ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

CURRICULUM – R 2008

III TO VIII SEMESTERS CURRICULUM AND SYLLABI FOR

B.E. AGRICULTURE AND IRRIGATION ENGINEERING

SEMESTER III

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA9211	Mathematics – III	3	1	0	4
CE9201	Strength of Materials-I	3	1	0	4
CE9202	Fluid Mechanics	3	1	0	4
AI9201	Surveying	3	0	0	3
AI9202	Theory of Machines	3	0	0	3
AI9203	Principles of Crop Production	3	1	0	4
PRACTICAL					
CE9204	Strength of Materials Laboratory	0	0	3	2
AI9204	Survey Laboratory	0	0	4	2
	TOTAL	**18**	**4**	**7**	**26**

SEMESTER IV

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
MA9262	Numerical Methods	3	1	0	4
CE 9253	Applied Hydraulics Engineering	3	1	0	4
AI 9251	Soil Science and Engineering	3	1	0	4
AI 9252	Hydrology and Water Resources Engineering	3	0	0	3
AI 9253	Food Science and Nutrition Technology	3	0	0	3
GE9261	Environmental Science and Engineering	3	0	0	3
PRACTICAL					
AI9254	Soil Science Laboratory	0	0	3	2
AI9255	Fluid Mechanics and Machinery Laboratory	0	0	3	2
	TOTAL	**18**	**3**	**6**	**25**

SEMESTER V

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AI9301	Irrigation Engineering	3	0	0	3
AI9302	Groundwater and Well Engineering	3	0	0	3
AI9303	Remote Sensing	3	0	0	3
AI9304	Aquaculture Engineering	3	0	0	3
AI9305	Design and Drawing of Agricultural Machinery	3	1	0	4
	Elective- I	3	0	0	3
PRACTICAL					
AI9306	Irrigation Drawing	0	0	3	2
AI9307	Irrigation Field Laboratory	0	0	3	2
GE9371	Communication Skills and Soft Skills	0	0	2	1
	TOTAL	**18**	**1**	**8**	**24**

SEMESTER VI

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
ME9037	Refrigeration and Air-Conditioning	3	1	0	4
CE9036	Integrated Water Resources Management	3	0	0	3
AI9351	Tractor and Farm Equipments	3	0	0	3
AI9352	Geographical Information System	3	0	0	3
AI9353	Drainage Engineering and Land Management	3	0	0	3
AI9354	Systems Analysis in Irrigation Engineering	3	0	0	3
	Elective- II	3	0	0	3
PRACTICAL					
AI9355	CAD For Agricultural Engineering	0	0	4	2
AI9356	Technical Seminar	0	0	2	1
	TOTAL	**21**	**1**	**6**	**25**

SEMESTER VII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
AI 9401	Agricultural Economics And Farm Management	3	0	0	3
AI 9402	Soil And Water Conservation Engineering	3	0	0	3
AI 9403	Food Processing Engineering	3	0	0	3
AI 9404	It in Agricultural Systems	3	0	0	3
AI 9405	Irrigation Equipment Design	3	0	0	3
	Elective- III	3	0	0	3
PRACTICAL					
AI 9406	Practical training (4 Weeks)	-	-	0	2
	TOTAL	**18**	**0**	**0**	**20**

SEMESTER VIII

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
	Elective-Iv	3	0	0	3
	Elective- V	3	0	0	3
PRACTICAL					
AI 9451	Project Work	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

ELECTIVES FOR B.E AGRICULTURAL AND IRRIGATION ENGINEERING

CODE NO.	COURSE TITLE	L	T	P	C
CE9037	Participatory Water Management	3	0	0	3
AI9021	Watershed Development	3	0	0	3
AI9022	Flood And Drought Management	3	0	0	3
AI9023	Irrigation Water Quality And Modeling	3	0	0	3
AI9024	Minor Irrigation And Command Area Development	3	0	0	3
AI9025	Advanced Irrigation Engineering	3	0	0	3
AI9026	Geology For Irrigation Engineering	3	0	0	3
AI9027	Bio-Technology Principles	3	0	0	3
AI9028	Seed Technology Applications	3	0	0	3
AI9029	Post-Harvesting Technology	3	0	0	3
AI9030	Bio Energy Resource Technology	3	0	0	3
AI9031	Commercial Micro Irrigation Engineering	3	0	0	3
AI9032	Dairy Engineering	3	0	0	3
AI9033	Instrumentation And Control Engineering	3	0	0	3
AI9034	Manufacturing Process	3	0	0	3
AI9035	Unit Operations In Bio-Processing	3	0	0	3
GI9030	Remote Sensing And GIS For Agriculture And Forestry	3	0	0	3
AI9036	Agricultural Business Management	3	0	0	3
CE9401	Principles of Management	3	0	0	3
MA9267	Statistics And Linear Programming	3	1	0	4
ME9355	Heat And Mass Transfer	3	0	0	3
GE9075	Intellectual Property Rights (IPR)	3	0	0	3
GE9072	Indian Constitution And Society	3	0	0	3
GE9073	Contract Laws And Regulations	3	0	0	3
GE9022	Total Quality Management	3	0	0	3
GE9021	Professional Ethics In Engineering	3	0	0	3

