PROGRAMME EDUCATIONAL OBJECTIVES (PEO) – AGRICULTURAL & IRRIGATION ENGINEERING

i) To train and educate students with general knowledge and skills in agricultural water management, agricultural production process, farm machinery and farm management.

ii) To provide a sound theoretical knowledge in engineering principles applied to water resources and agricultural engineering

iii) To prepare students for successful agricultural water management carrier integrating agriculture and irrigation technology.

iv) To develop innovative capacity of students for increasing agricultural production with scarce water resources available.

v) To impart positive and responsive out-reach attitudes, initiative and creative thinking in their mission as engineers.

vi) To understand ethical issues and responsibility of serving the society and the environment at large.

PROGRAM OUTCOMES – AGRICULTURAL AND IRRIGATION ENGINEERING

Graduates of Agricultural and Irrigation Engineering will have

a) Ability to apply the knowledge of mathematics, science and engineering in agriculture

b) Ability to design and conduct experiments, analyze and interpret data to prepare farm specific reports

c) Ability to design an irrigation system to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, and sustainability

d) Ability to think creatively, to formulate problem statements, to communicate effectively, to synthesize information, and to evaluate agricultural systems

e) Ability to function in interdisciplinary teams within the Institute and also with other organizations at National/ International level while planning the research projects.

f) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

g) Will develop competencies in computer and automatic control systems, information systems, mechanical systems, natural resource systems to solve engineering problems

h) Graduates will be able to express themselves clearly in oral and verbal communication needs.

i) Ability to devise a strategy or action plan to utilize the acquired knowledge of irrigation engineering in increasing water-use-efficiency and farm mechanization for reducing cost of cultivation.

j) Graduates will be capable of self-education in emerging water resources problems and understand the value of lifelong learning.

PEOs and POs – Agricultural and Irrigation Engineering

PEOs	POs									
	a	**b**	**c**	**d**	**e**	**f**	**g**	**H**	**I**	**J**
i)	x	x	x					x		
ii)			x	x		x	x			
iii)	x	x	x							
iv)					x			x		
v)			x		x					x
VI)								x	x	x

ANNA UNIVERSITY, CHENNAI 600 025

UNIVERSITY DEPARTMENTS

R - 2012

B. E. AGRICULTURAL AND IRRIGATION ENGINEERING

I - VIII SEMESTERS CURRICULA AND SYLLABI

SEMESTER I

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
HS 8151	Technical English - I	3	1	0	4
MA 8151	Mathematics - I	3	1	0	4
PH 8151	Engineering Physics	3	0	0	3
CY 8151	Engineering Chemistry	3	0	0	3
GE 8151	Computing Techniques	3	0	0	3
GE 8152	Engineering Graphics	2	0	3	4
PRACTICAL					
PH 8161	Physics Laboratory	0	0	2	1
CY 8161	Chemistry Laboratory	0	0	2	1
GE 8161	Computer Practices Laboratory	0	0	3	2
GE 8162	Engineering Practices Laboratory	0	0	3	2
	TOTAL	**17**	**2**	**13**	**27**

SEMESTER II

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
HS 8251	Technical English - II	3	1	0	4
MA 8251	Mathematics – II	3	1	0	4
PH8202	Physics for Agricultural and Irrigation Engineering	3	0	0	3
CY 8251	Chemistry for Civil and Agricultural	3	0	0	3
GE 8251	Engineering Mechanics	3	1	0	4
AI 8201	Principles of Agricultural and Irrigation	3	0	0	3
PRACTICAL					
CY8211	Applied Chemistry Laboratory for Agricultural Engineers	0	0	4	2
AI 8211	Agricultural and Irrigation Engineering Practices	0	0	3	2
	TOTAL	**18**	**3**	**7**	**25**

SEMESTER III

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA 8357	Transform techniques and Partial Differential Equations	3	1	0	4
AI 8301	Soil Science and Engineering	3	0	0	3
AI 8302	Surveying	3	0	0	3
AI 8303	Theory of Machines	3	0	0	3
CE 8351	Fluid Mechanics	3	1	0	4
CE 8353	Strength of Materials	3	0	0	3
PRACTICAL					
AI 8311	Surveying Laboratory	0	0	4	2
CE 8362	Strength of Materials Laboratory	0	0	3	2
	TOTAL	**18**	**2**	**7**	**24**

SEMESTER IV

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA 8353	Numerical Methods	3	1	0	4
GE 8351	Environmental Science and Engineering	3	0	0	3
AI 8401	Food Science and Nutrition	3	0	0	3
AI 8402	Hydraulic Engineering for Agricultural	3	1	0	4
AI 8403	Principles and Practices of Crop Production	3	1	0	4
AI 8452	Hydrology and Water Resources Engineering	3	0	0	3
PRACTICAL					
AI 8411	Fluid Mechanics Laboratory	0	0	3	2
AI 8412	Soil Science and Water Quality Laboratory	0	0	3	2
	TOTAL	**18**	**3**	**6**	**25**

SEMESTER V

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AI 8501	Design and Drawing of Agricultural Machinery	3	1	0	4
AI 8502	Groundwater and Well Engineering	3	0	0	3
AI 8503	Irrigation Engineering for Agricultural Engineers	3	0	0	3
AI 8504	Remote Sensing and Geographical Information System	3	0	0	3
AI 8505	Unit Operations and Post Harvest Technology	3	0	0	3
AI 8551	Integrated Water Resources Management	3	0	0	3

PRACTICAL					
AI 8511	Irrigation Drawing	0	0	3	2
AI 8512	Irrigation Field Laboratory	0	0	3	2
	TOTAL	**18**	**1**	**6**	**23**

SEMESTER VI

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AI 8601	Dairy and Food Engineering	3	0	0	3
AI 8602	Principles of Management for Agricultural Engineers	3	0	0	3
AI 8603	Tractor and Farm Equipments	3	0	0	3
	Elective - I	3	0	0	3
	Elective – II	3	0	0	3
PRACTICAL					
HS 8561	Employability Skills	0	0	2	1
AI 8611	CAD for Agricultural Engineering	0	0	4	2
AI 8612	Food Engineering Laboratory	0	0	3	2
	TOTAL	**15**	**0**	**9**	**20**

SEMESTER VII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AI 8701	Agricultural Economics	3	0	0	3
AI 8702	Bio-Energy Resource Technology	3	0	0	3
AI 8703	Soil and Water Conservation Engineering	3	0	0	3
AI 8751	Participatory Water Resources Management	3	0	0	3
	Elective – III	3	0	0	3
	Elective - IV	3	0	0	3
	Elective - V	3	0	0	3
PRACTICAL					
AI 8711	Creative and Innovative Project	0	0	3	2
AI 8712	Industrial Training (4 weeks)	0	0	0	2
	TOTAL	**21**	**0**	**3**	**25**

SEMESTER VIII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AI 8801	Sustainable Agriculture and Food Security	3	0	0	3
	Elective – VI	3	0	0	3
PRACTICAL					
AI 8811	Project work	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

TOTAL: 181 CREDITS

ELECTIVES FOR AGRICULTURAL AND IRRIGATION ENGINEERING

S.NO	CODE No.	COURSE TITLE	L	T	P	C
1	AI 8001	Agricultural Business Management	3	0	0	3
2	AI 8002	Drainage Engineering and Land Management	3	0	0	3
3	AI 8003	Environment and Agriculture	3	0	0	3
4	AI 8004	Farm Management	3	0	0	3
5	AI 8005	Geology for Agricultural and Irrigation Engineers	3	0	0	3
6	AI 8006	Irrigation Equipment Design	3	0	0	3
7	AI 8007	Irrigation Water Quality and Modeling	3	0	0	3
8	AI 8008	IT in Agricultural Systems	3	0	0	3
9	AI 8009	Minor Irrigation and Command Area Development	3	0	0	3
10	AI 8010	Seed Technology Applications	3	0	0	3
11	AI 8011	Systems Analysis in Irrigation Engineering	3	0	0	3
12	MA 8356	Probability and Statistics	3	1	0	4
13	GE8751	Engineering Ethics and Human Values	3	0	0	3
14	MG8654	Total Quality Management	3	0	0	3
15	GI 8071	Geoinformatics for Agriculture and Forestry	3	0	0	3
16	ME 8080	Refrigeration and Air Conditioning	3	0	0	3
17	ME 8651	Heat and Mass Transfer	3	1	0	4
18	GE 8072	Disaster Management	3	0	0	3
19	GE 8073	Human Rights	3	0	0	3

HS 8151	TECHNICAL ENGLISH – I (Common to all branches of B.E / B.Tech programmes)	L T P C 3 1 0 4

OBJECTIVES:

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as interne and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I **9 + 3**

Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one's place, important festivals etc. – Introducing oneself, one's family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II **9 + 3**

Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association; E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III **9 + 3**

Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV **9 + 3**

Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations & acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V **9 + 3**

Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast & telecast from Radio & TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters.

TOTAL: 60 PERIODS

OUTCOMES:

Learners should be able to

- speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- read different genres of texts adopting various reading strategies.
- listen/view and comprehend different spoken discourses/excerpts in different accents

TEXTBOOKS:

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012.
2. S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Black Swan, Chennai, 2011.

REFERENCES:

1. Pickett, Nell Ann, Ann A.Laster and Katherine E.Staples. Technical English: Writing, Reading and Speaking. New York: Longman, 2001.
2. Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge,2011.
3. Morgan, David and Nicholas Regan. Take-Off: Technical English for Engineering. Reading: Garnet Publishing Limited, 2008.
4. Thorn, Michael and Alan Badrick, An Introduction to Technical English, Harlow: Prentice Hall Europe, 1993.
5. Rizvi, M.Ashraf., Effective Technical Communication. New Delhi: Tata McGraw-Hill PublishingCompany, 2007.

EXTENSIVE READERS:

1. Murthy, Sudha. Wise & Otherwise. New Delhi: Penguin Books India, 2006.
2. Gates, Bill and Collins Hemingway. Business @ the Speed of Thought: Succeeding in the Digital Economy. New York: Warner Business Books, 2000.

Website Resources

1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com

MA 8151 **MATHEMATICS – I** **L T P C**
3 1 0 4

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES **9+3**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II INFINITE SERIES **9+3**

Sequences – Convergence of series – General properties – Series of positive terms –Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms –Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES **9+3**

Limits and Continuity – Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables –Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Errors and approximations – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT IV IMPROPER INTEGRALS **9+3**

Improper integrals of the first and second kind and their convergence – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions

UNIT V MULTIPLE INTEGRALS **9+3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of variables in double and triple integrals – Area of a curved surface.

TOTAL: 60 PERIODS

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one fields of materials and integral

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd.,New Delhi,11th Reprint, 2010.

REFERENCES:

1. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
2. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH8151	ENGINEERING PHYSICS	L T P C
	(Common to all branches of B.E / B.Tech programmes)	**3 0 0 3**

OBJECTIVE:

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

Elasticity - Poisson's ratio and relationship between moduli (qualitative) - Stress-strain diagram - factors affecting elasticity - bending of beams - cantilever - bending moment - theory and experiment of Young's modulus determination - Uniform and non-uniform bending - I shaped girders - twisting couple - hollow cylinder - shaft - torsion pendulum - determination of rigidity modulus- moment of inertia of a body (regular and irregular).

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - loudness and intensity - Weber-Fechner Law - standard intensity and intensity level - decibel - reverberation - reverberation time - rate of growth and decay of sound intensity - derivation of Sabine's formula - absorption coefficient and its determination - factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance - noise and their remedies. Ultrasonics - production - magnetostriction and piezoelectric methods - detection of ultrasound - acoustic grating - industrial applications - NDT - Ultrasonic method: scan modes and practice.

UNIT III THERMAL PHYSICS 9

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity - conductions in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radical flow of heat through a spherical shell - thermal insulation of buildings – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law and Planks law (derivation). Laws of thermodynamics - Otto and diesel engines and their efficiency - entropy - entropy of Carnot's cycle - reverse Carnot's cycle - refrigerator.

UNIT IV APPLIED OPTICS 9

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its application - Lasers - Einstein's coefficients - CO_2 , Nd:YAG and semiconductor lasers - homo junction and hetro junction - construction and working - applications - Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V SOLID STATE PHYSICS 9

Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications

TEXTBOOKS:

1. Gaur R.K., and Gupta, S.L., Engineering Physics, Dhanpat Raj Publications,2003
2. Palanisamy, P.K., Engineering Physics, Scitech Publications (P) Ltd, 2006.
3. Arumugam, M., Engineering Physics, Anuradha Publications, 2000.

REFERENCES:

1. Sankar, B.N., Pillai.S.O., Engineering Physics, New Age International (P) Ltd., 2007.
2. Rajendran.V Engineering Physics, Tata McGraw-Hill, 2009.

CY 8151 ENGINEERING CHEMISTRY L T P C

(Common to All Branches of Engineering and Technology) 3 0 0 3

OBJECTIVES:

- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I CHEMICAL THERMODYNAMICS 9

Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van't Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY 9

Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.

UNIT III KINETICS AND CATALYSIS 9

Introduction – reaction velocity, factors affecting reaction velocity, rate constant, order of reaction, molecularity, pseudo molecular reactions, zero, first, second and third order reactions, reactions of fractional orders, determination of order of reactions. Catalysis: Auto catalysis - Enzyme Catalysis: Michaelis-Menton equation; factors affecting enzyme catalysis. Heterogeneous Catalysis: Types of adsorption isotherms: Langmuir–Hinselwood and Rideal–Eley Mechanism.

UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Photoprocesses - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitisation. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. Width and intensities of spectral lines. Spectrophotometric estimation of iron. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram) and applications.

UNIT V NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and Applications. Risk discussion and Future perspectives.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, kinetics and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXTBOOKS:

1. P. Kannan and A. Ravikrishnan, “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009.
2. S. Vairam, P. Kalyani and Suba Ramesh, “Engineering Chemistry”, Wiley India, 2011

REFERENCES:

1. P.W. Atkins and de Paula Julio, “Physical Chemistry”, Oxford University Press, 8th Ed., (Indian Student Edition) (2009).
2. K. K. Rohatgi-Mukherjee, “Fundamental of Photochemistry” New Age International (P) Ltd., New Delhi, 1986.
3. G.A. Ozin and A.C. Arsenault, “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, 2005.
4. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, “Polymer Science”, New Age International P (Ltd.,), Chennai, 2006

GE8151 COMPUTING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES: The students should be made to:

- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION 8

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS 10

Problem formulation – Problem Solving - Introduction to ' C' programming –fundamentals – structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV FUNCTIONS AND POINTERS 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V STRUCTURES AND UNIONS 9

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design C Programs for problems.
- Write and execute C programs for simple applications.

TEXTBOOKS

1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.

REFERENCES

1. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, " Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

GE 8152 ENGINEERING GRAPHICS L T P C
2 0 3 4

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination) **1**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING **5+9**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES **5+9**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS **5+9**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **5+9**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **6+9**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (Demonstration Only) **3**

Introduction to drafting packages and demonstration of their use.

TOTAL (L:30+P:45):75 PERIODS

OUTCOMES: On Completion of the course the student will be able to

- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting

TEXTBOOK:

1. N.D.Bhatt and V.M.Panchal, “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010

REFERENCES:

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
5. Natrajan K.V.,"A text book of Engineering Graphics",Dhanalakshmi Publishers, Chennai, 2009.
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

PH 8161	PHYSICS LABORATORY (Common to all branches of B.E. / B.Tech. Programmes)	L T P C 0 0 2 1

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

1.	Torsional pendulum	Determination of rigidity modulus of wire and moment of inertia of disc
2.	Non–uniform bending	Determination of young's modulus
3.	Lee's disc	Determination of thermal conductivity of a bad conductor
4.	Potentiometer	Determination of thermo e.m.f. of thermocouple
5.	Air wedge	Determination of thickness of a thin sheet of paper
6.	i. Optical fibre	Determination of Numerical Aperture and acceptance angle
	ii. Compact disc	Determination of width of the groove using laser
7.	Acoustic grating	Determination of velocity of ultrasonic waves in liquids
8.	Post office box	Determination of Band gap of a semiconductor
9.	Spectrometer	Determination of wavelength using grating
10.	Viscosity of liquids	Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

TOTAL: 30 PERIODS

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

CY 8161	CHEMISTRY LABORATORY	L T P C
	(Common to all branches of Engineering and Technology)	**0 0 2 1**

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics – ester hydrolysis.
13. Corrosion experiment – weight loss method.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

REFERENCES:

1. A text of quantitative inorganic analysis, A. L.Vogel, ELBS London, 1995.
2. Experiments in physical chemistry, D.P. Shoemarker and C.W. Gardad, McGraw Hill, London, 2001.
3. American Public Health Association.

GE8161 COMPUTER PRACTICES LABORATORY L T P C
0 0 3 2

OBJECTIVES: The student should be made to:

- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:

1. Search, generate, manipulate data using MS office/Open office
2. Presentation and visualization - graphs, charts, tables, 2D, 3D.
3. Simple C programming using loops: Arrays and Matrix operations.
4. Solving problems using C: Recursive problems – factorial; Iterative problems – trigonometric series evaluation.
5. String manipulations in C
6. Statistical problem solving using C: mean, variance, mode, median and range.
7. Solving numerical problems using C
8. Using Structures and Unions in C
9. Solving numerical problems using Matlab tool.
10. Image generation and animation using Processing tool.

