops to reduce post harvest losses and value addition.

UNIT-I

Importance of processing of fruits and vegetables, spices, condiments and flowers. Characteristics and properties of horticultural crops important for processing, Peeling: Different peeling methods and devices (manual peeling, mechanical peeling, chemical peeling, and thermal peeling), Slicing of horticultural crops: equipment for slicing, shredding, crushing, chopping, juice extraction, etc., Blanching: Importance and objectives; blanching methods, effects on food (nutrition, colour, pigment, texture).

UNIT-II

Chilling and freezing: Application of refrigeration in different perishable food products, Thermophilic, mesophilic & Psychrophilic micro-organisms, Chilling requirements of different fruits and vegetables, Freezing of food, freezing time calculations, slow and fast freezing, Equipment for chilling and freezing (mechanical & cryogenic), Effect on food during chilling and freezing, Cold storage heat load calculations and cold storage design, refrigerated vehicle and cold chain system, Dryers for fruits and vegetables, Osmo-dehydration.

UNIT-III

Packaging of horticultural commodities, Packaging requirements (in terms of light transmittance, heat, moisture and gas proof, micro organisms, 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-IV

Minimal processing, Common methods of storage, Low temperature storage, evaporative cooled storage, Controlled atmospheric storage, Modified atmospheric packaging, 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.

UNIT-V

Flowcharts for preparation of different finished products, Important parameters and equipment used for different Unit Operations, Post harvest management and equipment for spices and flowers, Quality control in fruit and vegetable processing industry. Food supply chain.

Course Outcomes:

The students will be able to:

- Understand the physical, chemical, and mechanical properties of food and their handling and storage.
- Determine the porosity and roundness of fruits and vegetables.
- Understand maturity indices of fruits and vegetables.
- Understand the concept of quality in relation to fruit and vegetable based products.
- Understand the processing and preservation of fruits and vegetables using various techniques.

References:

1. Arthey, D. and Ashurst, P. R. 1966. Fruit Processing. Chapman and Hall, New York.
2. Pantastico, E.C.B. 1975. Postharvest physiology, handling and utilization of tropical and
3. Subtropical fruits and vegetables AVI Pub. Co., New Delhi.

Website sources:

- http://ecoursesonline.iasri.res.in/course/view.php?id=164
- https://www.youtube.com/watch?v=szC5qqB0CdI

EAG659 Post Harvest Engineering of Horticultural Crops Lab L:T:P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Performance evaluation of peeler and slicer
2. Performance evaluation of juicer and pulper
3. Performance evaluation of blanching equipment
4. Testing adequacy of blanching
5. Freezing of food, freezing time calculations,
6. Study of cold storage and its design
7. Study of CAP and MAP storage
8. Study of different types of packaging materials commonly used for raw and processed fruits and vegetables products
9. Minimal processing of vegetables
10. Preparation of value added products
11. Visit to fruit and vegetable processing industry
12. Visit to spice processing plant.

EAG610 Farm Machinery and Equipment-II 3(2+1) L: T: P 3:0:0

Objectives: To develop skills in the students required to develop and modification of indigenous harvesting machines/methods as per the need of the area and farmers

UNIT- I

Introduction to plant protection equipment – sprayers and dusters. Classifcation of sprayers. Types of nozzles. Calculations for calibration of sprayers. Introduction to intercultural equipments. Use of weeders – manual and powered. Study of functional requirements of weeders and main components.

UNIT-II

Familiarization of fertilizer application equipment. Study of harvesting operation – harvesting methods, harvesting terminology. Mower – types, constructional details, working and adjustments. Study of shear type harvesting devices – cutter bar, inertial forces, counter balancing, terminology, cutting pattern. Study of reapers, binders and windrowers – principle of operation and constructional details.

UNIT- III

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.

UNIT- IV

Factors affecting thresher performance. Combine and their terminology, classification of combines, Computation of combine losses, study of combine troubles and troubleshooting. Study of chaff cutters and capacity calculations.

UNIT- V

Study of straw combines – working principle and constructional details. Study of root crop diggers – 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.

Course Outcomes:

Students completing this course will be able to:

- Familiar with combines, cotton harvester, and chaffcutter.
- The students will be able to understand the mechanization and various equipment used in the farm for different field operations
- Familiar with potato and groundnut diggers

References:

1. Kepner RA, Roy Barger & EL Barger. Principles of Farm Machinery.
2. Smith HP and LH Wilkey. Farm Machinery and Equipment.
3. Culpin Claude. Farm Machinery.
4. Srivastava AC. Elements of Farm Machinery.
5. Lal Radhey and AC Datta. Agricultural Engineering Principles of Farm Machinery.

Website Sources:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in/

EAG660 Farm Machinery and Equipment-II Lab L: T: P 3:0:0

List of Experiment: Minimum 08 experiments out of the following:

1. Study of types of dusters and functional components.
2. Familiarization with plant protection and interculture equipments.
3. Study of types of sprayers and functional components.
4. Study of nozzle types and spread pattern using patternator.
5. Study of fertilizer application equipments.
6. Study of various types of mowers and reaper.
7. Study of power threshers.
8. Study of functional units of combines.
9. Study of root crop diggers.
10. Familiarization with the working of cotton and maize harvesters.
11. Familiarization with vegetable and fruit harvesters.

EAG611 Engineering Properties of Agricultural Produce L: T: P 3:0:0

Objectives: To acquaint the students with various aspects of engineering properties such as size, shape, mass, energy balance, fluid flow, heat transfer and psychrometry required for food processing.

UNIT- I

Classification and importance of engineering properties of Agricultural Produce, shape, size, roundness, sphericity, volume, density, porosity, specific gravity, surface area of grains, fruits and vegetables, Thermal properties, Heat capacity, Specific heat, Thermal conductivity, Thermal diffusivity, Heat of respiration;

UNIT- II

Co-efficient of thermal expansion, Friction in agricultural materials; Static friction, Kinetic friction, rolling resistance, angle of internal friction, angle of repose, Flow of bulk granular materials, Aero dynamics of agricultural products, drag coefficients, terminal velocity.