MA 9211 **MATHEMATICS-III** **L T P C**
3 1 0 4

AIM

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES

- 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 introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- 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 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 II 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 III 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 – Solution of linear equations of higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 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 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.

L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOK

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

CE9201 STRENGTH OF MATERIALS – I L T P C
3 1 0 4

OBJECTIVE:

Enable the student **t**o understand the behaviour of deformable structural elements, subjected to different types of loadings

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 12

Rigid and deformable bodies – Stability, strength and stiffness - Axial and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Biaxial state of stress – Elastic Constants - Stresses and deformation of thin cylindrical and spherical shells – Stresses at a point – Stress tensor - Stresses on inclined planes – Principal stresses and principal planes – Mohr's circle of stress.

UNIT II ANALYSIS OF PLANE TRUSSES 12

Stability and equilibrium of plane frames – perfect frames - types of trusses – Analysis of forces in truss members – Method of joints – Method of tension co-efficient – Method of sections.

UNIT III BENDING OF BEAMS 12

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

UNIT IV TORSION 12

Theory of simple torsion - Stresses and deformation in circular and hollow shafts – Stepped shafts – Shafts fixed at both ends – Stresses and deflection in helical springs.

UNIT V DEFLECTION OF BEAMS 12

Double Integration method – Macaulay's method – Area moment method – Conjugate beam method for computation of slopes and deflections in determinate beams.

L: 45 + T: 15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Egor. P.Popov " Engineering Mechanics of Solids" Prentice Hall of India, New Delhi 2001
2. Vazirani, N, Ratwani, M. "Analysis of Structures" Khanna Publishers, New Delhi 2001
3. Rajput, R.K "Strength of Materials", S Chand & Company Ltd., New Delhi 2006

REFERENCES:

1. Irwing H.Shames, James M.Pitarresi, “Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002
2. Roger T.Fenner, “ Mechanics of Solids”, ELBS, Oseny Mead, Oxford, 1990
3. Malhotra, D.R. Gupta, H.C., “The Strength of Materials”, Satya Prakashan (Tech. India Publications), New Delhi, 1995.
4. Beer.F.P. & Johnston.E.R.“Mechanics of Materials”, Tata McGraw Hill, New Delhi 2004.
5. Elangovan.A., “Thinmavisaiyiyal” (Mechanics of Solids in Tamil), Anna University,1995.

CE 9202 FLUID MECHANICS L T P C
3 1 0 4

OBJECTIVE:

The student is introduced 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. 2. The applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on vanes is studied.

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 12

Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers - Momentum integral equation - Separation of boundary layer. Drag and Lift. Lift characteristics of airfoils. Induced drag. Polar Diagram.

L: 45 + T: 15 TOTAL: 60 PERIODS

TEXT BOOKS

1. Streeter, V.L. and Wylie, E. B., *Fluid Mechanics.* McGraw Hill, New York, 1983
2. John F.Douglas, Janusz M. Gasiorek and John A.Swaffield, PEARSON Education, India, 2003

REFERENCES

1. Fox W.R. and McDonald A.T., *Introduction to Fluid Mechanics* John-Wiley and Sons, Singapore, 1995.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2000.
3. Roberson J.A and Crowe C.T., Engineering Fluid Mechanics. Jaico Books Mumbai, 2000.

AI 9201 SURVEYING L T P C

3 0 0 3

OBJECTIVE:

The objective of this course is to introduce to the students the various methods of surveying.

UNIT I INTRODUCTION AND CHAIN SURVEYING 8

Definition – Principles – Classification – Field and office work – Scales – Conventional signs – Survey instruments – Ranging and chaining – Reciprocal ranging – Setting perpendiculars – well-conditioned triangles - Traversing – Plotting – Enlarging and reducing figures.