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS

Hardware: 30 Terminals

Software:

1. MS Office / Open Office software
2. C-Compiler
3. MATLAB 7 / Octave 3 / Scilab 5
4. Processing 1.5

TOTAL: 45 PERIODS

OUTCOMES: At the end of the course, the student should be able to:

- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

GE 8162 ENGINEERING PRACTICES LABORATORY L T P C
(Common to all Branches of B.E. / B.Tech. Programmes) 0 0 3 2

OBJECTIVE:

- To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE 12

Plumbing

Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.

Laying pipe connection to the suction side of a pump – inlet. Laying pipe connection to the delivery side of a pump – out let.

Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

Wood Work

Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

Study

Study of joints in door panels, wooden furniture Study of common industrial trusses using models.

2. ELECTRICAL ENGINEERING PRACTICE 9

Basic household wiring using switches, fuse, indicator – lamp etc., Preparation of wiring diagrams

Staircase light wiring

Tube – light wiring

Study of iron-box, fan with regulator, emergency lamp

GROUP – B (MECHANICAL AND ELECTRONICS) 15

3. MECHANICAL ENGINEERING PRACTICE

Welding

Arc welding of butt joints, lap joints, tee joints

Gas welding Practice. Basic Machining

Simple turning, drilling and tapping operations. Machine assembly Practice.

Study and assembling the following: Centrifugal pump, mixies and air conditioners. Demonstration on

Smithy operations like the production of hexagonal bolt. Foundry operation like mould preparation for grooved pulley.

4. ELECTRONIC ENGINEERING PRACTICE 9

Soldering simple electronic circuits and checking continuity. Assembling electronic components on a small PCB and testing.

Study of Telephone, FM radio, low-voltage power supplies.

TOTAL: 45 PERIODS

OUTCOMES:

- ability to fabricate carpentry components and pipe connections including plumbing works.
- ability to use welding equipments to join the structures.
- ability to fabricate electrical and electronics circuits.

HS 8251	TECHNICAL ENGLISH – II	L T P C
	(For all branches of B.E / B.Tech programmes)	**3 1 0 4**

OBJECTIVES:

- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies
- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component

UNIT I **9 + 3**

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II **9 + 3**

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one's friend / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students' dialogues.

UNIT III **9 + 3**

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); Reading - Speed reading – reading passages with the time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); E-materials - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV **9 + 3**

Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V **9 + 3**

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/

agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion

TOTAL: 60 PERIODS

OUTCOMES: Learners should be able to

- speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXTBOOKS:

1. Mindscapes: English for Technologists and Engineers, Orient Black Swan, 2012.
2. S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Black Swan, Chennai, 2011.

REFERENCES:

1. Laws, Anne. Presentations. Hyderabad: Orient BlackSwan, 2000.
2. Lewis, Hedwig. Body Language: A Guide for Professionals. New Delhi: Sage Publications,1998.
3. Naterop, Jean B. and Rod Revell. Telephoning in English. Cambridge: Cambridge University Press, 1987.
4. Rutherford, Andrea J. Basic Communication Skills for Technology. New Delhi: Pearson Education, 2001.
5. Ur, Penny. Teaching Listening Comprehension. Cambridge: Cambridge University Press,1984.

EXTENSIVE READERS:

1. Abdul Kalam, A P J. Ignited Minds: Unleashing the Power within India. New Delhi: Penguin Books India, 2002.
2. Parameswaran, Uma. C.V.Raman: A Biography. New Delhi: Penguin Books India, 2011.

WEB RESOURCES:

1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com

MA 8251 MATHEMATICS – II L T P C
(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVES:

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS 9+3

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+3

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 9+3

Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, az, $1/z$, z^2 - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V LAPLACE TRANSFORMS 9+3

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems –Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem —– Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXTBOOKS:

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana, B.V. “Higher Engineering Mathematics”, Tata McGraw Hill, New Delhi, 2010.

REFERENCES:

1. Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, New Delhi, 2007.
2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi,7th Edition, 2009.
4. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, New Delhi, 2007.

PH8202 PHYSICS FOR AGRICULTURAL AND IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES :

- To introduce the essential principles of physics related to agriculture and irrigation engineering.

UNIT I SOIL PHYSICS 9

Soil as a dispersion three-phase system - Volume and mass relationships of soil constituents - Solid phase - Liquid phase - gaseous phase - soil heat flow - Soil compaction and consolidation - The Field soil water regime - Solute transport in soil - Methods for analyzing spatial variations of soil properties.

UNIT II PHOTOSYNTHESIS 9

Photosynthesis - Leaves and leaf structure - The nature of light - Chlorophyll and accessory pigments - The structure of the chloroplast and photosynthetic membranes - Stages of photosynthesis - The light reactions - Dark reaction - C-4 Pathway - The carbon cycle.

UNIT III BIOPHYSICS 9

Biophysics - Biophysics methods applicable in agriculture - possibilities of application of new methods in agriculture - effects in agriculture with biophysical methods - effects of new methods applied in agriculture in protection of environment - X-ray separation of crops - electrostatic - Spraying of crops - Moisture determination in agricultural materials.

UNIT IV REMOTE SENSING IN AGRICULTURE AND IRRIGATION 9

Electromagnetic spectrum: The photon and radiometric quantities - radiant energy - radiant flux density - radiant intensity - transmittance - absorptance - reflectance - distribution of radiant energies - spectral signatures - sensor technology - sensor types - passive and active - spatial resolution - processing and classification of remote sensed data - pattern recognition - approaches to data / image interpretation - use of remote sensing in agriculture and irrigation.

UNIT V FOOD IRRADIATION AND PRESERVATION 9

Effects of ionizing radiation on biological organism - Effects of ionizing radiation on foods - applications of food irradiation - low dose - medium dose and high dose - Food irradiation using electron beams, X-rays - nuclear radiation - Processing of seeds, spices, fruits and vegetables.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have knowledge on the basics of physics related to soil physics, photo synthesis, biophysics etc.,
- they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

REFERENCES:

1. Elements of Soil Physics, P. Koorevaar, G. Menelik, C. Dirksen, Elsevier Science & Technology, 1999.
2. Electronic radiation of foods - An Introduction to Technology, R.B.Miller, Springer, 2005.
3. Fundamentals of Remote Sensing, George Joseph, University Press Pvt.Ltd., 2005.
4. Bulgarian Journal of Plant Physiology, Special Issue, 2003.

CY8251 CHEMISTRY FOR CIVIL AND AGRICULTURAL ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To develop an understanding about the chemistry of building materials.
- Brief elucidation on corrosion and its control.
- To develop sound knowledge about the water science and technology.
- To impart basic knowledge on adhesives, abrasives, refractories and composites.
- To understand the basic concepts of chemical and instrumental methods of analysis.

UNIT I CHEMISTRY OF BUILDING MATERIALS 9

Introduction- lime – types, manufacture, properties - cement – Portland cement, setting and hardening of cement, types of cement, analysis of cement and dolomite, special cement. Concrete- manufacture and its properties-gypsum plasters. Ceramics – clay products - white ware, stone ware and earthen ware. Glass - manufacture, types, properties and uses. Fly ash –properties and uses.

UNIT II CORROSION AND ITS CONTROL 9

Introduction- chemical and electrochemical corrosions- mechanism of electrochemical and galvanic corrosions- concentration cell corrosion- passivity- soil, pitting, inter-granular, water line, stress and microbiological corrosions- galvanic series- factors influencing corrosion - measurement of corrosion rate. Corrosion control – material selection and design - electrochemical protection– sacrificial anodic protection and impressed current cathodic protection. Protective coatings - metallic coatings (hot dipping, metal cladding, galvanizing, tinning, electroplating, electroless plating), non-metallic inorganic coatings, organic coatings (paints).

UNIT III ADHESIVES AND COMPOSITES 9

Adhesives: Introduction on adhesive action, definitions, development of adhesive bond strength- physical and chemical factors influencing adhesive action- classification of adhesives- important synthetic adhesives. Composites - Introduction- definition - constitution- classification- applications of composite materials- fiber reinforced composites- properties of reinforced composites.

UNIT IV ABRASIVES, AND REFRACTORIES 9

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of refractories – general method; acidic refractories – fire clay, silica; basic refractories – magnesite, dolomite; neutral refractories – silicon carbide, zircon.

UNIT V WATER AND INSTRUMENTAL ANALYSIS 9

Properties of water, sources, quality for different uses-significance of water quality parameter Ph, EC, TDS, Hardness, chloride, sulphate, iron, fluoride, nitrate, BOD, COD, and heavy metals (As, Hg, Cr, Pb) and their determination by titrimetry, electrometry, UV-visible, AAS, ICP-AES, softening of water by ion exchange method, municipal water treatment, principle, coagulations, and filtration, and disinfection. Desalination by reverse osmosis method.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXTBOOKS:

1. Dara S.S,Umare S.S.“Engineering Chemistry”, S. Chand & Company Ltd., New Delhi, 2010.
2. Kannan P., Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hitech Publishing Company Pvt. Ltd. Chennai, 2009

REFERENCES:

1 Sivasankar B., “Engineering Chemistry”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2008.

2 Mary Jane Shultz “Engineering Chemistry”., Cengage Learning India private Limited., New Delhi., 2007.

3 Ashima Srivastava., Janhavi N N., Concepts of Engineering Chemistry”., ACME Learning Private Limited., New Delhi., 2010.

4 Vairam S, Kalyani P, Suba Ramesh.,“Engineering Chemistry”., Wiley India Pvt Ltd.,New Delhi., 2011.

GE 8251 ENGINEERING MECHANICS L T P C
3 1 0 4

OBJECTIVE :

- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering

UNIT I BASICS AND STATICS OF PARTICLES 9 + 3

Introduction – Units and Dimensions – Laws of Mechanics – Lami’s theorem, Parallelogram and triangular Law of forces –– Vectorial representation of forces – Vector operations of forces - additions, subtraction, dot product, cross product – Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility .

UNIT II EQUILIBRIUM OF RIGID BODIES 9 + 3

Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9 + 3

Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES 9 + 3

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion -Newton's laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 9 + 3

Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction –wedge friction-. Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL (L : 45 + T : 15) : 60 PERIODS

OUTCOMES:

- ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
- ability to analyse the forces in any structures.
- ability to solve rigid body subjected to dynamic forces.

TEXTBOOKS:

1. Beer, F.P and Johnson Jr. E.R. "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004)
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

REFERENCES:

1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11thEdition, Pearson Education (2010).
2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education (2006)
3. J.L.Meriam and L.G.Kraige, " Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2,Third Edition, John Wiley & Sons,(1993)
4. Rajasekaran, S and Sankarasubramanian, G., "Engineering Mechanics Statics and Dynamics", 3rd Edition, Vikas Publishing House Pvt. Ltd., (2005).

AI8201 PRINCIPLES OF AGRICULTURAL AND IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To present the basic theory and practice for various areas of Agricultural Engineering, application of engineering to the problems of agricultural production.

UNIT I INTRODUCTION, SOIL & WATER CONSERVATION 6

Agricultural Engineering – Introduction – Branches - Importance in national and global scenario – Institutes & organizations – Soil & water - Land development, Soil irrigability classification - Soil erosion and control, Soil conservation methods, Watershed management.

UNIT II IRRIGATION ENGINEERING AND FARM STRUCTURES 12

Agro meteorology - Soil Water Plant relationship – Sources of water – Tanks – Wells & Reservoirs – Canal Network – Irrigation Scheduling – Irrigation methods –Micro irrigation - Participatory management of Irrigation Systems.

Farm stead, Farm Roads, Cattle sheds, Stanchion barn, Poultry shed, Hog housing, Machinery and implement shed, Storage structures for food grain, feed & forage - Structures for Plant environment - Green houses, Poly houses – Shade net.

UNIT III FARM MACHINERY & EQUIPMENTS 7

Tractor and Power Tiller – Tillage equipments – Sowing, Planting, Fertilizer, application, Spraying, Mowing Equipments, Pumps

UNIT IV AGRICULTURAL PROCESS ENGINEERING 10

Post harvest of crops, Unit operations in agricultural processing, Packing of agricultural produces – Material handling equipments – Milk processing and dairy products.

UNIT V AGRO ENERGY 10

Energy requirement in agricultural operations - Solar (Thermal and Photovoltaic), Wind mills, Bio-gas energy and their utilization in agriculture – gobar gas plant - Gasification of biomass for IC Engines - Energy efficient cooking stoves and alternative cooking fuels – agricultural waste and their utilization.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on soil water conservation, irrigation engineering and farm structures provide a strong platform to understand the concepts on these subjects for further learning

TEXTBOOKS:

1. Michael, A.M. & Ojha, T.P. Principles of Agricultural Engineering Vol. I & II, Seventh Edition, Jain Brothers, New Delhi, 2011.
2. Harry L. Field, John B. Solie, Introduction to Agricultural Engineering Technology – A problem solving approach, Springer Science, NY, USA, 2007.

CY8211 APPLIED CHEMISTRY LABORATORY FOR AGRICULTURAL ENGINEERS L T P C
0 0 4 2

OBJECTIVES:

- The students should be made to introduce different experiments to test basic understanding the applied chemistry concepts.

1. Determination of Iodine value.
2. Determination of Acid value of resin.
3. Estimation of aniline point.
4. Determination of Cu in Brass sample.
5. Determination of Fe in Iron Ore.
6. Determination of Ca in Limestone.
7. Identification of functional groups in organic compounds.
8. Identification of monomers in polymers.
9. Determination of viscosity index by Brookfield viscometer.
10. Determination of TGA of polymeric sample.

TOTAL: 60 PERIODS

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply chemistry principles to evaluate agricultural engineering properties of materials

REFERENCES:

1. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New York (2001).
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., Vogel's Textbook of practical organic chemistry, LBS Singapore (1994).
3. G.H.Jeffery, J.Bassett, J.Mendham and R.C Denny vogel's, Text book of quantitative analysis chemical analysis, ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
4. I.M. Kolthoff, E.B.Sandell et.al. Quantitative chemical analysis, Mcmillan, Madras 1980.

AI8211 AGRICULTURAL AND IRRIGATION ENGINEERING PRACTICES LABORATORY **L T P C 0 0 4 2**

OBJECTIVE:

- Students should be able to understand the various aspects of agricultural and irrigation engineering studied in theory by performing basic experiments in lab.

AGROMETEOROLOGY **12**

1. Meteorology – Precipitation – Rain gauges - recording and non-recording rain gauges - Automatic Weather Station (AWS)
2. Measurement of evaporation using recording and non-recording evaporimeter
3. Measurement of humidity, sunshine, solar radiation, wind direction and speed

SEEDS AND CROPS **12**

4. Identification of food grains and crops
5. Estimation of germination rate for cereals, pulses and oilseeds by conventional method and using Seed Growth germinator
6. Estimation of biometric parameters of different food crops

SOIL AND WATER PARAMETERS **9**

7. Soil Moisture estimation using Infra red moisturemeter
8. pH and EC measurement using electrode device

AGRICULTURAL MACHINERY **12**

9. Demonstration of Agricultural machineries and equipments
10. Demonstration of Agricultural processing equipments

TOTAL: 45 PERIODS

OUTCOMES:

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

- Use various aspects of agricultural and irrigation engineering practices like measurement of evaporation, humidity, soil moisture estimation and familiarize with agricultural processing equipments.

REFERENCES:

1. Michael, A.M. & Ojha, T.P. Principles of Agricultural Engineering Vol. I & II, Seventh Edition, Jain Brothers, New Delhi, 2011.
2. Harry L. Field, John B. Solie, Introduction to Agricultural Engineering Technology – A problem solving approach, Springer Science, NY, USA, 2007.
3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

MA8357	TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS	L T P C 3 1 0 4

OBJECTIVES:

- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Classification of Partial Differential Equations – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous PDE.

UNIT II FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 9+3

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 9+3

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9+3

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

TOTAL: 60 PERIODS

OUTCOMES:

- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEX BOOK:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.

REFERENCES:

1. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, New Delhi, 2007.
2. Ramana, B.V. "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 11th Reprint , 2010.
3. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
4. Peter V.O'Neil, "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi, 2007.

AI8301 SOIL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To expose the students to the fundamental knowledge on Soil physical parameters, Permeability – Compaction, Bearing Capacity and types and methods of soil survey and interpretative groupings

UNIT I INTRODUCTION AND PHYSICAL PROPERTIES 9

Soil - definition - major components –Soil forming minerals and processes- soil profile -Physical properties - texture –density-porosity-consistence-colour- -specific gravity - capillary and non-capillary -plasticity. Soil air - soil temperature - soil water - classification of soil water- Movement soil water. Soil colloids – organic and inorganic matter-Ion exchange- pH – Plant nutrient availability.

UNIT II SOIL CLASSIFICATION AND SURVEY 9

Soil classification -soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey –Field mapping- mapping units - base maps -preparation of survey reports - concepts and uses - land capability classes and subclasses - soil suitability -Problem soils – Reclamation.