UNIT- III

Rheological properties; force, deformation, stress, strain, elastic, plastic and viscous behavior, Newtonian and Non-Newtonian liquid, Visco-elasticity, Newtonian and Non-Newtonian fluid, Pseudo-plastic, Dilatant, Thixotropic, Rheopectic and Bingham Plastic Foods, Flow curves.

UNIT- IV

Electrical properties; dielectric loss factor, loss tangent, A.C. conductivity and dielectric constant, method of determination.

UNIT- V

Application of engineering properties in handling processing machines and storage structures

Course Outcomes:

The student will be able to understand:

- Engineering properties of food and biomaterials.
- Structure and chemical composition of foods, Physical properties.
- Water activity, food stability sorption and desorption isotherm of food materials.
- Newtonian and non-Newtonian fluid.

- Thermal properties and Electrical and magnetic properties of food.
- Aero- and hydrodynamic characteristics, application of frictional properties in grain handling, processing and conveying.

References :

1. Mohesin, N.N. 1980. Physical Properties of Plants & Animals. Gordon & Breach Science Publishers , New York.
2. Mohesin, N.N. 1980. Termal Properties of Foods and Agricultural Materials. Gordon &
3. Breach Science Publishers, New York.
4. Prentice, J.H. 1984. Measurement in Rheological Properties of Food Stuffs. Elsevier Appliedscience Pub. Co. Inc. New York.
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EAG612A Wasteland Development L:T:P 3:0:0

Objectives: To study causes of watershed formation, assessment and methods to reclaim.

UNIT- I

Land degradation – concept, classification - arid, semiarid, humid and sub-humid regions, denuded range land and marginal lands.

UNIT- II

Wastelands – factors affecting, classification and mapping of wastelands, planning of wastelands development - constraints, agro-climatic zones, Soil conservation structures- gully stabilization, ravine rehabilitation, sand dune stabilization, water harvesting methods.

UNIT- III

Afforestation - agro-horti-forestry-silvipasture methods, forage and fuel crops-socioeconomic constraints. Shifting cultivation, optimal land use options. Wasteland development – hills, semi-arid, coastal areas, water scarce areas, reclamation of waterlogged and salt-affected lands.

UNIT- IV

Mine spoils- impact, land degradation and reclamation and rehabilitation, Micro-irrigation in wastelands development. Sustainable wasteland development under drought situations, socio-economic perspectives.

UNIT- V

Government policies. Participatory approach. Preparation of proposal for wasteland development and benefit-cost analysis.

Course Outcomes:

The students will able to:

- Theoretical knowledge of identifying the arid, semi-arid, humid and sub humid regions.
- The students will able to conserving the land against its degradation.
- The students will able to know about uses of structures in conservation of land.
- The students will able to know about the wasteland treatment under micro irrigation.

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EAG612B Information Technology for Land and Water Management L:T:P 3:0:0

Objectives: To acquaint the students with the application of IT in assessment of Land and Water resources and their management.

UNIT- I

Concept of Information Technology (IT) and its application potential. Role of IT in natural resources management.

UNIT- II

Existing system of information generation and organizations involved in the field of land and water management. Application and production of multimedia. Internet application tools and web technology.

UNIT- III

Networking system of information. Problems and prospects of new information and communication technology. Development of database concept for effective natural resources management.

UNIT- IV

Application of remote sensing, geographic information system (GIS) and GPS. Rational data base management system. Object oriented approaches. Information system, decision support systems and expert systems.

UNIT- V

Agricultural information management systems - use of mathematical models and programmes. Application of decision support systems, multi sensor data loggers and overview of software packages in natural resource management. Video-conferencing of scientific information.

Course Outcomes:

The student will be able to-

At the end of this course, the student will be able to-

- Understand about conventional natural resources management.
- Understand the components of GIS and land management.
- Understand and analyze aerial photography and preparation of maps for local planning.
- Analyze digital image processing, scanning and digitization of maps.

References:

1. Climate-Smart Agriculture – Source Book. 2013. Food and Agriculture Organization, Rome.
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3. Dipak De and Basavaprabhu Jirli (Eds.). 2010. Communication Support for Sustainable Development. Ganga Kaveri Publishing House, Varanasi – 221001.

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EAG612C Precision Farming Techniques for Protected Cultivation L: T: P 3:0:0

Objectives: Student will gain the knowledge of recent farming techniques to increase the accuracy and efficiency of agricultural input applications.

UNIT- I

Protected cultivation: Introduction, History, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment.

UNIT- II

Design and construction of green houses – site selection, orientation, design, construction, Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, different shading material fogging, combined fogging and fan pad cooling system, design of cooling system, maintenance of cooling and ventilation systems.

UNIT- III

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. Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design, and installation and material requirement.

UNIT- IV

Greenhouses and net houses – introduction, benefits, design, installation and material requirement. Management of irrigation. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers.

UNIT- V

Greenhouse climate measurement, control and management. Insect and disease management in greenhouse and net houses, Selection of crops for greenhouse cultivation, major crops in greenhouse- cultivation, harvesting and post harvest techniques, Economic analysis.

Course outcomes

- Knowledge about protected cultivation and precision farming.
- Design and construction of green houses.
- Types of irrigation systems used in Protected cultication.
- Knowledge about fetrilization.

- Greenhouse climate measurement.

References:

1. Singh Brahma and Balraj Singh. 2014. Advances in protected cultivation, New India Publishing Company.
2. Sharma P. 2007. Precision Farming. Daya Publishing House New Delhi.

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EHU601 Disaster Management L: T: P 3:0:0

Objectives:

- To provide students an understanding to the concepts and aspects of disaster and its relationship with development.
- To ensure awareness of Disaster Risk Reduction (DRR) approaches among students.
- To assist students develop ability to respond to their environment with potential response to disaster.