UNIT II COMPASS SURVEYING AND PLANE TABLE SURVEYING 7

Prismatic compass – Surveyor's compass – Bearing – System and conversions – Local attraction – Magnetic declination – Dip-Traversing – Plotting – Adjustment of error – Plane table instruments and accessories – Merits and demerits – Methods – Radiation – Intersection – Resection – Traversing.

UNIT III LEVELLING AND APPLICATIONS 12

Level line – Horizontal line – Levels and staves – Spirit level – Sensitiveness – Bench marks – Temporary and permanent adjustments – Fly and check leveling – Booking – Reduction – Curvature and refraction – Reciprocal leveling – Longitudinal and cross sections – Plotting – Calculation of areas and volumes – Contouring – Methods – Characteristics and uses of contours – Plotting – Earth work volume – Capacity of Reservoirs.

UNIT IV THEODOLITE SURVEYING AND MODERN SYSTEMS 11

Theodolite – Vernier and microptic – Description and uses – Temporary and permanent adjustments of vernier transit – Horizontal angle – Vertical angles – Heights and distances – Traversing - Closing error and distribution – Gale's tables – Omitted measurements – Electromagnetic distance measurements (EDM) – Total station instrument – Global Positioning System (GPS).

UNIT V ENGINEERING SURVEYS 7

Reconnaissance, preliminary and location surveys for engineering projects – Layout – Setting out works – Route surveys for highways and waterways – Curve ranging – Horizontal and vertical curves – Simple curves – Setting with chain and tapes, tangential angles by theodolite, double theodolite – Compound and reverse curves – Transition curves – Functions and requirements – Setting out by offsets and angles – Vertical curves – Sight distances.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Kanethkar T.P., Surveying and Levelling, Vols. I and II, United Book Corporation, Pune, 1994.
2. Punmia B.C, Vols. I, II and III, Laxmi Publications, 1989.

REFERENCES

1. Bannister A. and Raymond S., Surveying, ELBS, Sixth Edition, 1992.
2. Heribert Kahmen and Wolfang Faig, Surveying, Walter de Gruyter, 1995.
3. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 1971.
4. James M. Anderson and Edward M.Mikhail, Introduction to surveying, McGraw Hill Book Company, 1985.
5. Schofield, W., Engineering Surveying, Butterworth – Heinemann, London, Fifth Edition, 2001.

AI 9202 **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 - Velocity and acceleration in mechanisms - Vector polygon and instantaneous centre methods - Problems.

UNIT II FRICTIONS IN BEARINGS 9

Friction - Bearings - Pivot and collar bearings - Antifriction bearings - Application - loss of power due to friction in bearings - viscosity - theory of lubrication.

UNIT III BELT DRIVES AND CLUTCHES 9

Drives - belt - flat and V belts - tension ratio - centrifugal tension - creep. Chain Brakes - band - shoe. Clutches - types - single and multiple disc.

UNIT IV MOTION OF CAM AND FOLLOWER 9

Cam and follower - types - application - profiles for uniform velocity - acceleration - simple harmonic and cycloidal motion - uniform angular velocity.

UNIT V GEARS AND GOVERNORS 9

Gears - classification - terminology -law of gearing - tooth profile - interference between rack and pinion. Gear trains - simple - compound reverted. Governors - Watt and Porter governor - sensitivity and hunting. Inertia - turning moment - flywheel - fluctuation of speed and energy. Balancing of masses in single and multiple planes.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ballaney, P.L, Theory of machines, Khanna publishers,.1994
1. Khurmi, R.S. and Gupta, J.K, Theory of machines, Euarsia publication house, 1994.

REFERENCE:

1. Thomas Beven. 1984. Theory of machines. CBS publishers and distributors.

AI 9203 PRINCIPLES OF CROP PRODUCTION L T P C
3 1 0 4

OBJECTIVES:

- To introduce the students to principles of field and horticultural crop production, and to provide a glimpse of their production practices.
- To delineate the role of relate each of the crop production practices to the role of an agricultural / irrigation engineer, explicitly.

UNIT I AGRICULTURE AND CROP PRODUCTION 9+3

Introduction to agriculture and its crop production sub-sectors: agronomy and horticulture factors affecting crop growth and production – Principles of crop production: crop selection; systems of cropping; field preparation; plant spacing and arrangement; nutrient management; water management; crop protection.

UNIT II SOIL AS A MEDIUM FOR PLANT GROWTH 9+3

Soil physical and chemical properties of relevance to crop growth – Soil-water relations – Soil-nutrient relations –Soil and land degradation: physical constraints, chemical constraints, erosion and methods of their prevention and reclamation.