UNIT III PHASE RELATIONSHIP AND SOIL COMPACTION 9

Phase relations- Gradation analysis- Atterberg Limits and Indices- Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.

UNIT IV ENGINEERING PROPERTIES OF SOIL 9

Shear strength of cohesive and cohesion less - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test-Compressibility- Assessment of seepage through flow net construction-Permeability- Coefficient of Permeability-Darcy's law- field and lab methods.

UNIT V BEARING CAPACITY AND SLOPE STABILITY 9

Bearing capacity of soils - Factors affecting Bearing Capacity- Shallow and Pile foundations- Terzaghi's formula - BIS standards - Slope stability-Analysis of infinite and finite slopes- friction circle method-slope protection measures.

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of the course the student will be able to understand
- Fundamental knowledge of soil physical parameters.
- The procedures involved in soil survey, soil classification.
- The phase relationship and soil compaction.
- Concepts of bearing capacity and slope stability.

TEXTBOOKS:

1. Nyle C. Brady, The nature and properties of soil (10th Edition) Macmillan Publishing Company, New York, 2008.
2. Punmia, B.C., "Soil Mechanics and Foundation "Laxmi publishers, New Delhi. 2007.

REFERENCES:

1. Edward J. Plaster., "Soil Science", Cengage Learning India Ltd, New Delhi, 2009.
2. Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2007.
3. Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 2007.
4. Sehgal, S.B., "Text Book of Soil Mechanics", CBS Publishers and Distributors New Delhi, 2007.

AI8302 SURVEYING L T P C
3 0 0 3

OBJECTIVE:

- To introduce the principle of surveying, various methods and applications to Agricultural & Irrigation Engineering projects.

UNIT I FUNDAMENTALS AND CHAIN SURVEYING 9

Definition- Classifications - Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting – applications- enlarging and reducing figures- Areas enclosed by straight lines - Irregular figures- digital Planimeter.

UNIT II COMPASS AND PLANE TABLE SURVEYING 9

Compass – Basic principles - Types - Bearing – Systems and conversions – Sources of errors - Local attraction - Magnetic declination-Dip-Traversing - Plotting - Adjustment of closing error – applications - Plane table and its accessories - Merits and demerits - Radiation - Intersection - Resection – Traversing- sources of errors – applications.

UNIT III THEODOLITE AND MODERN SURVEYING 9

Theodolite - Types - Description - Horizontal and vertical angles - Temporary and Permanent adjustments – Heights and distances– Tangential and Stadia Tacheometry – Subtense methods - Stadia constants - Anallactic lens - Traversing - Gale's table - Total Station- Global Positioning System (GPS).

UNIT IV LEVELLING 9

Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of leveling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling - sources of errors in leveling- Precise levelling - Types of instruments - Adjustments - Field procedure.

UNIT V LEVELLING APPLICATIONS 9

Longitudinal and Cross-section-Plotting - Contouring - Methods – Characteristics and uses of contours- Plotting – Methods of interpolating contours – computation of cross sectional area and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams

TOTAL: 45 PERIODS

OUTCOMES:

- Students are expected to use all surveying equipments, prepare LS & CS, contour maps and carryout surveying works related to land and civil engineering projects.

TEXTBOOKS:

1. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
2. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004.

REFERENCES:

1. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice Hall of India 2004.
2. A.M. Chandra, Plane Surveying, New Age International Publishers 2002.
3. Alak De, Plane Surveying, S. Chand & Company Ltd., 2000.

AI8303 THEORY OF MACHINES L T P C

3 0 0 3

OBJECTIVE:

- To introduce the students the theory of machines pertaining to agricultural engineering.

UNIT I TERMINOLOGY 9

Definitions - Kinematic links - Pairs - Chain - Machines and mechanism - Types and uses – Kinematic inversion of four bar chain and slider crank mechanism. Velocity and acceleration in simple mechanisms - Vector polygon and instantaneous centre methods – Coriolis component of acceleration.

UNIT II FRICTION AND APPLICATIONS 9

Sliding and rolling friction –friction in screw threads-Bearing and lubrication- Friction clutches- Belt drives- Friction aspects in brakes.

UNIT III MOTION OF CAM AND FOLLOWER 9

Cam and follower - types - application – displacement diagrams - profile layout for uniform velocity - Uniform acceleration and retardation - simple harmonic and cycloidal motion.

UNIT IV GEARS AND GEAR TRAINS 9

Gears - classification - terminology -law of gearing - tooth profile - interference between rack and pinion. Gear trains - simple - compound reverted. Simple epicyclic gear trains

UNIT V FLYWHEEL AND BALANCING 9

Inertia - turning moment - flywheel - fluctuation of speed and energy. Balancing of rotating masses and reciprocating masses.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Basic knowledge on the friction applications, gear and gear trains.
- Learn the fundamentals related to motion of cam and follower and fly wheel balancing

TEXTBOOKS:

1. Rattan, S.S, Theory of Machines, 3rd edition, Tata McGraw-Hill, 2009.
2. Khurmi, R.S. and Gupta, J.K, Theory of machines, Eurasia Publication House, 1994.

REFERENCES:

1. Thomas Beven, Theory of Machines, CBS Publishers and Distributors, New Delhi, 1984.
2. Ballaney, P.L, Theory of machines, Khanna Publishers, New Delhi,1994
3. http://www.softintegration.com/chhtml/toolkit/mechanism/

CE 8351 FLUID MECHANICS L T P C

3 1 0 4

OBJECTIVES:

- To introduce the students to the mechanics of fluids through a thorough understanding of the properties of the fluids, behaviour of fluids under static conditions. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.
- To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on vanes.

UNIT I FLUIDS PROPERTIES AND FLUID STATICS 12

Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units - viscosity, density, perfect gas, vapour pressure and surface tension - Basic equation of fluid statics - Pressure measurements - Manometers. - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies - Relative equilibrium.

UNIT II BASIC CONCEPTS OF FLUID FLOW 12

(a) Kinematics – Methods of describing fluid motion - Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets; (b) Dynamics - Dimensional Concepts of System and Control volume - Application of control volume to continuity, energy and momentum - Euler's equation of motion along a stream line - Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation and moment-of-momentum equations and their applications.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 12

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models.

UNIT IV INCOMPRESSIBLE VISCOUS FLOW 12

Laminar flow between parallel plates, and pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment - Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V BOUNDARY LAYERS AND TRANSPORT BY ADVECTION AND DIFFUSION 12

Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers - Momentum integral equation – Steady molecular diffusion and conduction – Turbulent transport equations – Channel diffusion and Dispersions and Applications.

TOTAL : 60 PERIODS

OUTCOMES:

- The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

TEXTBOOKS :

1. Streeter, V.L. Wylie, E. B. and Bedford K.W, *Fluid Mechanics.* (9^{th} ed) Tata McGraw Hill, New Delhi, 1998
2. Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House New Delhi. 2003

REFERENCES :

1. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 1995.
2. Jain A. K. Fluid Mechanics. Khanna Publishers 1995.
3. Roberson J.A and Crowe C.T., Engineering Fluid Mechanics. Jaico Books Mumbai, 2000.

CE8353 STRENGTH OF MATERIALS L T P C

3 0 0 3

OBJECTIVE:

- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

UNIT III TORSION **9**

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS **9**

Double Integration method – Macaulay's method – Area moment Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell's reciprocal theorems.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS **9**

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theory – Application of theories of failure.

TOTAL: 45 PERIODS

OUTCOMES:

The students will have

- Thorough understanding of the fundamental concepts of stress and strain in mechanics of solids and structures.
- the ability to analyse determinate beams and trusses to determine shear forces, bending moments and axial forces.
- a sufficient knowledge in designing shafts to transmit required power and also springs for its maximum energy storage capacities.

TEXTBOOKS:

1. Bansal, R.K., Strength of Materials, Laxmi Publications (P) Ltd., 2007
2. Jindal U.C., Strength of Materials, Asian Books Pvt. Ltd., New Delhi, 2007

REFERENCES:

1. Egor. P.Popov " Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2001
2. Subramanian R., Strength of Materials, oxford University Press, Oxford Higher Education Series, 2007.
3. Hibbeler, R.C., Mechanics of Materials, Pearson Education, Low Price Edition, 2007
4. Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole Mechanics of Materials, Tata Mcgraw Hill publishing 'co. Ltd., New Delhi.

AI8311 SURVEYING LABORATORY **L T P C**
0 0 4 2

OBJECTIVE :

- To train the student to acquire skills in operating various surveying instruments and to obtain accurate results.

1) CHAIN SURVEYING

a) Ranging, Chaining and Pacing b) Chain traversing

2) COMPASS SURVEYING

a) Triangulation Problem b) Compass traversing

3) PLANE TABLE SURVEYING

a) Radiation
b) Intersection - Triangulation problem c) Plane table traversing

4) THEODOLITE SURVEYING

a) Measurement of horizontal & vertical angles b) Tangential & Stadia Tacheometry

5) LEVELLING

a) Fly levelling using Dumpy level b) Fly levelling using Tilting level c) Check levelling
d) Block Levelling
e) Radial Contouring

6) DEMONSTRATION OF TOTAL STATION AND GPS

TOTAL: 60 PERIODS

OUTCOMES:

- Students completing this course would have acquired practical knowledge on handling basic survey instruments including leveling and development of contour map of given area.

CE 8362 STRENGTH OF MATERIALS LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen (Izod and Charpy)
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
7. Deflection test on metal beam
8. Compression test on helical spring
9. Deflection test on carriage spring

TOTAL: 30 PERIODS

OUTCOMES:

- The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally.

REFERENCES:

1. Strength of Materials Laboratory Manual, Anna University, Chennai-600 025.
2. IS 1786-2008 – Specification for cold worked steel high strength deformed bars for concrete reinforcement

MA 8353 **NUMERICAL METHODS** **L T P C**
3 1 0 4

OBJECTIVES:

- To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
- To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method –Newton-Raphson method- Solution of linear system of equations - Gauss Elimination method – Pivoting - Gauss-Jordan methods – Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by Gauss-Jordan method - Eigenvalues of a matrix by Power method and by Jacobi's method.

UNIT II INTERPOLATION AND APPROXIMATION 9+3

Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTATION AND INTEGRATION 9+3

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne's and Adams-Bashforth predictor-corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3

Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain - One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

OUTCOMES:

- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXTBOOKS :

1. Grewal, B.S. and Grewal,J.S., "Numerical methods in Engineering and Science", Khanna Publishers, New Delhi, 9th Edition, 2007.
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers', Prentice Hall of India Private Ltd., New Delhi, 3rd Edition,2007.

REFERENCES:

1. Brian Bradie, “A Friendly Introduction to Numerical Analysis”, Pearson Education Asia, New Delhi, 1st Edition, 2007.
2. Gerald, C.F. and Wheatley, P.O., “Applied Numerical Analysis”, Pearson Education Asia, New Delhi, 6th Edition, 2006.
3. Laurene V. Fausett, “Applied Numerical Analysis using MATLAB”, Pearson Education, New Delhi, 1st print, 2nd Edition, 2009.

GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth‟s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting

and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL : 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS :

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCES :

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia',Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi,2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

AI8401 **FOOD SCIENCE AND NUTRITION** **L T P C**
3 0 0 3

OBJECTIVES

- To understand the food groups, constituents of food, energy from food and nutrition
- To expose the students to various food processing and preservation methods

UNIT I FOOD GROUPS AND FOOD SCIENCE 9

Food, Food groups and Food science – objectives - Quality attributes – size, shape, colour consistency, viscosity, texture, taste and flavour - Sensory evaluation of foods - Microorganisms in food spoilage - Food laws and standards - PFA, FPO, AGMARK, APEDA, BIS, International standards for export (CA and HACCP) - Food adulteration, common adulterants - effects - Methods for detection of food adulterants

UNIT II ENERGY FROM FOOD - CARBOHYDRATES, PROTEINS, LIPIDS 9

Energy – estimation of food energy, total energy needs of the body - BMR - Carbohydrates, classification, functions, digestion - absorption, Sources - Proteins – sources – digestion, absorption, assessing the quality of protein - AA score, BV, PER, NPR and NPU, protein deficiency - Lipids, classification, function, digestion and absorption - sources and requirements, saturated and unsaturated fatty acids, rancidity.

UNIT III VITAMINS, MINERALS & NUTRITION 9

Vitamins – classification (fat soluble and water soluble vitamins) - sources - importance, deficiency - RDA - Minerals, macronutrients importance, sources, deficiency and RDA - Minerals, micronutrients, importance , sources, deficiency and RDA - Weaning foods – Nutrition - characteristics of well and poorly nourished population, nutrition and good health.

UNIT IV BAKING, CONFECTIONARY & PRESERVATION BY SUGAR 9

Baking, Bread making, spoilage in bread – Preparation of cake, biscuits and cookies - Extrusion technology, extruders - Extruded products, vermicelli, macaroni, noodles and spaghetti - Confectionary - manufacture of crystalline and non-crystalline candies - cocoa products - Processing of fruits and vegetables - Preservation by sugar- Jam, Jelly, Marmalade, Squash

UNIT V PRESERVATION OF FOOD 9

Preservation by chemicals - Preservation by fermentation, wine, vinegar - Canning, spoilage - Drying and dehydration - beverages - Rules for setting up a fruit processing industry – Food packaging, definition, functions, requirements and methods of package.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- Various fundamentals of food groups and food science.
- Classifications of vitamins, minerals and nutrition.
- Various energy form food.

TEXTBOOKS:

1. Sunetra Roday, Food Science and Nutrition, Oxford University Press, New Delhi, 2008
2. Sri Lakshmi.B., Food Science, New Age International Publications, 4th Edition, New Delhi, 2007.

REFERENCES:

1. Desrosier, N.W., The technology of food preservation, CBS Publishers and Distributors, New Delhi, 4th edition, 2002.
2. Manoranjan Kalia, Food analysis and Quality control. Kalyani Publishers. Ludhiana, 2002.
3. Vijaya Khader, Text book of Food Science and Technology. ICAR, New Delhi. 2001.
4. Potter, N.N and Joseph, H.H. Hotchkiss, Food science, CBS Publishers and Distributors, New Delhi. 1996.

AI8402 HYDRAULIC ENGINEERING FOR AGRICULTURAL ENGINEERS L T P C
3 1 0 4

OBJECTIVES:

- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic pumps. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

UNIT I UNIFORM FLOW 9+3

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II VARIED FLOWS 9+3

Dynamic equations of gradually varied and spatially varied flows - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method, Graphical method - Applications.

UNIT III RAPIDLY VARIED FLOWS 9+3

Application of the energy equation for RVF - Critical depth and velocity - Critical, Sub-critical and Super-critical flow - Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Surges and surge through channel transitions.

UNIT IV ROTODYNAMIC PUMPS 9+3

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Submersible pumps -Turbine Pumps.

UNIT V POSITIVE DISPLACEMENT PUMPS 9+3

Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Piston pumps - Rotary pumps: Gear pump - Jet pump - Air-lift pump - Hydraulic Ram.

OUTCOMES:

- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

TOTAL (L: 45 + T: 15): 60 PERIODS

TEXTBOOKS:

1. Jain. A.K., Fluid Mechanics, Khanna Publishers, Delhi, 2010.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2002.

REFERENCES:

1. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 2009.
2. Rajesh Srivastava, Flow through open channels, Oxford University Press, New Delhi, 2008.
3. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, 2008.
4. Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2000.

AI8403 PRINCIPLES AND PRACTICES OF CROP PRODUCTION L T P C
3 1 0 4

OBJECTIVES:

- To introduce the students to principles of agricultural and horticultural crop production and to introduce the production practices of crops.
- To delineate the role of agricultural and irrigation engineers in relation to various crop production practices.

UNIT I AGRICULTURE AND CROP PRODUCTION 9+3

Introduction to agriculture and its crop production sub-sectors - field crop production and horticulture; Factors affecting crop growth and production: genetic (internal) and environmental (external) factors; Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices

UNIT II CROP SELECTION AND ESTABLISHMENT 9+3

Regional and seasonal selection of crops; Systems of crop production; Competition among crop plants; Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage; Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing.

UNIT III CROP MANAGEMENT 9+3

Crop water Management; Crop nutrition management - need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest.

UNIT IV PRODUCTION PRACTICES OF AGRICULTURAL CROPS 9+3

Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereal crops, grain legumes, oil seed crops, sugarcane, and fibre crops, and special purpose crops such as those grown for green manure.

UNIT V PRODUCTION PRACTICES OF HORTICULTURAL CROPS 9+3

Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, flower crops; Cultivation practices of representatives of each group; Special features of production of horticultural crops - green house cultivation.

TOTAL (L: 45 + T: 15): 60 PERIODS

OUTCOMES:

- Students completing this course would have acquired knowledge on crop selection, crop production crop management.
- The students will have the required knowledge in the area of production of agricultural and horticultural crops.

TEXTBOOKS:

1. Rajendra Prasad , Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2005.
2. Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 1995.

REFERENCES:

1. Kumar, N.,Introduction to Horticulture, Rajalakshmi Publications. Nagercoil, 1993.
2. Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices, plantation crops, medicinal and aromatic plants. Rajalakshmi Publications, Nagercoil. 1993.
3. Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications, New Delhi. 1989.
4. Bose T. K. and L.P.Yadav. Commercial Flowers, Nayaprakash, Calcutta. 1989.
5. Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore. 2005

AI 8452 HYDROLOGY AND WATER RESOURCES ENGINEERING L T P C
3 0 0 3

OBJECTIVE :

- To introduce the student to the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources.