UNIT I: Introduction to Disasters (12 Sessions)

- Definition: Disaster, Hazard, Vulnerability, Resilience, Risks
- Types of disasters – Earthquake, Landslide, Flood, Drought, Fire, campus shooting, bomb threat, terrorist incidence and financial emergency etc.
- Causes and Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.
- Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II: Approaches To Disaster Risk Reduction (10 Sessions)

- Disaster life cycle – its analysis, phases, culture of safety, prevention, mitigation and preparedness
- Community based DRR (Disaster Risk Reduction), Structural-nonstructural measures,
- Roles and responsibilities of community: Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders

UNIT III: Inter-Relationship Between Disasters And Development (08 Sessions)

- Factors affecting Vulnerabilities, impact of Development projects such as dams, embankments, changes in Land-use etc.
- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India – Relevance of indigenous knowledge, appropriate technology and local resources.
- Role of international cooperations in Disaster Management

UNIT IV: Disaster Risk Management In India (08 Sessions)

- Hazard and Vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management
- Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy – Other related policies, plans, programmes and legislation
- Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V: Disaster Management: Applications, Case Studies and Field Works (07 Sessions)

The project /fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively

based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions are discussed below.

Several governmental initiatives require Urban Local Bodies (ULBs) and Panchayati Raj Institutions (PRIs) to be proactive in preparing DM plans and community based disaster preparedness plans. Information on these would be available with the district collector or Municipal corporations.

Teachers could ask students to explore and map disaster prone areas, vulnerable sites, vulnerability of people (specific groups) and resources. The students along with teacher could work on ways of addressing these vulnerabilities, preparing plans and consultation with local administration or NGOs.

Students could conduct mock drills in schools, colleges or hospitals. They could also work on school safety, safety of college buildings, training in first aid.

Other examples could be- identifying how a large dam, road/ highway or an embankment or the location of an industry affects local environment and resources or how displacement of large sections of people creates severe vulnerabilities may be mapped by student project work.

The suggested topics for Project work for student could be as follows:

- Monitoring and evaluation plan for disaster response
- Low cost Home based water purification methods
- Planning Nutrition intervention programmes
- Safety tips before during and after earthquake, cyclone, floods and fire accidents.
- Mock Drills
- Major disasters in India
- Disaster Management in India
- Flood affected areas and damages in India
- Heat waves in India
- Earth quakes in India
- Historical Tsunamis in India
- Nuclear emergence
- Traffic accidents in India
- Train Accidents
- Major disease outbreak
- Disaster management structure in India
- Precaution, mitigation of disaster in India
- Warning system in India to prevent disaster
- Bhopal gas tragedy
- Kutch earth quake
- Tsunami (2004)
- Kosi Calamity 2008
- Mayapuri radiation exposure Delhi (2010)
- Mock exercises

Any field works related to disaster management.

Learning Outcomes: The students will be able to identify the nature and causes of disaster. Also the students will be able to apply the disaster risk reduction mechanism.

Teaching Resources

Emphasis will be on interactive teaching learning methods. Tools could be Range of Films-documentaries and feature films related to disasters and their impacts and on vulnerabilities

of people are available which a teacher could choose with care and screen. This could form a basis for classroom discussion.

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- Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., . ISBN-10: 1259007367, ISBN-13: 978-1259007361]
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- Carter, Nick. Disaster Management: A Disaster Manager's Handbook. Asian Development Bank, Manila Philippines.
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- https://en.wikipedia.org/wiki/Disaster_management_in_India
- https://ndma.gov.in/

EAG708 Post Harvest Engineering of Cereals, Pulses and Oil Seeds L:T:P 3:0:0

Objectives- To acquaint with the appropriate post harvest technologies of cereals, pulses and oil seeds.

UNIT-I

Cleaning and grading, aspiration, scalping; size separators, screens, sieve analysis, capacity and effectiveness of screens. Various types of separators: specific gravity, magnetic, disc, spiral, pneumatic, inclined draper, velvet roll, colour sorters, cyclone, shape graders. Size reduction: principle, Bond's law, Kick's law, Rittinger's law, procedure (crushing, impact, cutting and shearing), Size reduction machinery: Jaw crusher, Hammer mill, Plate mill, Ball mill.

UNIT-II

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, 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

UNIT-III

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.

UNIT-IV

Mixing: Theory of mixing of solids and pastes, Mixing index, types of mixers for solids, liquid foods and pastes. Milling of rice: Conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods, Pressure parboiling method, Types of rice mills, Modern rice milling, different unit operations and equipment. Milling of wheat, unit operations and equipment.

UNIT-V

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 corn and its products. Dry and wet milling. Milling of oilseeds: mechanical

expression, screw press, hydraulic press, solvent extraction methods, preconditioning of oilseeds, refining of oil, stabilization of rice bran., Extrusion cooking: principle, factors affecting, single and twin screw extruders. By-products utilization.

Course Outcomes:

The student will be able to:

- gain basic knowledge about processing of various agricultural products includin g cereals, pulses, oilseeds, fruits, vegetables and animal products.
- Acquire basic knowledge about material handling of various agricultural products
- Understand basic composition & structure of food grain
- Understand the basics of milling operations
- Learn processing of food grains into value added products
- Manage production, distribution & storage of grains
- Manage by products utilization

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2. Dash, S.K., Bebartta, J.P. and Kar, A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.
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8. Singh, R. Paul. and Heldman, R.Dennis. 2004. Introduction to Food Engineering. 3rd Edition. Academic Press, London.

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EAG758 Post Harvest Engineering of Cereals, Pulses and Oil Seeds Lab L:T:P 0:0:2

List of Experiment: Minimum 08 experiments out of the following:

1. Performance evaluation of different types of cleaners and separators
2. Measurement of moisture content: dry basis and wet basis,
3. Study of different size reduction machines and performance evaluation
4. Study of different types of conveying and elevating equipments
5. Study of different types of mixers
6. Determination of fineness modulus and uniformity index
7. Study of different equipments in rice mills and their performance evaluation
8. Study of different equipments in pulse mills and their performance evaluation
9. Study of different equipments in oil mills and their performance evaluation,
10. Visit to grain processing industries.