UNIT III FIELD PRACTICES 9+3

Objective and principles of tillage - Practices for application and management of organic manures, amendments, and chemical and bio-fertilizers – Plant protection chemicals and the methods of their application – Weed management practices – Harvest and post harvest processes.

UNIT IV FIELD CROPS 9+3

Important groups of field crops in Tamil Nadu and the generalized cultivation practices for each group: cereal crops; grain legumes; oil seed crops; sugarcane; and fibre crops – Special purpose crops, such as green manures, and their management.

UNIT V HORTICULTURAL CROPS 9+3

Important groups of horticultural crops in Tamil Nadu and the generalized cultivation practices for each group: vegetable crops; fruit crops; flower crops, plantation crops and others.

L: 45 + T: 15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Rajendra Prasad , Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2005.
2. Yellamanda Reddy, T. and Sankara Reddy, G.H., 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. Rangasawami, 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. Brady N.C. Nature and Properties of Soils, Prentice Hall of India Private Limited, New Delhi. 1995
6. Palaniappan, S.P. Systems in the Tropics- Principles and Management. Wiley Eastern Edition, New Delhi. 1985.

CE9204 STRENGTH OF MATERIALS LABORATORY L T P C
0 0 3 2

OBJECTIVE:
To study the properties of materials when subjected to different types of loading.

1. Tension test on mild steel / tor 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
6. Hardness test on metals
7. Deflection test on metal beam
8. Compression test on helical spring
9. Deflection test on carriage spring
10. Tests on bricks, concrete cubes and tiles - Demonstration only

TOTAL: 45 PERIODS

AI9204 SURVEY LABORATORY L T P C
0 0 4 2

OBJECTIVE:
The objective of this course is to train the students to acquire skill in operation of various survey instruments and to obtain accurate results.

1. CHAIN SURVEYING 8

I Study of chain and its accessories
ii Ranging, chaining and pacing
iii Chain surveying.

2. COMPASS SURVEYING **8**

i Triangulation problems
ii Compass traversing

3. PLANE TABLE SURVEYING **12**

i a) Study of Plane table and its accessories
b) Radiation
ii Intersection – Triangulation problems
iii Plane table traversing

4. LEVELLING **16**

i Study of levels and leveling staves
ii Fly leveling using dumpy level
iii Fly leveling using tilting level
iv Check leveling
v Block contouring
vi Radial contouring

5. THEODOLITE SURVEYING **12**

i Study of Theodolites
ii Measurements of Horizontal angles
iii Measurements of Vertical angles
iv Stadia Tacheometry

6. Experiment using Total station and GPS **4**

TOTAL: 60 PERIODS

MA 9262 **NUMERICAL METHODS** **L T P C**
3 1 0 4

AIM:
This course gives a complete procedure for solving different kinds of problems occur in engineering and technology numerically.

OBJECTIVE:
The students would be acquainted with the basic concepts in this course and their uses.

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 – Matrix Inversion by Gauss-Jordan method – Iterative methods of Gauss-Jacobi and Gauss-Seidel – 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.

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 – 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.

L: 45, T: 15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, (2004).
2. Sankara Rao, K. "Numerical methods for Scientists and Engineers', 3rd Edition Prentice Hall of India Private Ltd., New Delhi, (2007).

REFERENCES:

1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, (2007).
2. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, (2006).
3. Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, (2007).

CE 9253 APPLIED HYDRAULICS ENGINEERING L T P C

3 1 0 4

OBJECTIVES:

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

UNIT I OPEN CHANNEL FLOW 9+3

Steady uniform flow - Best hydraulic sections for uniform flow - Specific energy and specific force.

UNIT II STEADY GRADUALLY VARIED FLOWS 10+3

Dynamic equation - Water surface flow profile classifications - Profile determination by graphical method, direct step method and standard step methods.

UNIT III RAPIDLY VARIED FLOWS 8+2

Hydraulic jumps - Types - Energy dissipation - Surges and surge through channel transitions.

UNIT IV TURBO MACHINES 10+4

Turbines – Classification - Reaction turbines – Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbines - Performance of turbines - Similarity laws; Centrifugal pumps - Minimum speed to start the pump – NPSH - Cavitation in pumps - Operating characteristics - Multistage pumps.

UNIT V POSITIVE DISPLACEMENT PUMPS 8+3

Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Rotary pumps.

L: 45 + T:15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Subramanya K., Flow in Open Channels. Tata McGraw Hill, New Delhi 1994.
2. Jain. A.K., Fluid Mechanics. Khanna Publishers, Delhi. 1996.

REFERENCES:

1. Ven Te Chow, Open Channel Hydraulics, McGraw Hill, New York, 1959.
2. Mays L. W., Water Resources Engineering. John Wiley and Sons (WSE), New York, 2004.
3. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2000.