UNIT I PRECIPITATION AND ABSTRACTIONS 10

Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation-Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods- Interception- Evaporation. Horton's equation, pan evaporation measurements and evaporation suppression- Infiltration-Horton's equation-double ring infiltrometer, infiltration indices.

UNIT II RUNOFF 8

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Runoff estimation using empirical - Strange's table and SCS methods – Stage discharge relationships-flow measurements- Hydrograph – Unit Hydrograph – IUH

UNIT III FLOOD AND DROUGHT 8

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis-Drought Prone Area Programme (DPAP)

UNIT IV RESERVOIRS 8

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve

UNIT V GROUNDWATER AND MANAGEMENT 10

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

TOTAL: 45 PERIODS

OUTCOMES:

- The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation.
- The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
- The students will know the basics of groundwater and hydraulics of subsurface flows

TEXTBOOKS :

1. Subramanya .K. Engineering Hydrology- Tata McGraw Hill, 1999.
2. Jayarami Reddy .P. Hydrology, Tata McGraw Hill, 1999.

REFERENCES :

1. David Keith Todd. Groundwater Hydrology, John Wiley & Sons, Inc. 2007
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. Applied Hydrology, McGraw Hill International Book Company, 1998.
3. Raghunath .H.M., Hydrology, Wiley Eastern Ltd., 1998.
4. Linsley, R.K. and Franzini, J.B. Water Resources Engineering, McGraw Hill International Book Company, 1995

AI8411 FLUID MECHANICS LABORATORY L T P C
0 0 3 2

OBJECTIVE:

- Students should be able to verify the principles studied in theory by performing the experiments in lab.

LIST OF EXPERIMENTS:

1. Flow Measurement 24

1. Calibration of Rotometer
2. Flow through Venturimeter
3. Flow through a circular Orifice
4. Determination of mean velocity by Pitot tube
5. Verification of Bernoulli's Theorem
6. Flow through a Triangular Notch
7. Flow through a Rectangular Notch

2. Losses in Pipes 6

8. Determination of friction coefficient in pipes
9. Determination of losses due to bends, fittings and elbows

3. Pumps 12

10. Characteristics of Centrifugal pumps
11. Characteristics of Submersible pump
12. Characteristics of Reciprocating pump

4. Determination of Metacentric height 3

13. Determination of Metacentric height of a ship

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to measure flow in pipes and determine frictional losses.
- The students will be able to develop characteristics of pumps and turbines.

REFERENCES:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, Chennai. 2004.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House, New Delhi, 2000.
3. Subramanya, K. Flow in open channels, Tata McGraw - Hill pub. Co.1992.
4. Subramanya, K. Fluid mechanics, Tata McGraw- Hill pub. Co., New Delhi, 1992.

AI8412 SOIL SCIENCE AND WATER QUALITY LABORATORY L T P C
0 0 3 2

OBJECTIVE:

- Students should be able to verify various quality aspects of soil and water studied in theory by performing experiments in lab.

1.	Identification of rocks and minerals	3
2.	Conduct soil profile study	3
3.	Collection and processing of soil samples	3
4.	Determination of soil moisture, EC and pH	3
5.	Field density determination by Core Cutter and Sand Replacement method	3
6.	Specific gravity determination by Pycnometer	3
7.	Textural analysis of soil by International Pipette method	3
8.	Grain size analysis by using Mechanical shaker	3
9.	Identification of soil colour using Munsell chart	3
10.	Determination Organic carbon	3
11.	Estimation of Gypsum requirements	3
12.	Collection of irrigation water and analysis for EC, pH, CO_3, HCO_3, Ca, Mg, K	6
13.	Computation of salts in irrigation water and classification.	6

TOTAL: 45 PERIODS

OUTCOMES:

- Students know the techniques to determine index properties and engineering properties such as shear strength, compressibility and permeability by conducting appropriate tests and water quality tests.

REFERENCES:

1. Punmia, B.C, “Soil Mechanics and Foundation Engineering”, Laxmi Publishers, New Delhi. 2007.
2. APHA, Standard methods for the examination of water and wastewater, 19th ed. American Public Health Association, Washington, D.C. 1995.
3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

AI8501 DESIGN AND DRAWING OF AGRICULTURAL MACHINERY L T P C
3 1 0 4

OBJECTIVES:

- To introduce to the students about the basic concepts of design of agricultural machineries.
- To get through the detailed design & drawing of various components of agricultural machineries.

UNIT I STRESSES IN MACHINE MEMBERS 9+3

Introduction to design process- factor influencing the machine design, selection of material based on mechanical properties- Direct, bending and torsional stress equations- calculation of Principal stresses for combined loading. Design of curved beams- factor of safety – theories of failure- stress concentration- design of variable loading- Soderberg and Goodman relations.

UNIT II DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS 9+3

Selection of V-Belts and pulleys- selection of flat belts and pulleys- wire ropes and pulleys- selection of transmission chains and sprockets. Design of pulleys and sprockets.

UNIT III DESIGN OF SHAFTS AND COUPLINGS 9+3

Design of solid and hollow shafts based on strength and rigidity- Design of keys, keyways and splines- Design of rigid and flexible couplings. Design of bolts and nuts - knuckle and cotter joints.

UNIT IV DESIGN OF ENERGY STORING ELEMENTS 9+3

Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs.

UNIT V DESIGN OF GEARS AND BEARINGS 9+3

Gears - spur gear and helical gear - terminology - strength of gear teeth - Lewis equation - Buckingham equation. **-** Failure of gear teeth.

Design of bearings – sliding contact and rolling contact types. – Cubic mean load – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions.

TOTAL (L: 45 +T: 15): 60 PERIODS

(Note: Use of PSG Design Data book is permitted in the University examination)

OUTCOME:

- At the end of the course the student will have the knowledge on agricultural machineries and detailed design and drawing of various components.

TEXTBOOKS:

1. Khurmi R.S and Gupta J.K, A Textbook of Machine Design, Euarsia publication house, 2005.
2. Bhandari V.B, “Design of Machine Elements”, Tata McGraw-Hill Book Co, 2003.

REFERENCES:

1. Norton R.L, Machine Design – An Integrated Approach, Pearson Publications, 3rd Edition, 2006.
2. A.K. Srivastava, C.E. Goering and R.P. Rohrbach. Engineering Principles of Agricultural Machines. Revised Printing by American Society of Agricultural Engineers. 1993.
3. Gary Krutz, Lester Thompson and Paul Clear., "Design of Agricultural Machinery", John Wiley and Sons, New York, 1984.

AI8502 GROUND WATER AND WELL ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts of groundwater, its availability, assessment and utilization
- To understand the theory behind well design, construction and management of wells.

UNIT I HYDROGEOLOGIC PARAMETERS 9

Water Balance – Distribution of subsurface water – Water bearing properties of Rocks – Types of Aquifers – Aquifer properties Estimation – Pumping test :– Permeability, Specific yield, transmissivity and Storage coefficient – Methods of Estimation – Ground water table fluctuation method – GEC Norms – Ground water development and potential in India.

UNIT II WELL HYDRAULICS 9

Darcy's law – Groundwater Flow Equation – Steady state flow – Dupuit Forcheimer Assumption – Theim's Equation - unsteady flow – Theis method and Jacob method – Image well theory – Partial penetration of wells.

UNIT III WELL DESIGN 9

Design characteristics – Design of wells - Well diameter, depth and Well screen design – Materials for well screens – Well casing – Design of collector wells and Infiltration gallery – Dug wells versus tube wells

UNIT IV WELL CONSTRUCTION AND MAINTENANCE 9

Types of wells – Well drilling - Boring, Jetting – Rotary drilling, Hammer drilling – Construction – Installation of pipes and screens - Well development, Completion and disinfection – Well maintenance – Well performance test – Well effectiveness – Well loss – Pumping equipments.

UNIT V SPECIAL TOPICS 9

Artificial Recharge Techniques – Sea water Intrusion – Ground water modeling Techniques – Ground water pollution and legislation - Ground water development and potential in India – Hazardous substances – Hazard identification – Dose response assessment – Risk analysis

TOTAL: 45 PERIODS

OUTCOMES:

- Students know the technical concept of determine , its availability, assessment and utilization
- Familiarize with the the theory behind well design, construction and management of wells.

TEXTBOOKS:

1. Karanth, K.R. Groundwater Assessment, Development and Management. Tata Mc- Graw Hill, 2008.
2. Raghunath, H.M. Groundwater Hydrology, Wiley Eastern Ltd., 2000.

REFERENCES:

1. Rastogi,A.K. Numerical Groundwater Hydrology, Penram International Publishing. Pvt. Ltd., Bombay, 2008.
2. David Keith Todd. Groundwater Hydrology, John Wiley & Sons, Inc. 2007
3. Fletcher.G.Driscoll, “Groundwater and Wells”, Johnson Revision, New York, 1987.

AI8503 IRRIGATION ENGINEERING FOR AGRICULTURAL ENGINEERS L T P C
3 0 0 3

OBJECTIVE:

- To introduce the student to the concept of soil-plant characteristics and their water requirements. At the completion of the course the students should be able to understand the necessity of planning an irrigation system to provide water at the right time and right place.

UNIT I CROP WATER REQUIREMENT 10

Irrigation – Necessity and importance - Advantages and disadvantages – Crop and crop seasons in India –Duty, Delta, Base Period– Factors affecting Duty-Irrigation efficiencies– Consumptive use of water-Irrigation requirements of crops - Standards for irrigation water-Planning and Development of irrigation projects.

UNIT II METHODS OF IRRIGATION 8

Classification of irrigation methods – Surface irrigation – Subsurface irrigation – Sprinkler irrigation – Merits and demerits – Lift irrigation – Tank irrigation.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 9

Head works –Weirs and Barrage –Types of impounding structures - Factors affecting, location of dams -Forces on a dam -Design of Gravity dams- Earth dams, Arch dams – Spillways -Energy dissipaters.

UNIT IV CANAL IRRIGATION 9

Classification of canals- Alignment of canals – Design of irrigation canals– Regime theories - Canal Head works – Canal regulators - Canal drops – Cross drainage works – Canal Outlet, Escapes –Lining and maintenance of canals.

UNIT V IRRIGATION MANAGEMENT, CLIMATE CHANGE & ADAPTATION 9

Irrigation water Management - Farmer’s organization and turn over – Water users associations – Water delivery system- Command Area Development - Basics of climate change - effects of climate change - Impacts on Agriculture - Challenges of climate change in irrigation Season based irrigation practices - Adaptation to changes - Systems of rice intensification - Sustainable irrigation practices and cropping pattern .

TOTAL: 45 PERIODS

OUTCOMES:

- The students will able to understand the requirement of crop water.
- They will know about the classification of irrigation, location and climatic adaption.
- Concepts of design of impounding structures.

TEXTBOOKS:

1. Sharma, R.K., and Sharma, T.K., “Irrigation Engineering”, S. Chand and Company, New Delhi, 2008.
2. Michael, A.M., “Irrigation Engineering”, Vikas Publishers, New Delhi, 2008.
3. Garg, S.K., “Irrigation Engineering,” Laxmi Publications, New Delhi, 2008.

REFERENCES:

1. Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co, New Delhi, 2008.
2. Dilip Kumar Majumdar., “Irrigation Water Management”, Prentice-Hall of India, NewDelhi, 2008.
3. Jan C. van Dam, “Impacts of Climate Change and Climate Variability on Hydrological Regimes, Cambridge University Press, 2003.
4. Adams. R.M, Hurd.B.H., Lenhart. S and Leary N “Effects of global Climate Change on Agriculture”, Climate Research, 1998.

AI8504 REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- To introduce the principles and basic concepts of Remote Sensing and GIS
- To introduce the remote sensing systems, data products and analysis
- To introduce the spatial data models, analysis and presentation techniques
- To study the applications of Remote Sensing and GIS in agriculture, soil and water resources

UNIT I CONCEPTS OF REMOTE SENSING AND SATELLITES 9

Definition- Historical background - Components of remote sensing – Energy source, electromagnetic spectrum, radiation principle, platforms and sensors - Active and passive remote sensing interference - Atmospheric effects on remote sensing – Energy interaction with earth surface feature - Data acquisition - Reflectance, spectral signatures for water, soil and vegetation.- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT,SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution - Recent satellites with its applications

UNIT II DATA PRODUCTS AND IMAGE ANALYSIS 9

Data products –based on level of processing- o/p – scale – area/coverage – data availability – data ordering- data price - Image interpretation – Visual interpretation elements – interpretation key. Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.

UNIT III CONCEPTS OF GIS 9

Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.

UNIT IV DATA INPUT AND ANALYSIS 9

Data – Spatial, Non-Spatial – Database models – Hierarchical network, Relational and Object Oriented Data Models – Raster and Vector – Methods of Data input – Data Editing – Files and formats – Data structure – Data compression. Introduction to analysis – Measurements – Queries – Reclassification – Simple spatial analysis – Buffering – Neighboring functions – Map overlay – Vector and raster – Spatial interpolation – Modelling in GIS – Digital Elevation Modelling – Expert systems

UNIT V APPLICATION OF RS AND GIS 9

Crop Acreage estimation - Estimation of Crop Water Requirement – Crop condition - Soil mapping – classification of soil with digital numbers – soil erosion mapping- reservoir sedimentation using image processing - Inventory of water resources – water quality assessment - Application of Remote Sensing and GIS in Precision Agriculture - Monitor Crop Health - Management Decision Support Systems

TOTAL: 45 PERIODS

OUTCOMES:

- The students will understand the remote sensing principles, remote sensing systemssatellite data processing and available data products.
- The students will understand decision making process using DBMS andutilization of these advanced techniques in addressing the real world problems.

TEXTBOOKS:

1. Anji Reddy. M, Remote Sensing and Geographical Information Systems, BS Publications, Hyderbad, 2001
2. Lillesand, T. M., and Kiefer, R.W., Remote Sensing and Image Interpretation, John Wiley and Sons, New York, 2000.

REFERENCES:

1. Bettinger, P., and Michael, G.W., “Geographical Information System: Applications in Forestry and Natural Resources Management,” Tata McGraw–Hill Higher Education, New Delhi, 2003
2. Ian Heywood., “An Introduction to GIS”, Pearson Education, New Delhi, 2001.
3. Jeffery Star and John Estes, “Geographical Information System – An Introduction,” Prentice Hall India Pvt. Ltd., New Delhi, 1998.
4. Patel A.N & Surendra Singh, “Remote sensing principles & applications”, Scientific Publishers , Jodhpur 1992

AI8505 UNIT OPERATIONS & POST HARVEST TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

- To expose the students to the fundamentals of various unit operations of Agricultural Processing
- To expose the students to different Post Harvest operations and processing methods of harvested crops
- To introduce material handling equipments, storage and waste utilization.

UNIT I EVAPORATION AND SIZE REDUCTION 9

Unit operations in agricultural processing – Evaporation - Types of evaporators – Capacity – Energy balance – Drying - principles - constant and falling rate of drying - thin layer and deep bed drying - types of dryers – Size reduction - Rittinger, Bond, Kick’s laws of crushing – crushers – types – crushing rolls – hammer mills – fine crushers

UNIT II MECHANICAL SEPARATION, CRYSTALLIZATION AND DISTILLATION 8

Screening – Trommel - Filtration – definition – filtration equipments – filter press – Stoke’s law – Sedimentation – centrifuging – Crystallization – crystallizers – Distillation – equipments

UNIT III ENGINEERING PROPERTIES OF AGRICULTURAL MATERIALS 9

Post harvest engineering of crops – objectives - post harvest losses in agricultural commodities - structure and composition of food grains - optimum stage of harvest - engineering properties of agricultural materials - Moisture content – measurement - – grain moisturemeter - equilibrium moisture content – psychrometry.

UNIT IV THRESHING AND GRADING 9

Threshing - traditional methods - mechanical threshers - principles and operation –. Cleaning and grading – principles - air screen cleaner – separators (cylinder, spiral, magnetic, inclined belt) - effectiveness of separation and performance index - color sorter - Groundnut decorticator
- Maize Sheller

UNIT V PROCESSING OF CEREALS & PULSES, MATERIAL HANDLING AND STORAGE 10

Paddy processing - parboiling - methods - dehusking of paddy – methods - rice polishers - types - degree of polishing - layout of modern rice mill - manufacture of beaten, expanded and puffed rice – Wheat milling processes and equipments - processing of pulses and corn - Material handling equipments - belt conveyor - screw conveyor and bucket elevators - storage conditions for safe storage - traditional methods – factors affecting storage – storage losses - modified and controlled atmosphere storage

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the study the student will have knowledge on

- Material handling equipments
- Different Post Harvest operations and processing methods of harvested crops.
- fundamentals of various unit operations of Agricultural Processing.