EAG709 Water Harvesting and Soil Conservation Structures L:T:P 3:0:0

Objectives: To have understanding about the degradation of productive soil globally and its effect thereon, also to know about the causes about water scarcity and their solution to fight against the evil effects through soil and water conservation technologies

UNIT- I

Water harvesting-principles, importance and issues. Water harvesting techniques– classification based on sources purpose and design criteria, storage and use. Runoff harvesting – short-term and long-term techniques.

UNIT- II

Structures - farm ponds - dug-out and embankment reservoir types. 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.

UNIT- III

Design considerations of *nala* bunds. Soil erosion control structures - introduction, classification. 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.

UNIT- IV

Hydraulic jump and its application. Spillway types - straight drop, box-type inlet spillways - functional use, advantages, disadvantages, and different components of spillways-straight apron and stilling basin outlet. Triangular load diagram for various flow conditions, creep line theory.

UNIT- V

Uplift-pressure, safety against sliding, overturning, crushing and tension. Energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations.

Course outcomes:

By the end of the course, the students will be able to

- Know different soil erosion control structures and their requirements for better soil and
- Moisture conservation in different situations.
- Understand the theory behind flow through soil conservation structures and use specific
- Energy and momentum concepts to analyze flow problems. Prepare plan and design water harvesting and permanent soil and water conservation
- Engineering structures with cost estimation.

References:

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EAG710 Agricultural Structures & Environmental Control L:T:P 3:0:0

Objectives: To acquaint the students with various aspects of agricultural structures and with various aspects of environmental control and renewable and non-renewable resources of energy

UNIT- I

Planning and layout of farmstead. Scope, importance and need for environmental control, 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, Livestock production facilities, BIS Standards for dairy, piggery, poultry and other farm structures.

UNIT- II

Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc. Storage of grains, Causes of spoilage, Water activity for low and high moisture food and its limits for storage.

UNIT- III

Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins), Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins, Storage of seeds.

UNIT- IV

Rural living and development, rural roads, their construction cost and repair and maintenance. Sources of water supply, norms of water supply for human being and animals, drinking water standards and water treatment suitable to rural community.

UNIT- V

Site and orientation of building in regard to sanitation, community. sanitation system; 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.

Course Outcomes:

Students completing this course will be able to:

- To prepare estimate for different farm buildings, structures, roads, fencing and construction, repair and maintenance of farm structures
- Design and layout of farm buildings, poultry houses, goat houses, bio-gas plant, farm roads, fencing etc.
- Measure different environmental parameters and indicators, ventilation, air temperature, cooling load of farm buildings

References:

1. Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana.
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EAG711 Sprinkler and Micro irrigation Systems L:T:P 3:0:0

Objectives:

- To make students familiar with different micro irrigation systems.
- Learn the various layout and design along with fertilizer application through these systems.
- To train the students about the field specific for design of Drip and Sprinkler Irrigation system, their proper operation and the maintenance of the system.

UNIT-I

Sprinkler irrigation: application and types of sprinkler irrigation systems; design of sprinkler irrigation system: layout selection, design of lateral, sub main and main pipe line.

UNIT- II

Design steps; selection of pump and power unit for sprinkler irrigation system; performance evaluation of sprinkler irrigation system: uniformity coefficient and water use efficiency.

UNIT- III

Types of micro irrigation systems- merits and demerits, different components; Design steps of drip irrigation system: general considerations, wetting patters, emitter selection.

UNIT- IV

Maintenance of micro irrigation system: clogging problems, filter cleaning, flushing and chemical treatment.

UNIT- V

Fertigation: advantages and limitations, fertilizers solubility and their compatibility, fertigation frequency, duration and injection rate, fertigation methods.

Course Outcomes:

By learning the topic student will be able to know the:

- Design the field channels, Regime Channels, border irrigation, drip and sprinkler irrigation system and fundamentals of check basin and furrow irrigation.
- To provide a sound theoretical knowledge applied to water resources and agricultural engineering.
- The students will able to understand the requirements of crop water.
- The Students will understand the importance of water quality for beneficial uses, especially irrigation and its management.
- To develop innovative capacity of students for increasing agricultural production with scarce water resources available.

References:

1. Keller Jack and Bliesner Ron D. 2001. Sprinkle and Trickle Irrigation. Springer Science+business Media, New York .
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EAG712A Plastic Applications in Agriculture L: T: P 3:0:0

Objectives: Students are exposed with the technology to design micro irrigation system, fertigation system, greenhouse design, environment control for efficient management of crop to increase productivity.

UNIT-I

Introduction of plasticulture - types and quality of plastics used in soil and water conservation, production agriculture and post harvest management. Quality control measures. Present status and future prospective of plasticulture in India.

UNIT-II

Water management - use of plastics in in-situ moisture conservation and rain water harvesting. Plastic film lining in canal, pond and reservoir. Plastic pipes for irrigation water management, bore-well casing and subsurface drainage. Drip and sprinkler irrigation systems. Use of polymers in control of percolation losses in fields.

UNIT-III

Soil conditioning - soil solarisation, effects of different colour plastic mulching in surface covered cultivation. Nursery management - Use of plastics in nursery raising, nursery bags, trays etc. Controlled environmental cultivation - plastics as cladding material, green / poly / shade net houses, wind breaks, poly tunnels and crop covers.

UNIT-IV

Plastic nets for crop protection - anti insect nets, bird protection nets. Plastic fencing. Plastics in drying, preservation, handling and storage of agricultural produce, innovative plastic packaging solutions for processed food products. Plastic cap covers for storage of food grains in open. Use of plastics as alternate material for manufacturing farm equipment and machinery.

UNIT-V

Plastics for aquacultural engineering and animal husbandry - animal shelters, vermi-beds and inland fisheries. Silage film technique for fodder preservation. Agencies involved in the promotion of plasticulture in agriculture at national and state level. Human resource development in plasticutlure applications.