AI 9251 SOIL SCIENCE AND ENGINEERING L T P C
3 1 0 4

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Soil Physical parameters
- Permeability- Compaction and compressibility
- Types and methods of soil survey and interpretative groupings

UNIT I INTRODUCTION AND PHYSICAL PROPERTIES 9 + 3

Soil - definition - major components - soil forming processes- soil profile -Physical properties - texture – structure-absolute specific gravity - capillary and non-capillary porosity - soil colour - soil consistency - plasticity. Soil air - soil temperature - soil water - soil moisture constants – classification of soil water. Soil water movement. Soil colloids - organic – inorganic. Ion exchange- soil organic matter - pH - nutrient availability.

UNIT II PHASE RELATIONSHIP 9 + 3

Weight and Volume relationships- Gradation analysis- Atterberg Limits-Classification of soil based on the above- Compaction theory- Lab and field compaction study.

UNIT III ENGINEERING PROPERTIES OF SOIL 9 + 3

Shear strength-Mohr-Coloumb strength theory-Basic tests-Compressibility- Assessment of seepage through flow net construction-Permeability-Darcy's law-measurements-Consolidation-Coefficient of Compressibility-Earth pressure theory-Active and passive conditions

UNIT IV BEARING CAPACITY AND SLOPE STABILITY 9 + 3

Bearing capacity of soils-Shallow foundation-Terzaghi's formula- BIS standards- Factors affecting Bearing Capacity- Slope stability-Analysis of infinite and finite slopes-Simple method.

UNIT V SOIL CLASSIFICATION AND SURVEY 9 + 3

Soil classification -soil taxonomy – soils of Tamil Nadu and India. Soil survey - types and methods of soil survey - soil mapping units - base maps -preparation of survey reports. Soil survey interpretation - concepts and uses - interpretative groupings - land capability - irrigability - soil suitability- capability and productivity ratings (Storie and Reiquier indices). Problem soils - reclamation - land use planning - preparation of land use maps.

L:45+T:15 TOTAL : 60 PERIODS

TEXT BOOKS:

1. Nyle C. Brady, The nature and properties of soil (10th Edition) Macmillan Publishing company New York, 1992:
2. Punmia, B.C.,Soil Mechanics and Foundation. Laxmi publishers, New Delhi. 1992.

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REFERENCES:

1. Hillel, D., Introduction to soil physics, Academic press Inc., New York. 1982
2. Buol, S.W., Kole, F.D and Mc Cracken. R.J. Soil genesis and classification. Oxford and IBH publishing Co, New Delhi., 1975

3. Russel, E.J., Soil conditions and plant growth Tata - Mc Graw Hill, New Delhi. 1989
4. Bharat Singh, A text book of Soil Mechanics, Nem Chand and Bros, Roorkee. 1990.
5. Murthy, V.N.S. A textbook of Soil Mechanics and Foundation Engineering Sri Kripa Technical Consultants, Bangalore. 1993
6. Ghildyal, B.P. and Tripathi, R.P. Soil Physics, Wiley Eastern Limited. 1987

AI 9252 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. At the completion of the course the student 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

UNIT III STORAGE AND DISTRIBUTION WORKS 10
Classification of reservoirs, General principles of design, site selection, spillways, surface area Vs elevation Vs storage relationship, life of reservoirs-Canals-Canal alignment, Cross drainage works

UNIT IV GROUNDWATER AND RAIN WATER HARVESTING 10
Origin- Classification and properties of aquifers-Groundwater potential-Darcy's law-Importance- RWH in rural and urban areas- RWH from building roof and open areas-direct storage sumps- RWH structures.

UNIT V FLOODS AND DROUGHTS 7
Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Areas Program (DPAP).

TOTAL: 45 PERIODS

TEXT BOOKS:
1. Subramanya .K. Engineering Hydrology- Tata McGraw Hill, 1999.
2. Jayarami Reddy .P. Hydrology, Tata McGraw Hill, 1999.
3. Raghunath .H.M., Hydrology, Wiley Eastern Ltd., 1998.

REFERENCES:

1. Linsley, R.K. and Franzini, J.B. Water Resources Engineering, McGraw Hill International Book Company, 1995
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. Applied Hydrology, McGraw Hill International Book Company, 1998.