TEXTBOOKS:

1. Chakraverty, A., “Post Harvest Technology of Cereals, Pulses and Oilseeds”, Oxford and IBH Publishing Company, Calcutta, 2008.
2. Sahay, K.M., and Singh, K.K., “Unit operations of Agricultural Processing”, Vikas Publishing House Pvt. Ltd., New Delhi, 2008.
3. Earle, R.L. Unit Operations in Food Processing, Pergamon Press. Oxford. U.K. 2003.

REFERENCES:

1. McCabe, W.L., J.C.Smith and P.Harriot. Unit Operations of Chemical Engineering. McGraw-Hill. Inc. Kosaido Printing Ltd. Tokyo, Japan. 2001.
2. Geankoplis C.J. Transport Process and Unit Operations. Prentice-Hall of India Private Limited, New Delhi. 1999.
3. Multon, J.L., Reimbert, A.M., Marsh D and Eydt A.J. Preservation and storage of grains, seeds and their by products. CBS Publishers and Distributors, Delhi. 1989.
4. Henderson, S.M. and R.L. Perry. Agricultural Process Engineering. John Wiley and Sons, New York. 1955.

AI8551 INTEGRATED WATER RESOURCES MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to the interdisciplinary analysis of water and design of intervention strategies.
- To develop knowledge base on capacity building on Integrated Water Resources Management (IWRM).

UNIT I IWRM FRAMEWORK 9

Definition – meanings –objectives- evolution of IWRM- IWRM relevance in water resources management – Importance of paradigm shift in India: processes and prospective outcomes.

UNIT II CONTEXTUALIZING IWRM 9

IWRM in Global and Regional water partnership - MDG goals - UN formulations- Institutional Transformation- bureaucratic reforms and inclusive development.

UNIT III EMERGING ISSUES IN WATER MANAGEMENT 9

IWRM and Irrigation – Domestic - Drinking water Management in the context of Climate change- Flood –Drought – Pollution – Water poverty-sanitation and health-Conceptual problems and policy issues.

UNIT IV IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA 9

Rural Development-Ecological sustainability- -Watershed Development and conservation-Ecosystem Regeneration – waste water reuse-Sustainable livelihood and food security-Links between water –health- and poverty.

UNIT V ASPECTS OF INTEGRAL DEVELOPMENT 9

Capacity building - Solutions for effective Water Management. Case studies on conceptual framework of IWRM – IWRM and regional and global partnership – Emerging issues – IWRM and water resources development

TOTAL: 45 PERIODS

OUTCOME:

- At the completion of the course the student should be able to apply appropriate management techniques for planning, operating and maintaining the different components of integrated water resources and drainage system.

TEXTBOOKS:

1. Mollinga .P. etal " Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006
2. Sithamparanathan, Rangasamy, A., and Arunachalam, N., "Ecosystem Principles and Sustainable Agriculture", Scir Publisher, Chennai, 1999.

REFERENCES:

1. Cech Thomas V., Principles of Water Resources: History, Development, Management and Policy. John Wiley and Sons Inc., New York. 2003.
2. Murthy, J.V.S., "Watershed Management in India", Wiley Eastern Ltd., New York, 1995.
3. Dalte, S.J.C., "Soil Conservation and Land Management", International Book Distribution, India, 1986.

AI8511 IRRIGATION DRAWING L T P C
0 0 3 2

OBJECTIVE:

- To conceive, design and draw the irrigation structures in detail showing the plan, elevation and sections.

UNIT I TANK COMPONENTS 11

Fundamentals of design - Tank bunds – Tank surplus weirs – Tank sluice with tower head - Drawings showing foundation details, plan and elevation.

UNIT II IMPOUNDING STRUCTURES 11

Design principles - Earth dams – Gravity Dams - Arch dams – Spill ways – Drawing showing plan, elevation, half sections including foundation details.

UNIT III CROSS DRAINAGE WORKS 12

General design principles - Aqueducts – Syphon aqueducts – Super passage – Canal syphon – Canal drops – Drawing showing plan, elevation and foundation details.

UNIT IV CANAL REGULATION STRUCTURES 11

General Principles - Canal head works – Direct Sluice - Canal regulator – Canal escape – Drawing showing detailed plan, elevation and foundation details.

TOTAL: 45 PERIODS

OUTCOME:

- At the end of the study , the student can able to design and draw the plan, elevation and sections of tank components, impounding structures, cross drainage works and canal regulation structures.

TEXTBOOKS:

1. Satya Narayana Murthy Challa, “Water Resources Engineering: Principles and Practice”, New Age International Publishers, New Delhi, 2002.
2. Garg, S.K., “Irrigation Engineering and Design of Structures”, New Age International Publishers, New Delhi, 1997.

REFERENCES:

1. Mohanakrishnan. A, “A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu”, Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy, 2011.
2. Raghunath, H.M. “Irrigation Engineering”, Wiley India Pvt. Ltd., New Delhi, 2011.
3. Sharma R.K., “Irrigation Engineering and Hydraulic Structures”, Oxford and IBH Publishing Co., New Delhi, 2002.

AI8512 IRRIGATION FIELD LABORATORY L T P C
0 0 3 2

OBJECTIVE:

- Students should be able to verify the principles studied in theory by performing the experiments in lab.

1.	To study various instruments in the Meteorological Laboratory	3
2.	Determination of infiltration rate using double ring infiltrometer	3
3.	Determination of infiltration rate using digital infiltrometer	3
4.	Determination of soil moisture wetting pattern for irrigation scheduling	3
5.	Measurement of flow properties in open irrigated channels (flumes, notches)	9
6.	Estimation of Leaf Area Index	3
7.	Evaluation of surface irrigation	3
8.	Determination of uniformity coefficient for drip irrigation system	6
9.	Determination of uniformity coefficient for sprinkler system (catch can method)	6

10. To conduct experiment on canopy analyzer 3
11. To conduct experiment on disc filter for micro irrigation systems 3

TOTAL: 45 PERIODS

OUTCOME:

- On the completion of the course the student will have the knowledge on various meteorological instruments and understanding the concept of different irrigational systems in the laboratory tests.

REFERENCES:

1. Michael, A.M., “Irrigation Theory and Practice”, Vikas Publishing House, New Delhi, 1999.
2. Asawa, G.L., “Irrigation Engineering”, New Age International Private Limited, New Delhi, 1996.
3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

AI8601 DAIRY AND FOOD ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to dairy industry, properties and processing of milk,manufacture of dairy products , sanitation and effluent treatment in dairy industry
- To expose the students to the fundamental knowledge of food, its properties and different methods of food processing

UNIT I PROPERTIES AND PROCESSING OF MILK 9

Dairy Industry – importance and status – Milk Types – Composition and properties of milk - Production of high quality milk - Method of raw milk procurement and preservation - Processing – Staining - Filtering and Clarification - cream separation – Pasteurization – Homogenization - sterilization, UHT processing and aseptic packaging – emulsification - Fortification.

UNIT II DAIRY PRODUCTS 9

Manufacture of Milk Powder - Processing of Milk Products - Condensed Milk - Skim milk - Butter milk - Flavoured Milk, whey, casein, yoghurt and paneer - Manufacture of Butter - Cheese Ghee, ice creams and frozen desserts - standards for milk and milk products - Packaging of Milk and Milk Products - Cleaning and Sanitation - Dairy effluent treatment and disposal .

UNIT III FOOD AND ITS PROPERTIES, REACTION AND KINETICS 9

Constituents of food - thermal processing of foods - cooking, blanching, sterilization, pasteurization, canning - Interaction of heat energy on food components, reaction kinetics, Arrhenius equation, TDT curves - water activity, sorption behaviour of foods – isotherm models - monolayer value, BET isotherms, Raoult’s law, Norrish, Ross, Salwin - Slawson equations.

UNIT IV PROCESSING AND PRESERVATION OF FOODS 10

Coffee, Tea processing - Concentration of foods, freeze concentration - osmotic and reverse osmotic concentration - drying and dehydration of food - Tray, tunnel, belt, vacuum and

freeze dryers - rehydration of dehydrated foods - Fat and oil processing, sources, extraction, methods and equipments, refining of oils, hydrogenation, manufacture of margarine - Food preservation methods - preservation by irradiation, microwave and dielectric heating of food.

UNIT V QUALITY CONTROL 8

Quality control of processed food products - Factors affecting quality - Food packaging, importance, flexible pouches - restorable pouches - aseptic packaging, granules, powder and liquid packaging machines - nanotechnology – principles - applications in food processing – food plant location

TOTAL: 45 PERIODS

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.
- Students will be understand the importance of quality control and food packaging.

TEXTBOOKS:

1. Chandra Gopala Rao. Essentials of Food Process Engineering. B.S Publications, Hyderabad, 2006.
2. Walstra. P., Jan T. M. Wouters., Tom J. Geurts “Dairy Science and Technology”, CRC press, 2005.
3. Ananthakrishnan, C.P., and Sinha, N.N., “Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi, 1999.
4. Charm, S.E., “Fundamentals of Food Engineering”, AVI Pub.Co.Inc, New York, 1997.

REFERENCES:

1. Subbulakshmi.G., and Shobha A. Udipi, Food Processing and Preservation, New Age International Publications, New Delhi, 2007.
2. Toledo, R.T., “Fundamentals of Food Process Engineering”, CBS Publishers and Distribution, New Delhi, 1997.
3. Tufail Ahmed., “Dairy Plant Engineering and Management”, Kitab Mahal Publishers, Allahabad, 1997.
4. Dairy Science and Technology Handbook, Volumes 1-3, John Wiley & Sons,1993.

AI8602 PRINCIPLES OF MANAGEMENT FOR AGRICULTURAL ENGINEERS L T P C
3 0 0 3

OBJECTIVES:

- To learn the different principles and techniques of management in planning, organizing directing and controlling.
- To study the historic development of Management thoughts
- To learn the nature and purpose of planning, forecasting and decision making
- To learn the concepts of organizing, delegation of authority and HRD concepts

UNIT I HISTORICAL DEVELOPMENT OF MANAGEMENT THOUGHTS 9

Definition of Management – Management is Science or Art – Comparison of Management and Administration – Development of Management thoughts – Contribution of F.W.Taylor and H.Fayol – Types of Business Organisation

UNIT II PLANNING 9

Nature & Purpose of Planning – Planning process – types of planning – objectives – setting objectives – policies – Planning promises – Process of MBO – Forecasting in Planning – Decision making steps and process.

UNIT III ORGANISING 9

Nature and Purpose – Formation of Organizations – Formal and informal organization – Organization Chart and Manual – Types of organization structure – Line and Staff authority –departmentalization – Delegation of Authority – centralization and Decentralizaion – advantages and disadvantages – staffing – selection and recruitment process – techniques Career development

UNIT IV DIRECTING 9

Scope – human factors in directing – integrating objectives – leadership – types and theories of leadership – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – communication – process of communication – barrier in communication – effective communication – impact of technology in organization communication – organizational culture.

UNIT V CONTROLLING 9

System and process of controlling – requirement for effective control – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting – global business environment – globalization and liberalization – intervention management and global theory of management.

TOTAL : 45 PERIODS

OUTCOME:

- On the completion of the coarse the student will have the knowledge on the managerial skills like organizing, planning, forecasting and decision making.

TEXT BOOKS:

1. Harold Kooritz & Heinz Weihrich “Essentials of Management”, Tata Mcgraw Hill,1998.
2. Joseph L Massie “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES:

1. Tripathy PC And Reddy PN, “Principles of Management”, Tata Mcgraw Hill,1999.
2. Decenzo David, Robbin Stephen A, ”Personnel and Human Reasons Management”, Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, “ Engineering Management”,Addison Wesley,-2000

AI8603 TRACTOR AND FARM EQUIPMENTS L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to the working principles of tractor, farm equipments, Power Tiller, makes of tractors and power tillers, tillage implements.
- To expose the students to farm mechanization benefits and constraints, Identification of components of primary and secondary tillage implements.

UNIT I FARM MECHANIZATION 9

Farm mechanization in India - benefits and constraints - status of power availability for crop production in India – Makes of tractors, power tillers, earth moving machinery - IC engines - constructional features and operation - valve actuation system - cooling systems - lubricating systems - fuel system - governing and electrical system. Fuels - combustion - chemical reaction - air fuel ratio - knocking.

UNIT II COMPONENTS OF TRACTORS 9

Classification of tractors - transmission system - clutch - gear box – Differential and final drive - Steering systems and front axle - Brakes - Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction - PTO. Tractor fault diagnosis - Disassembly of tractor engine, transmission, steering, brakes, tyres, and hitch and hydraulics - their inspection - repair - assembly and adjustment.

UNIT III TILLAGE IMPLEMENTS 9

Tillage - objectives – soil dynamics in tillage and traction - furrows terminology - methods of ploughing - field capacity - efficiency, application rate and losses - problems. Primary tillage implements - components and functions - indigenous ploughs - mould board, disc, rotary and chisel ploughs. Secondary tillage implements - components and functions of tillers, harrows, ridger, bund former, puddler, leveller and green manure trampler. – seed-cum-fertilizer drills and planters - components – functions.

UNIT IV INTERCULTURAL AND HARVESTING EQUIPMENTS 9

Plant protection equipment - sprayers and dusters - classification and uses. Intercultural equipment - sweep - junior hoe - weeders - types and uses. Harvesting equipment - principles – components - function. Threshers - types - principle of operation, combine - functions - advantages.

UNIT V EARTH MOVING MACHINERIES AND COST ANALYSIS 9

Earth moving machineries – dozers, hydraulic excavators, safety, operation and maintenance of farm machineries - cost of operation of farm machinery and implements - cost analysis of implements and tractors – Machineries for seed to seed - Identification of components of primary and secondary tillage implements, seed drill, intercultural implements, plant protection equipment.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be able to understand the various equipments and mechanizations used in the farm.
- The students will have the knowledge on earth moving machinaries, tractor classification and tillage implements.

TEXTBOOKS:

1. Barger, E.L., et al., “Tractors and their Power Units”, John Wiley and Sons Inc., New York, 2007.
2. Harris Pearson Smith., “Farm Machinery and equipment”, McGraw hill –publications 1955.

REFERENCES:

1. Jagadishwar Sahay, “Elements of Agricultural Engineering”, Agro Book Agency, Patna, 2010
2. Liljedhi, B.L. Tractors and their Power Units,. John Willey and Sons, New Delhi, 2009.
3. Srivastava, A.C., “Elements of Farm Machinery”, Oxford and IBH Publication Co., New Delhi, 1990.
4. Jain, S.C., and Rai, C.R., “Farm Tractor Maintenance and Repair”, Standard Publishers and Distributors, New Delhi, 2004.
5. http://en.wikipedia.org/wiki/List_of_agricultural_machinery

HS8561	EMPLOYABILITY SKILLS (Lab / Practical Course)	L T P C 0 0 2 1

(Common to all branches of Fifth or Sixth Semester B.E / B.Tech programmes)

OBJECTIVES:

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations

1. Making presentations – introducing oneself – introducing a topic – answering questions – individual presentation practice
2. Creating effective PPTs – presenting the visuals effectively
3. Using body language with awareness – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – sociability skills - questioning and clarifying skills – mock GD
8. Writing reports – collecting, analyzing and interpreting data – drafting the report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

Requirements for a class of 30 students

1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD’s and DVD’s on relevant topics
5. Individual chairs for conducting group discussions

TOTAL : 30 PERIODS

OUTCOME:

- At the end of the course, the students will improve their soft skills, report writing and special focus on presentation skills, group discussion and interview skills.

REFERENCES:

1. Dhanavel, S.P. 2010. English and Soft Skills. Hyderabad: Orient BlackSwan Ltd.
2. Corneilssen, Joep. How to Prepare for Group Discussion and Interview. New Delhi: Tata-McGraw-Hill, 2009.
3. D’Abreo, Desmond A. Group Discussion and Team Building. Mumbai: Better YourselfBooks, 2004.

4. Ramesh, Gopalswamy, and Mahadevan Ramesh. The ACE of Soft Skills. New Delhi: Pearson, 2010.
5. Gulati, Sarvesh. Corporate Soft Skills. New Delhi: Rupa and Co. 2006.
6. Van Emden, Joan, and Lucinda Becker. Presentation Skills for Students. New York: Palgrave Macmillan, 2004.

EXTENSIVE READERS:

1. Covey, Stephen R. The 7 Habits of Highly Effective People. New York: Free Press, 1989.
2. Bagchi, Subroto. The Professional. New Delhi: Penguin Books India, 2009.

WEB RESOURCES:

1. www.humanresources.about.com
2. www.careerride.com

AI8611 CAD FOR AGRICULTURAL ENGINEERING L T P C
0 0 4 2

OBJECTIVE:

- To draft the agricultural engineering related machineries and structures manually and also by computer aided methods.