Course Outcomes:

Students shall gain knowledge on

- The different types of materials and media used for packaging
- Manufacturing processes for different packaging materials
- Quality testing techniques for different packaging materials.
- Hazards and toxicity associated with packaging materials.

References:

1. Brahma Singh, Balraj Singh, Naved Sabir and Murtaza Hasan. 2014.Advances in Protected Cultivation. New India Publishing Agency, New Delhi.
2. Brown, R.P. 2004. Polymers in Agriculture and Horticulture. RAPRA Review Reports : Vol. 15, No. 2, RAPRA Technology Limited, U.K.
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EAG712B Human Engineering and Safety L: T: P 3:0:0

Objectives: Exposure to application of human factors for engineering design, measurement of energy cost of different activities. Use of anthropometric parameters in designing of different agricultural machines and equipments Knowledge of ergonomic assessment of different working environment

UNIT- I

Human factors in system development – concept of systems; basic processes in system development, performance reliability, human performance.

UNIT- II

Information input process, visual displays, major types and use of displays, auditory and factual displays.

UNIT- III

Speech communications. Biomechanics of motion, types of movements, Range of movements, strength and endurance, speed and accuracy, human control of systems.

UNIT- IV

Human motor activities, controls, tools and related devices. Anthropometry: arrangement and utilization of work space, atmospheric conditions, heat exchange process and performance, air pollution.

UNIT- V

Dangerous machine (Regulation) act, Rehabilitation and compensation to accident victims, Safety gadgets for spraying, threshing, Chaff cutting and tractor & trailer operation etc.

Course Outcomes:

The student will be able to:

- Learn the moral issues and problems in engineering; find the solution to those problems.
- Learn the need for professional ethics, codes of ethics and roles, concept of safety, risk assessment.
- Gain exposure to Environment Ethics & computer ethics; know their responsibilities and rights
- Understood the core values that shape the ethical behaviour of an engineer

- Exposed awareness on professional ethics and human values.
- Known their role in technological development

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- https://www.coursera.org/lecture/quality-healthcare/human-factors-jPVnG

EAG712C Waste and By-Products Utilization 3(2+1) L: T: P 3:0:0

Objectives: To provide an understanding of the technology for waste and bi-product utilization of agriculture waste.

UNIT-I

Types and formation of by-products and waste; Magnitude of waste generation in different food processing industries; Uses of different agricultural by-products from rice mill, sugarcane industry, oil mill etc,.

UNIT-II

Concept, scope and maintenance of waste management and effluent treatment, Temperature, pH, Oxygen demands (BOD, COD), fat, oil and grease content, metal content, forms of phosphorous and sulphur in waste waters, microbiology of waste, other ingredients like insecticide, pesticides and fungicides residues.

UNIT-III

Waste utilization in various industries, furnaces and boilers run on agricultural wastes and byproducts, briquetting of biomass as fuel, production of charcoal briquette, generation of electricity using surplus biomass, producer gas generation and utilization.

UNIT-IV

Waste treatment and disposal, design, construction, operation and management of institutional community and family size biogas plants, concept of vermin-composting, Pretreatment of waste: sedimentation, coagulation, flocculation and floatation.

UNIT-V

Secondary treatments: Biological and chemical oxygen demand for different food plant waste– trickling filters, oxidation ditches, activated sludge process, rotating biological contractors, lagoons.

Tertiary treatments: Advanced waste water treatment process-sand, coal and activated carbon filters , phosphorous, sulphur, nitrogen and heavy metals removal, Assessment, treatment and disposal of solid waste; and biogas generation, Effluent treatment plants.

Course Outcomes:

The students will be able to:

- Understand the scientific principles of the use of biodegradable waste and agricultural by-products from agriculture
- Understand the basic information on waste management status in India.
- Apply acquired knowledge both theoretical and practically to generate market for agriculture by-product waste utilization.

References:

1. Markel, I.A. 1981. Managing Livestock Waste, AVI Publishing Co.
2. Shewfelt, R.L. and Prussi, S.E. 1992. Post-Harvest Handling – A Systems approach, Academic Press Inc.
3. USDA. 1992. Agricultural Waste Management Field Hand book. USDA, Washington DC.
4. Weichmann J. 1987. Post Harvest Physiology of vegetables, Marcel and Dekker Verlag.
5. V.K. Joshi & S.K. Sharma. Food Processing Waste Management: Treatment & Utilization. NewIndia Publishing Agency.
6. Prashar, Anupama and Bansal, Pratibha. 2007-08. Industrial Safety and Environment. S.K. Kataria and sons, New Delhi
7. Garg, S K. 1998. Environmental Engineering (Vol. II) – Sewage Disposal and Air Pollution Engineering. Khanna Publishers, New Delhi
8. Bhatia, S.C.. 2001. Environmental Pollution and Control in Chemical Process Industries. Khanna Publishers, New Delhi.

Web Sources:

- http://ecoursesonline.iasri.res.in/course/view.php?id=518

EAG713 Renewable Energy Resources & Management L: T: P 3:0:0

Objective: To train graduates with adequate knowledge of renewable energy sources and its utilization for human benefits.

UNIT-I

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application.

UNIT-II

Familiarization with types of biogas plant sand gasifiers, biogas, bio-alcohol, biodiesel and bio-oil production and their utilization as bio-energy resource.

UNIT-III

Introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater.

UNIT-IV

Application of solar energy: solar drying, solar pond, solar distillation, solar photo-voltaic system and their application.

UNIT-V

Briquettes, Types of Briquetting machines, uses of Briquettes. Introduction of wind energy and their application.

Course Outcomes:

Students completing this course will be able to:

- Identify the non conventional resources and understand solar cell material, array, power plant and its limitations
- Understand about solar thermal energy, collectors and analyze solar thermal power plant for power generation, energy storage for heating and cooling purposes
- Understand about Geothermal Energy, Principle of working of MHD Power plant and Fuel Cells.
- Familiar with Wind energy and energy conversion system.