AI 9253 FOOD SCIENCE AND NUTRITION TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Food groups, Energy from food and nutrition
- Food processing
- Food preservation

UNIT I FOOD GROUP AND FOOD SCIENCE 9

Food, Food groups and Food science – objectives - Quality attributes – size, shape, colour consistency, viscosity, texture, taste and flavour - Sensor evaluation of foods - Microorganisms in food spoilage - Food laws and standards PFA, FPO, Agmark, BIS International standards for export - Food adulteration, definition, common adulterants effect of food adulteration - Methods for detection of food adulterants - Nutrition definition characteristics of well and poorly nourished population, relation of nutrition to good health.

UNIT II ENERGY FROM FOOD 9

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

UNIT III NUTRITION 9

Fat-soluble vitamins, vitamin A, D, E & K, importance, sources, deficiency and RDA - Mid semester examination - Vitamins, folic acid, Pyridoxine, pantothenic acid and B12, importance, sources, deficiency and RDA - Minerals, macronutrients importance, sources, deficiency and RDA - Minerals, micronutrients, importance , sources, deficiency and RDA - Germination technology, Preparation of Weaning foods.

UNIT IV FOOD PROCESSING 9

Baking, Bread, Role of ingredients in baking, quality aspects, spoilage in bread – Preparation of cake, biscuits and cookies - Extrusion technology, development of Extruded products, vermicelli, macraroni, noodles and spaghetti - Confectionary - Role of raw ingredients - manufacture of crystalline and non, Crystalline candies - Processing of fruits and vegetables, principles and methods - Preservation by sugar, Jam, Jelly, Marmalade - Preservation by sugar, candies and preserve.

UNIT V PRESERVATION OF FOOD 9

Preservation by chemicals, squash, Ready to serve beverage - Preservation by fermentation, wine, vinegar - Canning, spoilage - Drying and dehydration - Rules and regulations for setting up of fruit processing industry - Food packaging, Definition, functions, requirements and methods of package.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Potter, N.N and Joseph, H.H .Hotchkiss.,Food science. CBS Publishers and Distributors, New Delhi. 1996.
2. Desrosier, N.W., The technology of food preservation, CBS Publishers and Distributors, New Delhi. 1987.
3. Sri Lakshmi.B., Food Science, New Age International Publications, 4th Edition, New Delhi, 2007.

REFERENCE:

1. Lal and Siddappa, Food and vegetable preservation, ICMR. 1986.

GE9261 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

AIM:

To create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE :

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

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

TEXT BOOKS

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.

AI 9254 SOIL SCIENCE LABORATORY L T P C
0 0 3 2

OBJECTIVES:

On completion of the course students are expected to

- Identify the soil texture and interpret its physical characteristics
- Identify problem soils and estimate remedial lime requirement Classify irrigation water

1. Identification of rocks and minerals
2. Collection and processing of soil samples
3. Determination of soil moisture, EC and pH
4. Bulk density determination by cylinder and wax coating method.
5. Textural analysis of soil by International Pipette method
6. Sedimentation and separation of different textural fractions
7. Preparation of HCl extract and assessment of soil colour
8. Estimation of CEC and exchangeable cations.
9. Organic carbon determination
10. Description of soil profile
11. Estimation of gypsum and lime requirements
12. Collection of irrigation water and analysis for EC and pH, and CO_3 and HCO_3
13. Computation of salts in irrigation water and classification.

TOTAL: 45 PERIODS

AI 9255 FLUID MECHANICS AND MACHINERY LABORATORY L T P C

0 0 3 2

OBJECTIVES:

- To get competence in the use of flow measuring devices in pipe and open channel flows.
- To develop characteristics of pumps and turbines

PRACTICAL SCHEDULE:

1. Flow measurement through venturimeter.
2. Determination of friction coefficient in pipes.
3. Flow measurement through V - notch and rectangular notch.
4. Flow measurement through circular orifice.
5. Flow measurement through Parshall flume, Cutthroat flume and Venture flume.
6. Determination of mean velocity by Pitot tube and current meter.
7. Characteristics of Centrifugal pumps.
8. Characteristics of Reciprocating pump.
9. Characteristics of Gear pump.
10. Characteristics of Submersible pump.

TOTAL: 45 PERIODS

REFERENCES:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 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

AI 9301 IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

At the end of the semester, the student shall understand the need and mode of irrigation. The student also shall know the irrigation management practices of the past, present and future. The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part. Finally, the student shall be in a position to conceive and plan any type of irrigation project.

UNIT I INTRODUCTION 9

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and Development of irrigation projects.