1.	Design and Drawing of Underground pipeline system	8
2.	Design and Drawing of Check dam	6
3.	Design and Drawing of Mould board plough	8
4.	Design and Drawing of Disk plough	8
5.	Design and Drawing of Post harvest technology units (threshers and	8
6.	Design and Drawing of Biogas plant.	6
7.	Introduction & demonstration on solid modeling	8
8.	Introduction & demonstration on Pro e	8

TOTAL: 60 PERIODS

OUTCOMES:

- The student will be able to understand the plan and layout of underground pipes, post harvesting units and check dams.
- The students also will be able to design and draw the components using computer aided methods

REFERENCES:

1. Michael, A.M. “Irrigation Theory and Practice”, Vikas Publishing House, New Delhi, 1999.
2. Rai, G.D. “Nonconventional Sources of Energy”, Khanna publishers, New Delhi, 1995.
3. Srivastava, A.C.”Elements of Farm Machinery”, Oxford and IBH Publications Co., New Delhi, 1990.
4. Vijay Duggal. “A general guide to Computer Aided Design & Drafting, Mailmax Publications, 2000
5. Tadeusz Stolarski et al. “Engineering Analysis with ANSYS Software”, Butterworth Heinemann Publications, 2006
6. Louis Gary Lamit, “Introduction to Pro/ENGINEER” SDC Publications, 2004.

AI8612	FOOD ENGINEERING LABORATORY	L T P C 0 0 3 2

OBJECTIVE:

- To get hands on experience on various aspects of food science, post harvest technology and food process engineering.

A. Experiments on Food Spoilage **3**

1. Total Plate Count, Total Coliforms and *E.coli* and Moulds in foods (Demonstration only)

B. Experiments on Food Adulteration **6**

2. Test for adulterant in Ghee
   Test for adulterants in oils and fats
3. Test for dye in tea
   Test for Non-Permitted colours in foods

C. Experiments on Macro & Micro Nutrients **12**

4. Estimation of protein in foods Estimation of sugars in foods Estimation of fat in foods
5. Estimation of Calcium, Sodium, Potassium and Iron in foods
6. Estimation of Fortificants in food

D. Experiments on Food Processing & Preservation **12**

7. Gluten in Wheat Flour and Maida
8. Brix values of fruit products
9. Test for preservative in fruit products
   Estimation of preservative in fruit products
10. Estimation of Vitamin C in fruit juice

E. Experiments on Post Harvest Technology **6**

11. Determination of Moisture in food grains, spices and condiments
12. Microscopic examination of Mould infestation in food grains and nuts

F. Experiments on Food Process Engineering **6**

13. Acid values and peroxide value of edible oils
14. Expansion and Oil Absorption characteristic of snacks on frying

TOTAL: 45 PERIODS

OUTCOME:

- On the completion of the course, the students will able to get experience on food processing engineering.

REFERENCES:

1. Chakraverty, A., “Post Harvest Technology of Cereals, Pulses and Oilseeds”, Oxford and IBH Publishing Company, Calcutta, 2008.
2. Sri Lakshmi.B., Food Science, New Age International Publications, 4th Edition, New Delhi, 2007.
3. Chandra Gopala Rao. Essentials of Food Process Engineering. B.S. Publications, Hyderabad, 2006.
4. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

AI8701 AGRICULTURAL ECONOMICS L T P C
3 0 0 3

OBJECTIVES:

- To impart the fundamental knowledge and basic concepts of Economics.
- To understand Farm financial analysis, Investment and Budgeting for farms.

UNIT I INTRODUCTION 9

Agricultural Economics – definition and scope - Importance of Agricultural Economics – Branches of agricultural economics - Agricultural production economics- Meaning- Definitions - Agricultural finance – Meaning – Definitions – micro vs macro finance –need for agricultural finance-Agricultural marketing – meaning, definition, importance of agricultural marketing.

UNIT II BASIC CONCEPTS IN ECONOMICS 9

Basic terms and concepts in economics – Goods & Services – free and economic goods, Utility – Cardinal and Ordinal approaches. Characteristics of utility – Forms of utility - Value – Definition – Characteristics; Price – Meaning, Wealth – Meaning Attributes of wealth, Types of wealth, Distinction between wealth and welfare - Demand Schedule, demand curve, Law of demand - Supply – meaning, definition, law of supply, supply schedule, supply curve

UNIT III LAWS OF ECONOMICS 9

Basic laws of economics – demand and supply concepts – Law of Diminishing Marginal Utility – statement, assumptions of law, explanation, limitations of the law, Importance. Law of Equi- marginal Utility – Meaning, Assumptions, Explanation of the Law, Practical Importance, Limitations. Consumer"s Surplus – Meaning, Assumptions, Explanation, Difficulties in measuring Consumer"s Surplus, Importance - Economies of scale external and internal economies and diseconomies - Cost concepts – types - Opportunity cost – comparison of costs .

UNIT IV COST CURVES 9

Principle of substitution – isoquant, isocline, expansion path, ridge line and least cost combination of inputs-Product-product relationship – Production possibility curve, iso revenue line and optimum combination of outputs – Cost curves –Optimum input and output levels – Factor –factor relationship – Least cost combination of inputs – Estimation of cost of cultivation and cost of production of crops - annual and perennial crops – Preparation of interview schedule and farm visit for data collection.

UNIT V FINANCIAL ANALYSIS 9

Farm financial analysis – Balance sheet – Income statement – Cash flow analysis – Farm investment analysis – Time comparison principles – undiscounted measures – discounted measures – sensitivity analysis - Public revenue – meaning, major and minor sources of public revenue Tax – meaning, classification – direct and indirect taxes, methods of taxation - proportional, progressive, regressive and degressive taxation, Agril taxation – other types of taxation, VAT.

TOTAL: 45 PERIODS

OUTCOMES:

The students will have the knowledge on

- Basic concepts of economics and laws of economics.
- Familiarize with the cost curves and financial analysis.

TEXTBOOKS:

1. Johl, S.S., and Kapur, T.R., 'Fundamentals of Farm Business Management', Kalyani publishers, Ludhiana, 2007.

2. Subba Reddy, S., Raghu Ram, P., Neelakanta Sastry T.V and Bhavani Devi I,'Agricultural Economics', India Book House Ltd., 2006.
3. Devi, I., 'Agricultural Economics' Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2006.

REFERENCES:

1. Raju, V.T., "Essentials of Farm Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.
2. Subba Reddy, S., and Raghu Ram, P. ' Agricultural Finance and Management', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.
3. Sankhayan, P.L. 'Introduction to Farm Management', Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2001
4. Muniraj, R., "Farm Finance for Development", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2000. .

AI8702 BIO ENERGY RESOURCE TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To impart the fundamental knowledge on the importance of Bio resources, Bio energy and reactors.
- Alcohol and ethanol production and
- Energy and Environment

UNIT I BIO RESOURCE AN INTRODUCTION 9

Bio resource – origin – biomass types and characteristics- biomass construction technology- Biodegradation - steps in biogas production- parameters affecting gas production- Types of biogas plants- Construction details- operation and maintenance.

UNIT II BIO ENERGY 9

Slurry handling- enrichment and utilization – Biogas appliances- Biochemical characteristics of bio resources- Bioenergetics –Biocatalysis –Kinetics of product formation.

UNIT III BIO REACTORS AND FERMENTORS 9

Bio reactors/ fermentors – Batch type – continuous stirred tank reactors- Biological waste water treatment- Activated sludge process- Down stream processing-Recovery and purification of products.

UNIT IV ALCOHOL PRODUCTION 9

Alcohol ethanol production - Acid hydrolysis - enzyme hydrolysis-Methanol synthesis - Antibiotics- enzymes- principles of thermochemical conversion – combustion - pyrolysis- Gasification – types of gasifiers.

UNIT V ENERGY AND ENVIRONMENT 9

Principles of operation- chemical reaction- cleaning and cooling - Utilization- Improved wood burning stove - Energy plantations- Biomass briquetting - co generation- Impact on Environment.

TOTAL: 45 PERIODS

OUTCOMES

- The students will be able to understand the concepts on bio energy source technology.

TEXT BOOKS:

1. Rai G.D,Non conventional sources of Energy, Khanna publishers, New Delhi, 1995.
2. Bouley James .E & David Follis - Biochemical Engineering Fundamentals Mc Graw- Hill publishing company, Tokyo.1986

REFERENCE:

1. Chawla O.P, Advances in Biogas Technology ICAR publication New Delhi 1986

AI8703 SOIL AND WATER CONSERVATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To present the concepts of erosion so that students get a sound knowledge about the problems associated with it.
- To enable the students to make use of the principles and concepts to solve issues related to soil and water management.

UNIT I SOIL EROSION PRINCIPLES 9

Approaches to soil conservation – Soil conservation in India - Erosion – Agents - Causes - Mechanics of water erosion – Soil erosion problems - Types of water erosion: Raindrop erosion, Sheet erosion, Rill erosion, Gully erosion, Stream bank erosion – Classification of Gully – Gully Control Structures: Drop Spillway, Drop Inlet, Chute Spillways - Prerequisites for soil and water conservation measures.

UNIT II ESTIMATION OF SOIL EROSION 9

Runoff computation for soil conservation: SCS-CN method – Evolution of Universal Soil Loss Equation: Applications and Limitations – Modified Universal Soil Loss Equation – Revised Universal Soil Loss Equation-2 - Permissible erosion – Land use capability classification - Classification of eroded soils.

UNIT III EROSION CONTROL MEASURES 10

Agronomic practices: contour cultivation - strip cropping – tillage practices – Soil management practices – Bunding: Types and design specifications - Mechanical measures for hill slopes – Terracing: Classification and design specification of bench terrace – Grassed waterways: Location, construction and maintenance – Types of temporary and permanent gully control structures.

UNIT IV WATER CONSERVATION MEASURES 9

In-situ soil moisture conservation – Water harvesting principles and techniques: Micro catchments, catchment yield using morphometric analysis - Farm ponds: Components, Design, Construction and Protection – Check dams - Earthen dam – Retaining wall.

UNIT V SEDIMENTATION 8

Sediment: Sources – Types of sediment load – Mechanics of sediment transport – Estimation of bed load – Sediment Graph - Reservoir sedimentation: Basics - Factors affecting sediment distribution pattern, Rates of reservoir sedimentation - Silt Detention Tanks.

TOTAL: 45 PERIODS

OUTCOME:

- The students will be able to gain fundamental knowledge on the concepts of erosion and sedimentation.
- They will have sufficient knowledge on water conservation measures and soil erosion measures.

TEXTBOOKS:

1. Suresh, R., "Soil and Water Conservation Engineering", Standard Publication, New Delhi, 2007.
2. Ghanshyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000.
3. "Sedimentation Engineering", 2006, ASCE manual and Report on Engineering Practice No. 54, Edited by Vito A. Vanoni. ASCE publishing.

REFERENCES:

1. Murthy, V.V.N., "Land and Water Management Engineering", Kalyani Publishers, Ludhiana, 1998.
2. Gurmail Singh, "A Manual on Soil and Water Conservation", ICAR Publication, New Delhi, 1982.
3. Mal, B.C., "Introduction to Soil and Water Conservation Engineering", Kalyani Publishers, New Delhi, 2002.

AI8751 PARTICIPATORY WATER RESOURCES MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To gain an insight on local and global perceptions and approaches on participatory water resource management

UNIT I FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH 6

Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Objectives of participatory approach

UNIT II UNDERSTANDING FARMERS PARTICIPATION 10

Farmers participation –need and benefits – Comparisons of cost and benefit -Sustained system performance - Kinds of participation – Context of participation, factors in the environment – WUA - Constraints in organizing FA – Role of Community Organiser – Case Studies.

UNIT III ISSUES IN WATER MANAGEMENT 9

Multiple use of water – Issues in Inter-sectoral Water Allocation - domestic, irrigation, industrial sectors - modernization techniques – Rehabilitation – Command Area Development - Water delivery systems

UNIT IV PARTICIPATORY WATER CONSERVATION 10

Global Challenges -Social – Economic – Environmental - Solutions –Political - Water Marketing – Water Rights -Consumer education – Success Stories Case Studies

UNIT V PARTICIPATORY WATERSHED DEVELOPMENT 10

Concept and significance of watershed - Basic factors influencing watershed development – - Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes –- People's participation – Entry point activities - Evaluation of watershed management measures.

TOTAL: 45 PERIODS

OUTCOMES:

- The students shall gain knowledge on the various processes involved in participatory water resource management.
- The students shall be aware of the issues related to water conservation

TEXTBOOKS:

1. Sivasubramanium, K. Water Management, SIMRES Publication, Chennai 2009
2. Uphoff.N., Improving International Irrigation management with Farmer Participation – Getting the process Right – Studies in water Policy and management, New West - View press, Boulder and London, 1986.
3. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.

REFERENCE:

1. Chambers R., Managing canal irrigation, Oxford IBM publishing Co.

AI8711	CREATIVE AND INNOVATIVE PROJECT	L T P C
	(Activity Based – Subject Related)	**0 0 3 2**

OBJECTIVE:

- To use the knowledge acquired in Agricultural and Irrigation Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

STRATEGY:

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop amethodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 60 PERIODS

OUTCOMES:

- The students would be able to synthesise from various courses studied in designing or fabrication or developing a system as applicable to his field of interest.
- The student will be able to test Innovative ideas through a project.

AI8712 INDUSTRIAL TRAINING (4 WEEKS) L T P C
0 0 0 2

OBJECTIVE:

- To train the students in field work by attaching to any industry / organization so as to have a first hand knowledge of practical problems and to gain working experience and skills in carrying out engineering tasks related to various fields of agriculture.

The students individually undertake training in reputed engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

AI8801 SUSTAINABLE AGRICULTURE AND FOOD SECURITY L T P C
3 0 0 3

OBJECTIVES:

- To study the importance of sustainable agriculture for the growing population, various resources required and their sustainability.
- Importance of science, food security and ecological balance.

UNIT I LAND RESOURCE AND ITS SUSTAINABILITY 9

Land Resources of India, Population and land, Land utilization, Net Area Sown, changes in cropping pattern, land degradation.

UNIT II WATER RESOURCE AND ITS SUSTAINABILITY 9

Rainfall forecasting - Adequacy of Rainfall for crop growth – Rainfall, Drought and production instability – Irrigation potential – Available, created and utilized – River basins; Watersheds and Utilizable surface water – Utilizable water in future (Ground water & Surface water)

UNIT III SUSTAINABLE AGRICULTURE 9

Agro-ecosystems - Impact of climate change on Agriculture, Effect on crop yield, effect on Soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance – Natural farming principles – Sustainability in rainfed farming.

UNIT IV FOOD PRODUCTION AND FOOD SECURITY 9

Performance of Major Food Crops over the past decades – trends in food production – Decline in total factor productivity growth – Demand and supply projections – Impact of market force – Rural Land Market – Emerging Water market – Vertical farming - Sustainable food security indicators and index – Indicator of sustainability of food Security – Path to sustainable development.

UNIT V POLICES AND PROGRAMMES FOR SUSTAINABLE AGRICULTURE AND FOOD SECURITY 9

Food and Crop Production polices – Agricultural credit Policy – Crop insurance –Policies of Natural Resources Use – Policies for sustainable Livelihoods – Virtual water and trade - Sustainable food Security Action Plan.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students will gain knowledge on the need for sustainable agriculture
- They will be able to comprehend the need for food security on global level and the Nutritional Security.
- The students will be able to demonstrate how ecological balance is required for sustainability of agriculture.

TEXTBOOKS:

1. M.S.Swaminathan, Science and sustainable food security, World Scientific Publishing Co., Singapore, 2010.
2. B.K.Desai and Pujari, B.T. Sustainable Agriculture : A vision for future, New India Publishing Agency, New Delhi, 2007.

REFERENCES:

1. Swarna S.Vepa etal., Atlas of the sustainability of food security. MSSRF, Chennai, 2004.
2. Sithamparanathan, J., Rengasamy, A., Arunachalam, N. Ecosystem principles and sustainable agriculture, Scitech Publications, Chennai, 1999.
3. Tanji, K. K., and Yaron, B. Management of water use in agriculture, Springer Verlag, Berlin, Germany, 1994.

AI8811 PROJECT WORK L T P C
0 0 12 6

OBJECTIVE:

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

SYLLABUS:

The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

OUTCOME:

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

AI8001 AGRICULTURAL BUSINESS MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To introduce the importance of Agri-business management, its characteristics and principles
- To impart knowledge on the functional areas of Agri-business like Marketing management, Product pricing methods and Market potential assessment.

UNIT I CONCEPTS OF AGRICULTURAL BUSINESS 9

Agri-business - scope, characteristics, types. Management - importance, definition, management and administration, management thoughts, Small business - characteristics and stages of growth - Management functions - planning, organizing, leading.

UNIT II AGRI – BUSINESS ORGANIZATION 9

Principles, forms of agri-business organizations, staffing, directing, supervision and motivation. Controlling - types, performance evaluation and control techniques. Management approaches - Profit Centered Approach, Management by objectives and Quality Circles. Strength, Weakness, Opportunities and Threat (SWOT) Analysis.

UNIT III AGRICULTURAL MARKETING 9

Functional areas of Agri-business - Production and Operations management - functions, planning physical facilities and managing quality. Agro-inputs and products inventory management - raw material procurement, inventory types, and costs. Marketing management- Marketing environment, marketing mix - Agricultural input marketing firms.

UNIT IV AGRICULTURAL BUSINESS FINANCE 9

Forms of agri-business organizations - Role of lead bank in agribusiness finance - Financial management. Acquiring capital- Budget analysis. Concepts and determinants- Business project scheduling of raw material procurement - production management - launching products (branding, placement) - Input marketing promotion activities.