- Understand Bio-mass and familiar with OTEC and Waste Recycling Plants.

References:

1. Rai, G.D. 2013. Non-Conventional Energy Sources, Khanna Publishers, Delhi. Rai, G.D., Solar Energy Utilization, Khanna Publishers, Delhi.
2. Khandelwal, K.C. & S. S. Mahdi. 1990. Biogas Technology- A Practical Handbook.
3. Rathore N. S., Kurchania A. K., Panwar N. L. 2007. Non Conventional Energy Sources, Himanshu Publications.
4. Tiwari, G.N. and Ghoshal, M.K. 2005. Renewable Energy Resources: Basic Principles and Applications. Narosa Pub. House. Delhi.
5. Rathore N. S., Kurchania A. K., Panwar N. L. 2007. Renewable Energy, Theory and Practice, Himanshu Publications.

Website Sources:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in/

EAG 760, EAG 761 & EAG 762, Experiential Learning I, Experiential Learning II & Experiential Learning III

Objective: To aware the students an opportunity to develop practical and entrepreneurial skills, and knowledge through hands on experience.

The students have to register for any three modules, which are as follows-

1. Process and food engineering.
2. Farm machinery and equipments.
3. Soil and water conservation engineering & Irrigation.
4. Micro irrigation techniques.
5. Maintenance of Agricultural Machinery.
6. Design of agricultural tools and implements.
7. Food Processing
8. Milk & Milk Products.
9. Agriculture Waste management.
10. Soil, plant, water & seed testing.
11. Performance, evaluation of agriculture machinery.
12. Watershed Management.
13. Medicinal & aromatic plants production and processing.

Sl. No.	Aspects of Evaluation	Max. Marks
1.	Project Planning and Writing	20
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
6.	Technical Skill Development	10
7.	Entrepreneurship and Business networking skills	20
9.	Report Writing Skills	10
10.	Final Presentation	10
	Total	100

Course Outcomes:

- It develops practical and entrepreneurial skills, and knowledge through meaningful hands on experience, confidence in their ability to design and execute project work.

EAG802 Industrial Management L: T: P 3:0:0

Objectives: Students will able to get basic knowledge of sales forecasting, industrial market research, economic analysis of competing companies, pricing problem of industry, capital project, production program and economic analysis of agriculture, trade and public relations.

UNIT- I

Introduction: Concept, Development, application and scope of Industrial Management. **Productivity:** Definition, measurement, productivity index, types of production system, Industrial Ownership.

UNIT- II

Management Function: Principles of Management- Management Tools – time and motion study, work simplification- process charts and flow diagrams, Production Planning, Specification of Production requirements.

UNIT- III

Inventory control: Inventory, cost, Deterministic models, Introduction to supply chain management.

UNIT- IV

Quality control: Meaning, process control, SQC control charts, single, double and sequential sampling, Introduction to TQM.

UNIT- V

Environmental Issues: Environmental Pollution – various management techniques to control Environmental pollution – Various control acts for Air, Water, Solid waste and Noise pollution.

Course Outcomes:

The student will be able to:

- Understand the theories and principles of modern management and apply the concepts to the management of organisations in private and public sector.

- Understand how managers can effectively plan in today's dynamic environment, be familiar with the design of organisation structure and describe how environmental uncertainty affects organisation design.
- Identify what strategies organisations might use to become more customer oriented and be more innovative.
- Identify the characteristics of effective teams and understand why teams have become so popular in organisations.

References:

1. Khanna O.P. : Industrial Engineering
2. T.R. Banga : Industrial Engineering and Management
3. Sharma B.R. : Environmental and Pollution Awareness.

Web Sources:

- https://www.digimat.in/nptel/courses/video/110105094/L01.html

EAG803 Entrepreneurship Development and Business Management L:T:P 3:0:0

Objectives: This course enables the students for Agribusiness Management principles, marketing and processing of agricultural commodities in context with new economic era. Build up the students in globalization and international emerging business environment.

UNIT- I

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- II

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.

UNIT- III

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– Entrepreneurial and managerial characteristics- Entrepreneurship development Programmes (EDP)- Generation incubation and commercialization of ideas and innovations- Motivation and entrepreneurship development.

UNIT- IV

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 country- Overview of Indian social, political systems and their implications for decision making by individual

entrepreneurs- Economic system and its implications for decision making by individual entrepreneurs- Social responsibility of business.

UNIT- V

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.

Course Outcomes:

The student will be able:

- Develop idea generation, creative and innovative skills.
- Aware of different opportunities and successful growth stories.
- Have the ability to discern distinct entrepreneurial traits
- Know the parameters to assess opportunities and constraints for new business ideas
- Understand the systematic process to select and screen a business idea
- design strategies for successful implementation of ideas
- write a business plan

References:

1. Harsh, S.B., Conner, U.J. and Schwab, G.D. 1981. Management of the Farm Business. Prentice Hall Inc., New Jersey.
2. Joseph, L. Massie. 1995. Essentials of Management. Prentice Hall of India Pvt. Ltd., New Delhi.
3. Omri Rawlins, N. 1980. Introduction to Agribusiness. Prentice Hall Inc., New Jersey
4. Gittenger Price, J. 1989. Economic Analysis of Agricultural Projects. John Hopkins University, Press, London.
5. Thomas W Zimmer and Norman M Scarborough. 1996. Entrepreneurship. Prentice-Hall, New Jersey.
6. Mark J Dollinger. 1999. Entrepreneurship Strategies and Resources. Prentice-Hall, Upper Saddal Rover, New Jersey.
7. Khanka S S. 1999. Entrepreneurial Development. S. Chand and Co. New Delhi.