UNIT II IRRIGATION METHODS 8

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES 10

Weirs – elementary profile of a weir – weirs on pervious foundations - Types of impounding structures - Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

UNIT IV CANAL IRRIGATION 9

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

UNIT V IRRIGATION WATER MANAGEMENT 9

Need for optimization of water use – Minimizing irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Asawa, G.L., “Irrigation Engineering”, New Age International Publishers, New Delhi, 2000.
2. Sharma, R.K., and Sharma, T.K., “Irrigation Engineering”, S.Chand and Company, New Delhi, 2000.

REFERENCES:

1. Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co., New Delhi, 2000.
2. Garg, S.K., “Irrigation Engineering,” Laxmi Publications, New Delhi, 1999.
3. Gupta, B.L., and Amir Gupta, “Irrigation Engineering”, Satya Praheshan, New Delhi, 2000

AI 9302 GROUNDWATER AND WELL ENGINEERING L T P C
3 0 0 3

OBJECTIVE:
This subject aims to understand the concepts of assessing and utilizing groundwater and wells.

UNIT I INTRODUCTION 7
Purpose and Objectives- Groundwater monitoring programme- Essentials of groundwater modeling and management- India and Tamil Nadu scenario.

UNIT II GROUNDWATER DATABASE 9
Formation, identification and evaluation of Geological-geomorphological-hydro-meteorological-hydrogeological-G.I.S.soft computing–estimation of aquifer properties-geophysical surveys-Governing equations of ground water flow.

UNIT III WELL HYDRAULICS AND DESIGN 12
Evaluation of Aquifer Parameters- Transmissivity and Storage coefficient-Pumping test-steady state analysis-Dupuit Forcheimer assumptions and derivations- unsteady state analysis-Theis-Jacob method-concept of image well theory. Design characteristics-sedimentary-igneous-metamorphic-alternate well design-design problems-location and number-diameter-casing and screening-development-well efficiency.

UNIT IV WELL CONSTRUCTION AND MAINTENANCE 7
Drilling principles -methods-application-monitoring well drilling methods-well development-gravel packing- well casing- drill pipe, plumpness and alignment-sterilization- Well maintenance- dewatering.

UNIT V SPECIAL TOPICS 10
Wells in hard rock area- Pumps and pumping performance- Artificial recharge-Groundwater regulation- Sea water intrusion- MODFLOW principles.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Raghunath, H.M., “Groundwater Hydrology”, Second reprint, Wiley Eastern Ltd., New Delhi, 2000.
2. Michael D.Campbell and Jay H.Lehr., “Water Well Technology”, McGraw-Hill Book Company, New Delhi, 2000.

REFERENCES:

1. Todd, D.K., “Groundwater Hydrology”, John Wiley and Sons, New York, 1994.
2. Fletcher.G.Driscoll, “Groundwater and Wells”, Johnson Revision, New York, 1987.

AI 9303 **REMOTE SENSING** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the basic concepts and principles of Remote Sensing systems
- To introduce the methods of image enhancement and classification techniques
- To describe various aspects of possible applications of Remote Sensing techniques in Agriculture.

UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS **9**

Remote sensing – Definition – Advantages – Components – electromagnetic radiation – Wave theory. Particle theory, Stefan – Boltzmann Laws – Interaction of EMR with Atmosphere – Scattering – Rayleigh, Mie and Non-Selective scattering – Absorption – Atmospheric windows – interaction of EMR with Earth objects – Spectral Signature – Spectral reflectance characteristics of vegetation, soil and water.

UNIT II REMOTE SENSING AND SATELLITES AND SENSORS **9**

Platforms – Types – Applications – Sun Synchronous and geo synchronous orbits – Active and passive Sensors – Resolution – Spatial, Spectral, Radiometric and Temporal, Significance of Resolution – Remote sensing satellites and sensors – LANDSAT, SPOT, IRS, RESOURCESAT, CARTOSAT, High Resolution commercial satellites – Meteorological satellites and sensors – METEOSAT, NOAA – Microwave Remote sensing Satellites – ERS, RADARSAT.

UNIT III IMAGE INTERPRETATION **7**

Data Products – Quick look data – Data ordering – Image interpretation – Visual interpretation elements – interpretation key.

UNIT IV DIGITAL IMAGE ANALYSIS **7**

Digital image processing – Image enhancement – image classification – Supervised and unsupervised – Vegetation Indices.

UNIT V APPLICATIONS TO AGRICULTURE, SOIL AND WATER RESOURCES **13**

Spectral reflectance of soil, crops – Optical, thermal and microwave regions – crop acreage estimation – Production forecasting through digital image analysis – Crop condition assessment – soil mapping using RS data – Problem soil identification and mapping – soil erosion – Soil sedimentation studies – Soil loss assessment – soil conservation – Irrigation scheduling – case studies.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Lillesand, T. M., and Kiefer, R.W., “Remote Sensing and Image Interpretation”, John Wiley and Sons, New York, 2000.