UNIT V MARKET PROMOTION AND HUMAN RESOURCES 9

Agricultural products - marketing promotion activities - product pricing methods. District Industries Centre - Consumer survey - Agricultural inputs retailing - Market potential assessment - types of distribution channels - Return on Investment - Personnel management. Recruitment, selection and training - Technology in Agri Business

TOTAL: 45 PERIODS

OUTCOME:

- The students shall be exposed to various trends in agricultural business management.

TEXTBOOKS:

1. Himanshu, “Agri Business Management – Problems and prospects”, Ritu Publications, Jaipur, 2005.
2. Smita Diwase, “Indian Agriculture and Agribusiness Management”, Krishi resource Management Network, Pune 2004.

REFERENCES:

1. Chandra Prasanna, “Projects: Preparation, Appraisal, Budgeting and Implementation”, Tata McGraw Hill Publications, New Delhi, 2001.
2. Kotler, P., “Marketing Management. Analysis, Planning and Control”, Prentice Hall Inc., New York, 2001.
3. Rao, V.S.P., and Narayana, P.S., “Principles and Practices of Management”, Konark Publishing Private Limited, New Delhi, 2001.
4. Tripathy, P.C., and Reddy, P.N., “Principles of Management”, Tata McGraw Hill Publications, New Delhi, 2000.

AI8002 DRAINAGE ENGINEERING AND LAND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts for planning, design and management of land drainage works in cultivated areas
- To study the various methods of land drainage and its impact on environment

UNIT I CONCEPTS OF DRAINAGE ENGINEERING 8

Problem soils - Water logging - Causes – ill effects – Land drainage – Benefits of drainage-components of drainage system: Surface drainage and sub surface drainage – drainage requirement - factors affecting land drainage: measurement of depth to water table, salinity, hydraulic conductivity, topography, impermeable layers.

UNIT II SURFACE DRAINAGE 8

Drainage surveys - Land preparation: leveling and grading - design of surface drains – calculation of design discharge – main line, lateral and collectors, drainage coefficient-rational method - CN method for drainage coefficient – Levees – Surface drainage of ponded areas, flat lands and sloping land – materials, maintenance.

UNIT III SUBSURFACE DRAINAGE 11

Groundwater flow – Darcy's equation – Boundary conditions – Dupuit -Forchheimer Theory - Design: Steady-State Equations: Hooghought, Ernst Equation – application of steady state equation - Unsteady-State Equations - Glover-Dumm Equation, De Zeeuw-Hellinga Equation - Application of Unsteady-State Equations - Seepage from a River into a Semi-confined Aquifer – Types of tile drains – Mole drains

UNIT IV WATER BALANCE AND DRAINAGE CRITEREA 9

Equations for Water Balances- Components of Water Balances: Surface, Unsaturated Zone, Groundwater, Integrated Water Balances, Practical Applications - Equations for Water and Salt Balances - Processing and Interpretation of Basic Data - Water Balance Analysis With Flow Nets - Water Balance Analysis with Models - Agricultural drainage criteria - Effects of Field Drainage Systems on Agriculture - Some examples of agricultural drainage criteria.

UNIT V ENVIRONMENTAL ASPECTS OF DRAINAGE 9

Environmental Impacts- Side effects inside the Project Area - Downstream Side-Effects-Upstream Side-Effects – Salinity in relation to Irrigation and Drainage - Salt Balance of the Root zone- Salinization due to Capillary Rise- Leaching Process - Bio drainage – principles – rainfed and irrigated systems - Design considerations for bio-drainage.

TOTAL: 45 PERIODS

OUTCOME:

- The students shall be able to plan and design the drainage system in an efficient manner.

TEXTBOOKS:

1. Michael A. M and T. P Ojha, Principles of Agricultural Engineering Vol II, Jain Brothers, New Delhi 2009
2. Ritzema, H.P., "Drainage Principles and Applications", Publication No. 16, International Institute of Land Reclamation and Improvement, Netherlands, 1994.

REFERENCES:

1. Bhattacharya, A.K., and Michael, A.M., "Land Drainage – Principles, Methods and Applications", Konark Publishers Pvt. Ltd., New Delhi, 2003.
2. Irrigation water Management, Training Manual No 6, Drainage of Irrigated Lands, Food and Agriculture Organisation, Rome 1996
3. Sharma, R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Company, New Delhi, 1984.
4. Kessler, J., "Drainage Principles and Applications", Vol. II and IV, International Institute of Land Reclamation and Improvement, Netherlands, 1979.

AI8003 ENVIRONMENT AND AGRICULTURE L T P C
3 0 0 3

OBJECTIVES:

- To emphasize on the importance of environment and agriculture on changing global scenario and the emerging issues connected to it.

UNIT I ENVIRONMENTAL CONCERNS 8

Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT II ENVIRONMENTAL IMPACTS 9

Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT III CLIMATE CHANGE 8

Global warming and changing environment – Ecosystem changes – Changing blue-green-grey water cycles – Water scarcity and water shortages – Desertification.

UNIT IV ECOLOGICAL DIVERSITY AND AGRICULTURE 10

Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insets and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation and agriculture – Agricultural biotechnology concerns.

UNIT V EMERGING ISSUES 10

Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts – Sustainable agriculture.

TOTAL: 45 PERIODS

OUTCOMES:

- Students will appreciate the role of environment in the current practice of agriculture and concerns of sustainability, especially in the context of climate change and emerging global issues.
- Ecological context of agriculture and its concerns will be understood.

TEXTBOOKS:

1. M.Lakshmi Narasaiah, Environment and Agriculture, Discovery Pub. House, 2006.
2. Arvind Kumar, Environment and Agriculture, ABH Publications, New Delhi, 2005.

REFERENCES:

1. T.C. Byerly, Environment and Agriculture, United States. Dept. of Agriculture. Economic Research Service, 2006.
2. Robert D. Havener, Steven A. Breth, Environment and agriculture: rethinking development issues for the 21st century : proceedings of a symposium, Winrock International Institute for Agricultural Development, 1994
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989

AI8004 FARM MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:

- To expose the students to the basic concepts and fundamental knowledge in Farm Management
- Farm financial analysis investment and budgeting for farms.

UNIT I FARM MANAGEMENT 9

Farm management - need and analysis – scope – Definitions – objectives – Farm management and its relationship with other sciences – Farm management decisions – farm business organizations – factors influencing the size of the farm.

UNIT II FARMPLANNING AND BUDGETING 9

Farm planning – necessity – characteristics of good farm plan – limitations of farm planning – farm budgeting – farm enterprise budgeting – partial budgeting – complete budgeting – whole farm planning and budgeting – Farm inventory – methods of valuation.

UNIT III FARM RECORDS AND ACCOUNTANCY 9

Benefits of farm records – limitations in the maintenance of farm records – records maintained in a farm – farm accountancy terms and concepts – journals – ledgers – cash book – depreciation – methods of computation - risk and uncertainty - Distinction between risk and uncertainty – sources of risk and uncertainty – production and technical risks – Price or marketing risk – Financial risk – methods of reducing risk - Concept of risk and uncertainty – causes for uncertainty – Managerial decisions to reduce risks in production process.

UNIT IV MANAGEMENT OF FARM RESOURCE 9

Management of resources – types of resources- land, labour, capital and measurement of their efficiencies – Mobilization of farm resources- Cost of machinery and maintenance – Break even analysis – Investment analysis – Discounting techniques - land use planning – owning the land – leasing – buying the land – land appraisal – farm layout – farm labour management – classification of farm labour – farm labour efficiency – capital management.

UNIT V APPLICATION OF TECHNIQUES TO FARM MANAGEMENT 9

Linear programming – dynamic programming – simulation – farm efficiency measures – physical efficiency measures – financial efficiency measures - Type of farming – Specialization, Diversification, Mixed farming, Dry farming and Ranching – Systems of farming -co-operative farming, Capitalistic farming, collective farming, State farming and Peasant farming.

TOTAL: 45 PERIODS

OUTCOME:

- Students are able to plan the financial aspects related to farm management in a cost effective manner.

TEXTBOOKS:

1. Johl, S.S., and Kapur, T.R., 'Fundamentals of Farm Business Management', Kalyani publishers, Ludhiana, 2007.
2. Subba Reddy, S., Raghu Ram, P., Neelakanta Sastry T.V and Bhavani Devi I, 'Agricultural Economics', India Book House Ltd., 2006.
3. Devi, I., 'Agricultural Economics' Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2006.

REFERENCES:

1. Raju, V.T., "Essentials of Farm Management", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.
2. Subba Reddy, S., and Raghu Ram, P. 'Agricultural Finance and Management', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.
3. Sankhayan, P.L. 'Introduction to Farm Management', Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2001
4. Muniraj, R., "Farm Finance for Development", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2000.

AI8005 GEOLOGY FOR AGRICULTURAL AND IRRIGATION ENGINEERS L T P C
3 0 0 3

OBJECTIVES:

- To expose the students to the different types of soils, rocks, their characteristics, identification.
- To impart the fundamental knowledge of hydrogeology and geological investigation

UNIT I MINEROLOGY 9

Scope of geology in irrigation engineering – Physical properties of minerals – Quartz – Feldspars – Mica – Gypsum – Calcite – Clay minerals – Igneous, sedimentary and metamorphic rocks – Granite – Synite – Gabbro –Basalt – Sandstone – Shale – Limestone – Conglomerate – Gneiss – Schist – Marble.

UNIT II WEATHERING AND SOIL 9

Identification of soil and rock types**-** Types of rock weathering –Mechanical and Chemical weathering- factors controlling weathering – products of weathering – soil formation - common rock forming minerals-action of river, wind, glacier types of soils – soil profile.

UNIT III SOIL TYPES 9

Soil genesis – Soil mineralogy and geochemistry of soil types – laterites, bauxites, ardisols, vertisols – geological sources of soil nutrients, nitrogen, phosphorus, potassium, calcium, magnesium and sulphur in soil and their and its significance in plant growth, micronutrients.

UNIT IV HYDROGEOLOGY 9

Sources of groundwater- Aquifers-Groundwater in various geological formations– Water bearing properties of rocks-dating of groundwater-springs – geological work of river-Chemical work of groundwater-Geological work of groundwater – Groundwater potential in Tamil Nadu.

UNIT V GEOLOGICAL INVESTIGATION 9

Remote sensing methods -Methods of geological investigation – Classification of geophysical methods- electrical resistively, seismic refraction, gravity, magnetic and acoustic prospecting for mineral and groundwater – Application of geophysics in groundwater and mineral study- Geophysical logging.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing this course

- Will be able to understand the importance of geology by understanding the various soil types.
- Will realize the importance of this knowledge in agriculture.

TEXTBOOKS:

1. Parbin Singh, “Engineering and General Geology”, Katson Publications, New Delhi, 2009.
2. Blyth, F.G.H., and M.H. de Freitas, “Geology for Engineers”, Edward Arnold, New York, 2010.
3. Varghese, P.C., Engineering Geology for Civil Engineering PHI Learning Private Limited, New Delhi, 2012.
4. Parbin Singh. A Text book of Engineering and General Geology, Katson publishing house, Ludhiana 2009
5. Venkatareddy. D. Engineering Geology, Vikas Publishing House Pvt. Ltd. 2010.

REFERENCES:

1. N. Chenna Kesavulu. Textbook of Engineering Geology, Macmillan India Ltd., 2009
2. F.G.Bell. Fundamentals of Engineering Geology, B.S. Publications. Hyderabad, 2011
3. Brady, N.C., and Weil, R R., “The Nature and Properties of Soils,” 13th Edition, Prentice Hall, New York, 2002.

AI8006 IRRIGATION EQUIPMENT DESIGN L T P C

3 0 0 3

OBJECTIVES:

- To expose the students to the fundamental knowledge in Pumps for Irrigation use
- To introduce the concept of micro-irrigation
- To design a Sprinkler & Drip irrigation system

UNIT I WATER LIFTS AND PUMPS 8

Pump classification Variable displacement pumps–Centrifugal pump- Submersible pump-Vertical Turbine pumps mixed flow – Jet and Airlift pumps-Pump selection and installation-Pump troubles and Remedies.

UNIT II PUMP VALVE 7

Types of valves- Pressure relief valve- Gate valve-Isolated valve- Non return valve-Butterfly valve- Solenoid valves- Automated control valve- selection, repair and maintenance.

UNIT III MICRO IRRIGATION CONCEPT AND APPLICATIONS 10

Micro irrigation- Comparison between Traditional and Micro irrigation methods -Merits and demerits of micro-irrigation system, Types and components of micro irrigation system- Scope and potential problem of micro irrigation - Low cost Micro irrigation Technologies- Gravity fed micro irrigation -Care and maintenance of micro-irrigation System- Economics of micro- irrigation system - Automation in micro-irrigation-Surge and cablegation irrigation- Greenhouse irrigation system.

UNIT IV DRIP IRRIGATION DESIGN 10

Drip irrigation - Components- Dripper- types and equations governing flow through drippers- Wetting pattern- Chemigation application- Pump capacity-Installation- Operation and maintenance of Drip irrigation system. - Design of surface and sub-surface drip irrigation.

UNIT V SPRINKLER IRRIGATION DESIGN 10

Sprinkler irrigation- Components and accessories - Hydraulic design - Sprinkler selection and spacing- Capacity of sprinkler system - types - Sprinkler performance- Sprinkler discharge- Water distribution pattern- Droplet size, filtering unit, fertigation - System maintenance

TOTAL: 45 PERIODS

OUTCOMES:

- At the completion of course the student will get the knowledge on micro irrigation concepts.
- The students shall able to understand the design concepts related to sprinkler irrigation.

TEXTBOOKS:

1. Suresh, R., “Principles of Micro-Irrigation Engineering”, Standard Publishers Distributors, New Delhi, 2010.
2. Michael, A.M., “Irrigation Theory and Practice”, Vikas Publishers, New Delhi, 2002.

REFERENCES:

1. Modi, P.N., and Seth, S.M., “Hydraulics and Fluid Mechanics”, Standard Book House, New Delhi, 1991.
2. Jack Keller and Rond Belisher., “Sprinkler and Trickle Irrigation”, Vannistrand Reinhold, New York, 1990.
3. Sivanappan R.K., “Sprinkler Irrigation”, Oxford and IBH Publishing Co., New Delhi, 1987.
4. Keller.J and D. Karmeli, “Trickle Irrigation Design”, Rainbird Sprinkler Irrigation Manufacturing Corporation, Glendora, California, USA.

AI8007 IRRIGATION WATER QUALITY AND MODELING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the water quality concepts, its estimation and evaluation for irrigation purposes, besides relevant environmental problems and modeling of non-point pollution sources.
- To understand the importance of water quality for irrigation, the collection and use of water quality data.

UNIT I WATER QUALITY PRINCIPLES 8

Water as a unique substance - Physical and chemical properties of water – Water quality parameters – Water cycle and water quality – Anthropogenic influences -Water quality problems..

UNIT II WATER QUALITY ESTIMATION 8

Water quality investigation – Sampling design and samplers – Data collection platforms – Field kits and investigations – Hydro chemical methods - Water quality data management - Analysis and inference – Graphical and statistical methods.

UNIT III EVALUATION OF WATER QUALITY 10

Water quality standards – Water quality for irrigation – Salinity and permeability - Irrigation practices with poor quality of water – Waste water reuse in irrigation – Benefits and limitations – Low cost Waste water treatment - Saline water irrigation – Future strategies.

UNIT IV WATER QUALITY MODELS 10

Water quality in irrigation systems – Eutrophication - Waste loads - BOD – DO sag curve - Leaching of agrochemicals – Non Point Source (NPS) models – Agricultural Non Point Source (AGNPS) pollution model.

UNIT V ENVIRONMENTAL ISSUES 9

Water quality indices - Agro ecosystems – Sustainable agriculture – Ecological farming – Vertical farms - Irrigation projects and environmental impacts.

TOTAL: 45 PERIODS

OUTCOMES:

- Students will understand the importance of water quality for beneficial uses, especially in irrigation and its management.
- Students will understand the role of environment in water quality and acquire skills in the use tools available for modelling water quality.

TEXTBOOKS:

1. Boyd, C. E., Water Quality : An Introduction, Kulwer Academic Publishers, Massachusetts, USA, 2000
2. Ayers, R. S. and D. W. Westcot, Water quality for Agriculture, FAO Irrigation and Drainage Paper no. 29 (REV. 1), FAO, Rome, 1994

REFERENCES:

1. Masters, G.M., Introduction to Environmental Engineering and Science, Pearson Education, Singapore, 2004.
2. Novonty, V., Water quality : Diffuse pollution and watershed management, John Wiley & Sons, New York, USA, 2003
3. American Public Health Association, Standard Methods for the Examination of water and waste water. APHA, New York, 2002.

AI8008 **IT IN AGRICULTURAL SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the students to areas of agricultural systems in which IT and computers play a major role.
- To also expose the students to IT applications in precision farming, environmental control systems, agricultural systems management and weather prediction models.

UNIT I PRECISION FARMING **9**

Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.

UNIT II ENVIRONMENT CONTROL SYSTEMS **9**

Artificial light systems, management of crop growth in greenhouses, simulation of CO_2 consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.

UNIT III AGRICULTURAL SYSTEMS MANAGEMENT **9**

Agricultural systems - managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources, Linear programming, Project scheduling, Artificial intelligence and decision support systems.