8. Mohanty S K. 2007. Fundamentals of Entrepreneurship. Prentice Hall India Ltd., New Delhi.

Web Sources:

- https://www.open.edu/openlearn/money-business/business-strategy-studies/entrepreneurial-behaviour/content-section---learningoutcomes
- https://www.uio.no/english/studies/programmes/entrepreneurship-innovation-master/learning-outcomes/
- https://onlinecourses.swayam2.ac.in/cec20_mg19/preview
- https://www.edx.org/learn/entrepreneurship

EAG804 Fundamental of Remote Sensing and GIS Applications L:T:P 3:0:0

Objectives: To train students in use of various hardware and software in use of satellite data, GPS technology in developing GIS based out puts for resource mapping and planning studies.

UNIT- I

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- II

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.

UNIT- III

Photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography; satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner;

UNIT- IV

Different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, important consideration in identification of training areas, vegetation indices; microwave remote sensing. GI Sand basic components, different sources of spatial data, basic spatial entities, major components of spatial data.

UNIT- V

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.

Course Outcomes:

At the end of this course, the student will be able to

- Familiar with remote sensing and GIS software.
- Familiar with Spectral reflectance curve and different types of sensors and platforms..
- Understand and analyze aerial photography and preparation of maps for local planning.
- Analyze digital image processing, scanning and digitization of maps.
- Understand the components of GIS and data management.

References:

1. Reddy Anji, M. 2006. Textbook of Remote Sensing and Geographical Information Systems. BS Publications, Hyderabad.
2. Elangovan, K. 2006. GIS Fundamentals Applications and Implementations. New India Publication Agency, New Delhi.
3. George Joseph. 2005. Fundamentals of Remote Sensing. 2nd Edition. Universities Press (India) Private Limited, Hyderabad.
4. Jensen, J.R. 2013. Remote Sensing of the Environment: An Earth Resource Perspective. Pearson Education Limited, UK.
5. Lillesand, T., R.W. Kiefer and J. Chipman. 2015. Remote Sensing and Image Interpretation. 7th Edition, John Wiley and Sons Singapore Pvt. Ltd., Singapore.
6. Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation. Tird Edition, Waveland Press Inc., Illinois, USA.
7. Sahu, K.C. 2008. Text Book of Remote Sensing and Geographic Information Systems. Atlantic Publishers and Distributors (P) Ltd., New Delhi.

Website Source:

- onlineecourses.nptel.ac.in
- agrimoon.com
- http://ecoursesonline.iasri.res.in

EAG 854 **Remote Sensing Lab** **L: T: P 0:0:2**

1. Familiarization with remote sensing and GIS hardware.
2. Use of software for image interpretation
3. Interpretation of aerial photographs and satellite imagery
4. Basic GIS operations such as image display;
5. Study of various features of GIS software package;
6. Scanning, digitization of maps and data editing; data base query and map algebra.
7. GIS supported case studies in water resources management.
8. Identification of various lands, water resource using satellites.
9. Visit to Remote Sensing and GIS station.

EAG805A **Food Quality and Control** **L:T:P 3:0:0**

Objectives: To acquaint with food quality parameters and control systems, food standards, regulations, specifications.

UNIT-I

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-II

Sampling; purpose, sampling techniques, sampling procedures for liquid, powdered and granular materials. Food adulteration and food safety.

UNIT-III

Quality control, Quality control tools, Statistical quality control, Sensory evaluation methods, panel selection methods, Interpretation of sensory results. Instrumental method for testing quality.

UNIT-IV

TQM and TQC, consumer preferences and acceptance, Food Safety Management Systems GAP, GHP, GMP, Hazards and HACCP (Hazard analysis and critical control point), Sanitation in food industry (SSOP),

UNIT-V

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.

Course Outcomes:

The student will be able to understand:

- The quality control and assurance system in food industry.
- The risk assessments procedure for food sector.
- GMPs and GHP regulations in the food sector.

- The different food safety management used worldwide.
- The sensory evaluation methodology used in food industry

References:

1. Ranganna S. Hand book of Analysis and Quality Control for Fruit and Vegetable Products. Srilakshmi B, A text book of Food Science and Technology.
2. Mudambi Sumati R, Rao Shalini M and Rajagopal M.V. Food Science.
3. Potter NN and Hotchkiss JH, Food Science.
4. Dev Raj, Rakesh Sharma and Joshi V.K, Quality for Value Addition in Food Processing.

Web Sources:

- https://onlinecourses.swayam2.ac.in/cec20_ag06/preview
- http://ecoursesonline.iasri.res.in/course/view.php?id=185
- http://coursera.org/lecture/valuechains/food-quality-vTDYx
- https://www.openlearning.com/courses/food-quality-assurance-and-control/

EAG805B Photovoltaic Technology and Systems L: T: P 3:0:0

Objectives: To disseminate technologies those are used to harness the power of solar energy**.**

UNIT- I

Solar PV Technology: Advantages, Limitations, Current Status of PV technology, SWOT analysis of PV technology

UNIT- II

Types of Solar Cell, Wafer based Silicon Cell, Thin film amorphous silicon cell Thin Cadmium Telluride (CdTe) Cell, Copper Indium Gallium Selenide (CiGS) Cell, Thin film crystalline silicon solar cell.

UNIT- III

Solar Photo Voltaic Module: Solar cell, solar module, solar array, series & parallel connections of cell, mismatch in cell, fill factor, effect of solar radiation and temperature on power output of module, I-V and power curve of module.

UNIT- IV

Balance of Solar PV system: Introduction to batteries, battery classification, lead acid battery, Nicked Cadmium battery, comparison of batteries, battery parameters, Charge controller: types of charge controller, function of charge controller, PWM type, MPPT type charge controller, Converters: DC to DC converter and DC to AC type converter.

UNIT- V

Application of Solar PV system. Solar home lighting system, solar lantern, solar fencing, solar street light, solar water pumping system, Roof top solar photovoltaic power plant and smart grid.

Course Outcomes:

The Student will be able to:

- Understand various photovoltaic technologies and design concepts.
- Develop an understanding of operational aspects of photovoltaic system design.
- Plan project implementation, operation and maintenance
- Carry out techno-economic-environmental performance evaluation of a solar PV power plant

References:

1. Rai GD. 1998. Non-conventional Sources of Energy. Khanna Pub.
2. Rathore N.S., Kurchania A.K., Panwar N.L. 2006. Renewable Energy: Theory & Practice, Himanshu Publications.
3. Solanki C.S. 2011. Solar Photovoltaic: Fundamentals, Technologies and Applications, PHI Learning Private Ltd.
4. Meinel & Meinel. Applied Solar Energy.
5. Derrick, Francis and Bokalders, Solar Photo-voltaic Products.

Website Sources:

- https://alison.com/course/solar-energy-solar-technology-and-its-use-worldwide
- https://www.edx.org/learn/solar-energy
- https://www.mooc-list.com/course/solar-energy-and-electrical-system-design-coursera
- http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2872
- http://ecoursesonline.iasri.res.in/course/view.php?id=71

EAG805C Food Plant Design and Management L: T: P 3:0:0

Objective: To acquaint the students with various aspects of design and layout of food plant.

UNIT- I

Food plant location, selection criteria, Selection of processes, plant capacity, Requirements of plant building and its components, Project design, flow diagrams, selection of equipment, process and controls, Objectives and principles of food plant layout.

UNIT- II

Salient features of processing plants for cereals, pulses, oilseeds, horticultural and vegetable crops, poultry, fish and meat products, milk and milk products.

UNIT- III

Introduction to Finance, Food Product Marketing, Food Business Analysis and Strategic Planning, Introduction to Marketing, Food Marketing Management, Supply chain management for retail food products.

UNIT- IV

Entrepreneurship development in food industry, SWOT analysis, generation, incubation and commercialization of ideas and innovations, New product development process,

UNIT- V

Government schemes and incentive for promotion of entrepreneurship, Govt. policy on small and medium scale food processing enterprise, export and import policies relevant to food processing sector, procedure of obtaining license and registration under FSSAI, Cost analysis and preparation of feasibility report.

Course Outcomes:

The student will be able:

- To understand the complete design aspects of Food processing industry
- To study about construction requirements, process design of Food Processing Industry

- To gain the knowledge of fabrication and installation of equipments & layout characteristics. To enhance the knowledge in the design of food processing equipments and food processing plant layout

References:

1. Hall, H.S. and Rosen, Y.S. Milk Plant Layout. FAO Publication, Rome.
2. López Antonio. Gómez. Food Plant Design. y Robberts Theunis C. Food plant engineering systems by, CRC Press, Washington.
3. Maroulis Z B and Saravacos G D. Food plant economics. Taylor and Francis, LLC
4. Mahajan M. Operations Research. Dhanpat Rai and Company Private Limited, Delhi. Maroulis Z B. Food Process Design. Marcel Dekker, Inc ,Cimarron Road, Monticello, New York 12701, USA.

Web Sources:

- http://ecoursesonline.iasri.res.in/course/view.php?id=529
- http://agrimoon.com/food-processing-plant-design-layout-pdf-book/

EAG806 Agri-Informatics L:T:P 3:0:0

Objectives: To acquaint students with innovative ideas, techniques and scientific knowledge of Computer Science & Technology applied in the area of Agricultural Science & Engineering.

UNIT- I

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System, definition and types. Introduction to MS-Office Word, MS Excel, Power Point. Audio visual aids - definition, advantages, classification for creating, Editing and Formatting a document and its Applications.

UNIT- II

Database, concepts and its types, creating database using computer applications, Applications of Data Base Management System in Agriculture. Data presentation, tabulation and graph creation, statistical analysis, mathematical expressions, ICT for Data Collection, formation of development programmes, monitoring and evaluation of Programmes.

UNIT- III

Internet and World Wide Web (WWW), Concepts, components and creation of web, HTML, XML coding. e-Agriculture, concepts, design and development. Application of use information and communication technologies (ICT) in Agriculture.

UNIT- IV

Computer Models in Agriculture: statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology, concepts, techniques, components and uses for generating valuable agri-information.

UNIT- V

Decision support systems, taxonomy, components, framework, classification and applications in Agriculture, DSS, Agriculture Information/Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools.

Course Outcomes:

The student will be able to:

- Understand analogy of computer
- Gain basic knowledge of MS Office
- Gain basic knowledge of Internet and WWW
- Use of IT application and different IT tools in Agriculture
- Use of Decision support systems, Agriculture Expert System and Soil Information Systems in Agriculture

References:

1. John Walkenbach, Herb Tyson, Michael R. Groh, Faithe Wempen, Microsoft Office 2010 Bible
2. Bangia,Learning Ms Office 2010 3. Prof. Satish Jain and M. Geetha, MS-Office 2010 Training Guide
3. Kate Shoup, Microsoft Office 2010 6. Melanie Gass, It's All about You Office 2010
4. Nancy Conner and Matthew MacDonald, Office 2010: The Missing Manual

Web Sources:

- https://www.youtube.com/watch?v=XtZlxR2Rvac
- https://www.youtube.com/watch?v=mYSvO9uD-gs
- http://aims.fao.org/online-courses

EAG856 Agri-Informatics Lab

List of Experiment: Minimum 08 experiments out of the following:

1. Study of Basic concepts Computer Components, accessories.
2. Introduction of different operating systems such as windows xp, UNIX. Creating Files & Folders, File Management in Operating System.
3. Use of MS-WORD and MS Power point for creating, editing and presenting a scientific Document, Handling of Tabular data, animation, video tools art tool graphics, template & designs.
4. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros,
5. MS-ACCESS Creating Database, preparing queries and reports, demonstration of Agri-information system.
6. Introduction to World Wide Web (WWW) and its components, creation of scientific website, presentation and management agricultural information through web.
7. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools.
8. Use of smart phones and other devices in agro advisory and dissemination of market information.
9. Introduction of Geospatial Technology, demonstration of generating information. important for Agriculture.
10. Hands on practice on preparation of Decision Support System.