UNIT IV WEATHER PREDICTION MODELS **9**

Importance of climate variability and seasonal forecasting, Understanding and predicting world's climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying seasonal climate forecasts.

UNIT V E-GOVERNANCE IN AGRICULTURAL SYSTEMS **9**

Expert systems, decision support systems, Agricultural and biological databases, e-commerce, e-business systems & applications, Technology enhanced learning systems and solutions, e-learning, Rural development and information society.

TOTAL: 45 PERIODS

OUTCOME:

- The students shall be exposed to IT applications in , environmentalcontrol systems, precision farming, agricultural systems management and weather prediction models.

TEXTBOOKS:

1. National Research Council, "Precision Agriculture in the 21st Century", National Academies Press, Canada, 1997.
2. H. Krug, Liebig, H.P. "International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation", 1989.

REFERENCES:

1. Peart, R.M., and Shoup, W. D., "Agricultural Systems Management", Marcel Dekker, New York, 2004.
2. Hammer, G.L., Nicholls, N., and Mitchell, C., "Applications of Seasonal Climate", Springer, Germany, 2000.

AI8009 MINOR IRRIGATION AND COMMAND AREA DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

- To understand the fundamentals of minor irrigation, its types, operation and maintenance and people's participation
- Command Area Development, On farm structures, policy, operation and maintenance

UNIT I MINOR IRRIGATION 8

Definition – Classification of minor irrigation- Minor irrigation through wells, tanks, ooranies and canals- Development of minor irrigation in India- Advantages.

UNIT II LIFT IRRIGATION 9

Dug well and Tube well irrigation – Construction, operation and maintenance- Conjunctive use of ground water with surface water - Ground water market- Ground water estimation- norms – case studies.

UNIT III TANK IRRIGATION 9

Concept of tank irrigation – Classification- components of tank irrigation- water distribution network- Cascade of tanks- People's participation in tank irrigation system and its maintenance- Turn over – case studies.

UNIT IV COMMAND AREA DEVELOPMENT 9

Need for command area development- Definition – Importance of CAD in agricultural production - On Farm Development – organization, operation and maintenance- Farmers participation- Turn over- case studies.

UNIT V SPECIAL TOPICS 10

National water policy - Institutional aspects - Socio-economic perspective- Reclamation of salt affected soils- Seepage loss in command area- Irrigation conflicts- Water productivity – Water pricing.

TOTAL: 45 PERIODS

OUTCOMES:

- The students will have knowledge and skills on Planning, design, operation and management of reservoir system.
- The student will gain knowledge on different methods of irrigation including canal irrigation.

TEXTBOOKS:

1. Rakesh Hooja, Management of Water for Agriculture: Irrigation, Water sheds and Drainage" Rawat Publications, New Delhi, 2006.
3. Sathyanarayana Murthy C., "Design of Minor Irrigation and Canal Structures" Wiley Eastern Ltd., New Delhi, 1990.

AI8010 SEED TECHNOLOGY APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:

- To expose the students to scope and importance of good quality seed production.
- To acquaint them with the principles and special techniques used in the process of production of good quality seed using specific examples.
- To familiarize them with planning, development and organization of seed programmes.

UNIT I INTRODUCTION 9

Definition and characteristics of seed and how it differs from grain; Propagation of crop plants through true seed and vegetative means; Features of good quality seed; Importance of seed in successful crop production; Floral biology: self and cross pollination; Methods of genetic improvement of crop plants such as selection, hybridization, mutation and polyploidy; Seed legislations promulgated in India from 1966 to date and the purpose of each of these legislations.

UNIT II SEED PRODUCTION AND CERTIFICATION 9

Multiplication of seed and seed material: systems of seed multiplication, classes of seed, multiplication models, multiplication ratio, field selection, planting ratio, isolation needs and rouging; Harvest and extraction of seed; Methods of hybrid seed production; Genetic deterioration during crop production cycles; Seed certification process: legal basis, pre-requisites for applicability, detailed description of the specific steps of the certification process (with particular emphasis on field inspection).

UNIT III SEED PROCESSING AND TESTING 9

Components of seed processing in a broader sense; Steps in seed processing in its narrower sense: preliminary cleaning, basic cleaning and grading, and equipment used in each of the steps; Seed treatment; Seed drying; Seed sampling; Seed testing: details of specific tests conducted for different purposes (service, certification and seed law enforcement); Standards prescribed for different crops.

UNIT IV DEVELOPING SEED PROGRAMMES 9

Types of organizations involved in seed production (public, quasi-governmental, private and cooperative), and their objectives and features; Organizational set up of a seed company; Steps involved in planning and developing a seed programme; Seed marketing activities, and analysis of seed demand and supply; Costing and pricing strategies; Economics of production of different crop seed; Seed packaging; Opportunities for Indian seed companies to have a greater share of world seed market; Visit to seed organizations; Preparing seed projects to obtain credit; Export procedures and formalities; Seed/plant quarantine methods.

UNIT V SEED PRODUCTION IN SPECIFIC CROPS 9

Principles and special techniques used for seed production in important horticultural crops by selecting representatives of vegetable / flower / fruit / spice / condiment / plantation crops.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students will be

- exposure to the biology of seed production and knowledge on seed legislation thorough with various aspects of multiplication of seeds and their certification acquiring knowledge on seed processing and testing methods.
- understand different seed programmes, special techniques for seed production and their cost economics.

TEXTBOOKS:

1. Singh, S.P., Commercial Vegetable Seed Production, Kalyani Publishers, Chennai, 2001.
2. Agarwal, R.L., Seed Technology, Oxford IBH Publishing Co., New Delhi, 1995.

REFERENCES:

1. Subir Sen and Ghosh, N., Seed Science, Kalyani Publishers, Chennai, 1999.
2. Dahiya, B.S., and Rai, K.N., Seed Technology, Kalyani Publishers, Chennai, 1997.
3. George, Raymond, A.T., Vegetable Seed Production, Longman Orient Press, London and New York, 1985.
4. Hand Book of Seedling Evaluation, ISTA, 1979.

AI8011 SYSTEMS ANALYSIS IN IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To introduce the students to the application of systems concept to irrigation planning and management.
- Optimization technique for modeling water resources systems, irrigation management and advanced optimization techniques to cover the socio-technical aspects will be taught.

UNIT I SYSTEM CONCEPTS 9

Definition, classification, and characteristics of systems – Scope and steps in systems engineering – Need for systems approach to water resources and irrigation.

UNIT II LINEAR PROGRAMMING 9

Introduction to operations research – Linear programming, problem formulation, graphical solution, solution by simplex method – Sensitivity analysis, application to design and operation of reservoir, single and multipurpose development plans – Irrigation water allocation- Cropping pattern optimization.

UNIT III DYNAMIC PROGRAMMING 9

Bellman's optimality criteria, problem formulation and solutions – Application to design and operation of reservoirs, Single and multipurpose reservoir development plans – Applications in Irrigation management.

UNIT IV SIMULATION 9

Basic principles and concepts – Random variate and random process – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic and stochastic simulation – Irrigation Scheduling.

UNIT V ADVANCED OPTIMIZATION TECHNIQUES 9

Integer and parametric linear programming – Applications to Irrigation water management- Goal programming models with applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students will have

- an understanding on systems approach methodology applied to water resources and irrigation
- able to apply the Linear programming, Dynamic Programming and Simulation for water resources and irrigation problems.

TEXTBOOKS:

1. Vedula, S., and Majumdar, P.P. Water Resources Systems – Modeling Techniques and Analysis Tata McGraw Hill, New Delhi, Fifth reprint, 2010.
2. Gupta, P.K., and Man Mohan, "Problems in Operations Research", (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.

REFERENCES:

1. Chaturvedi, M.C., "Water Resources Systems Planning and Management", Tata McGraw Hill, New Delhi, 1997.
2. Taha, H.A., "Operations Research", McMillan Publication Co., New York, 1995.
3. Hiller, F.S., and Liebermann, G.J., "Operations Research", CBS Publications and Distributions, New Delhi, 1992.

MA8356 PROBABILITY AND STATISTICS L T P C

3 1 0 4

OBJECTIVES:

- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The students will have a fundamental knowledge of the concepts of probability.

UNIT I RANDOM VARIABLES 9+3

Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 9+3

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – χ^2-test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

UNIT IV DESIGN OF EXPERIMENTS 9+3

Completely randomized design – Randomized block design – Latin square design - 22 - factorial design- Taguchi's robust parameter design.

UNIT V STATISTICAL QUALITY CONTROL 9+3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL (L: 45+T: 15): 60 PERIODS

OUTCOMES:

- The students will have a fundamental knowledge of the concepts of probability. Have knowledge of standard distributions which can describe real life phenomenon. Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXTBOOKS:

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, New Delhi, 2007.
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", 7th edition, Pearson Education, Asia, 2007.

REFERENCES:

1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson Brooks/Cole, International Student Edition, New Delhi, 7th edition, 2008.
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th edition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier, New Delhi, 3rd edition, 2004.
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill edition, New Delhi, 2004.

GE8751 ENGINEERING ETHICS AND HUMAN VALUES L T P C

3 0 0 3

OBJECTIVE

- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES 10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II ENGINEERING ETHICS 9

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 – Customs and Religion – Uses of Ethical Theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

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 9

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 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXTBOOK:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.

REFERENCES:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundametals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001

WEB SOURCES:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

MG8654 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

AIM:

- To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES:

- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II TQM PRINCIPLES 9

Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking– Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function –TPM – Concepts, improvement needs – Performance measures - BPR.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL: 45 PERIODS

OUTCOMES:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXTBOOK:

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education Asia, Third Edition, Indian Reprint , 2006.

REFERENCES:

1. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, Third Edition , 2003.
3. Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd., 2006 .
4. Janakiraman,B and Gopal, R.K, “Total Quality Management – Text and Cases”,Prentice Hall (India) Pvt. Ltd., 2006.

GI8071 GEOINFORMATICS FOR AGRICULTURE AND FORESTRY L T P C
3 0 0 3

OBJECTIVES:

- To enable the students to understand and apply Remote Sensing and GIS techniques in various fields of agriculture, soil, land and forest resources.

UNIT I CROPS **9**

Introduction - leaf optical properties - identification of crops and crop inventorying - crop acreage estimation - vegetation indices - yield estimation - crop production forecasting through digital analysis - microwave and hyper spectral sensing for crop inventory - crop monitoring and condition assessment in command areas - case studies.

UNIT II SOILS **9**

Introduction - soil survey, types of soil surveys - soil genesis and soil classification -soil taxonomy - soil reflectance properties - soil mapping using remote sensing – problem soils -saline, alkali soil characteristics - mapping of saline alkaline soils - soil erosion and sedimentation - assessment of soil erosion - estimation of reservoir capacity.

UNIT III LAND EVALUATION AND MANAGEMENT **9**

Introduction - land use / land cover definition - land use / land cover classification-concepts and approaches of land evaluation - parametric methods - change detection in land uses - decision support system for land use planning - optimum land use planning for sustainable agriculture.

UNIT IV DAMAGE ASSESSMENT **9**

Introduction - damage by pests and diseases - crop loss assessment by floods - flood hazard zone mapping - remote sensing capabilities and contributions for drought management - land degradation due to water logging and salinity - crop stress - reflectance properties of stressed crops - identification of crop stress.

UNIT V FORESTRY **9**

Introduction - forest taxonomy - inventory of forests - forest type and density mapping-biomass assessment - timber volume estimation - factors for forest degradation-mapping degraded forests - deforestation and aforestation - forest fire mapping and damage assessment - sustainable development of forests.

TOTAL: 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand

- Characterization of crops using Remote Sensing tools
- The concepts of soil mapping through remote sensing
- The evaluation of land capability for better land use planning

TEXTBOOKS:

1. Srinivas, M.G., Remote Sensing Applications, Narosa Publishing House, New Delhi, 2001.
2. Narayan, L.R.A., Remote Sensing and its Applications. Universities Press (India) Ltd.,Hyderabad, 2001.

REFERENCES:

1. Andrew Rencz, Manual of Remote Sensing. Vol.3. Edn.3. Remote Sensing for the Earth Sciences, American Society for Photogrammetry and Remote Sensing, John Wiley & Sons, New York, 1999.
2. Jensen, J.R., Remote Sensing of the Environment - An Earth Resource Perspective.Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2001
3. Agarwal, C.S. and P.K.Garg, Textbook on Remote Sensing in Natural Resources Monitoring and Management. Wheeler Publishing, New Delhi, 2000

ME8080 REFRIGERATION AND AIR CONDITIONING L T P C
3 0 0 3

OBJECTIVES:

- To understand the underlying principles of operation in different Refrigeration & Air conditioning systems and components.
- To provide knowledge on design aspects of Refrigeration & Air conditioning systems

UNIT I INTRODUCTION 5

Introduction to Refrigeration - Unit of Refrigeration and C.O.P.– Ideal cycles- Refrigerants Desirable properties – Classification - Nomenclature - ODP & GWP.

UNIT II VAPOUR COMPRESSION SYSTEM 10

Vapor compression cycle: p-h and T-s diagrams - deviations from theoretical cycle - sub-cooling and super heating- effects of condenser and evaporator pressure on COP- multi-pressure system - low temperature refrigeration - Cascade systems – problems. Equipments: Type of Compressors, Condensers, Expansion devices, Evaporators.

UNIT III OTHER REFRIGERATION SYSTEMS 8

Working principles of Vapour absorption systems and adsorption cooling systems - Steam jet refrigeration- Ejector refrigeration systems- Thermoelectric refrigeration- Air refrigeration - Magnetic - Vortex and Pulse tube refrigeration systems.

UNIT IV PSYCHROMETRIC PROPERTIES AND PROCESSES 10

Properties of moist Air-Gibbs Dalton law, Specific humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temp., Thermodynamics wet bulb temp., Psychrometric chart; Psychrometry of air-conditioning processes, mixing of air stream.

UNIT V AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION 12

Air conditioning loads: Outside and inside design conditions; Heat transfer through structure, Solar radiation, Electrical appliances, Infiltration and ventilation, internal heat load; Apparatus selection; fresh air load, human comfort & IAQ principles, effective temperature & chart, calculation of summer & winter air conditioning load; Classifications, Layout of plants; Air distribution system; Filters; Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to demonstrate the operations in different Refrigeration & Air Conditioning systems and also able to design Refrigeration & Air Conditioning systems.

TEXTBOOK:

1. Arora, C.P., Refrigeration and Air Conditioning, McGraw Hill, 3rd ed, New Delhi, 2010.

REFERENCES:

1. Roy J. Dossat, Principles of Refrigeration, Pearson Education Asia, 4th ed, 2009.
2. Stoecker, W.F. and Jones J. W., Refrigeration and Air Conditioning, McGraw Hill, New Delhi, 1986.
3. ASHRAE Hand book, Fundamentals 2010
4. Jones W.P., Air conditioning engineering, Elsevier Butterworth-Heinemann, 5th ed, 2001

ME8651 HEAT AND MASS TRANSFER L T P C
3 1 0 4

OBJECTIVES:

- To understand the mechanisms of heat transfer under steady and transient conditions
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

UNIT I CONDUCTION 9+3

General Differential equation of Heat Conduction– Cartesian and Polar Coordinates – One Dimensional Steady State Heat Conduction –– plane and Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis –Semi Infinite and Infinite Solids –Use of Heisler's charts. One dimensional Numerical analysis in conduction.

UNIT II CONVECTION 9+3

Boundary Layer Concept – Forced Convection – External Flow – Flow over Plates, Cylinders Spheres and Bank of tubes – Internal Flow – Entrance effects. Free Convection – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS 9+3

Nusselt's theory of condensation- Regimes of Pool boiling and Flow boiling, correlations in boiling and condensation. Heat Exchanger Types - Overall Heat Transfer Coefficient – Fouling Factors - Analysis – LMTD method - NTU method.TEMA Standards-Introduction

UNIT IV RADIATION 9+3

Black Body Radiation – Grey body radiation - Shape Factor – Electrical Analogy – Radiation Shields. Radiation through gases.

UNIT V MASS TRANSFER 9+3

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations.

TOTAL (L: 45 + T: 15): 60 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to understand and apply different heat and mass transfer principles of different applications.

TEXTBOOKS:

1. Yunus A. Cengel, Heat Transfer A Practical Approach – Tata McGraw Hill - 2010
2. Kothandaraman, C.P., Fundamentals of Heat and Mass Transfer, New Age International, New Delhi, 1998.

REFERENCES:

1. Frank P. Incropera and David P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley & Sons, 1998.
2. Holman, J.P., Heat and Mass Transfer, Tata McGraw Hill, 2000
3. Ozisik, M.N., Heat Transfer, McGraw Hill Book Co., 1994.
4. Yadav, R., Heat and Mass Transfer, Central Publishing House, 1995.

GE 8072 **DISASTER MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, 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 (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, 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.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

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 AND CASE STUDIES AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:

The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

GE 8073 HUMAN RIGHTS L T P C

3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V **9**

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

TOTAL : 45 PERIODS

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., “Human Rights under International law and Indian Laws”, Central Law Agency, Allahabad, 2014.
2. Chandra U., “Human Rights”, Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.