REFERENCES:

1. Roy, P.S., “Geoinformatics for Tropical Ecosystems”, Asian Association of Remote Sensing, New Delhi, 2003.
2. American Society of Photogrammetry and Remote Sensing, “Remote Sensing for Natural Resources Management and Environmental Monitoring”, Manual of Remote Sensing, Third Edition, Volume 4, John Wiley and Sons, New York, 2004.

AI 9304 AQUACULTURE ENGINEERING L T P C

3 0 0 3

OBJECTIVE:

At the end of the course the students would be exposed to basic knowledge in

- Definition of Aquaculture Engineering
- Operation and maintenance of Aquaculture farms and effective implementation of projects.
- Design, constructions and preparations of master plan for large scale – Aquaculture complex.

UNIT I SURVEY AND LOCATION OF SUITABLE SITES FOR AQUACULTURE 9

Study of topographical features of the proposed area water source, Hydro-meteorological parameters, Availability of seed and feed, power supply, Availability of skilled human resources, Machineries and equipments, infrastructure facilities, freshwater, Potable water supply, Availability of processing centres. Source of finance and Insurance coverage, Marketability-Aquaculture authority GOI guidelines and case studies.

UNIT II LAYOUT AND DESIGN OF AQUACULTURE FARMS 9

Leading canal, Pumping systems, Main inlet, Electrical distribution system, farm stead approach road, Peripheral dyke, Diffuser tank, Feeder canal and feeder canal dyke, inlet for culture ponds, size of culture ponds, Drainage canal dyke, partition dyke, culture pond outlet, Main outlet, Aerators, feeding trays, vehicles and other conveyance systems, watch towers.

UNIT III CONSTRUCTION OF AQUACULTURE FARMS 9

Administration of the contract, Supervision of the work, Materials and works in compliance with the specifications.

UNIT IV WATER INTAKE SYSTEMS 9

Freshwater intake from precipitation, Freshwater intake by using precipitation and groundwater, Freshwater intake by using irrigation canal water from a multipurpose project, Brackish water intake from a tidal creek/ an estuary by tidal influence, Brackish water intake by using both tide and pump, Brackish water/Freshwater intake through seepage, Brackish water/seawater intake through pumps, Pumps used in aquaculture for water exchange, maintaining water quality such as aeration, temperature control, depth control, complete draining etc.

UNIT V WATER QUALITY MANAGEMENT IN AQUACULTURE 9

Water Quality and aquaculture production, salinity, temperature, turbidity, suspended soil particles, Phytoplantation, Zooplantation, Nutrients, Dissolved oxygen, Carbon-di-oxide, PH, Alkalinity and Hardness, Ammonia, Nitrate, Nitrite, Hydrogen sulphide, Heavy metals and Pesticides, Soil and water quality – Analysis, Radix potential -Soil acidity, Organic carbon, Acid sulphate soil, Influence of impact of water quality and management.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Thomas B. Lawson, Fundamentals of Aquaculture Engineering, Chapman and Hall Inc., New York, 1995

REFERENCES:

1. "Aquaculture Engineering and Water Quality Management- Hand Book on Aqua Farming", The Marine Products Export Development Authority, Govt. of India, Cochin, Pp.64, 1995.
2. Sinha, V.R.P., and Srivastava, H.C., "Aquaculture Productivity", IBH Publishing Co. Pvt. Ltd., New Delhi, Pp. 868, 1991.

AI 9305 DESIGN AND DRAWING OF AGRICULTURAL MACHINERY L T P C
3 1 0 4

OBJECTIVE:

- 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 DESIGN OF MACHINE PARTS 9+3

Types of loading and induced stresses - Allowable stress - eccentric loading - combined stresses - principal stresses. Design of simple components - bolts and nuts - keys and key ways - knuckle and cotter joints - Shafting - design considerations - determination of shaft sizes on the basis of strength and rigidity.

UNIT II DESIGN OF BELT 9+3

Belt drives - materials - flat belt Euler's formula - V belt - design - power calculation and selection.

UNIT III DESIGN OF CHAIN AND COUPLINGS 9+3

Wire rope - strength calculation. Chain - components design. Shaft couplings - types - rigid couplings - flexible couplings - design.

UNIT IV STRENGTH OF GEARS 9+3

Gears - spur gear - terminology - strength of gear teeth - Lewis equation - Buckingham equation. - Failure of gear teeth. Bevel gear - terminology - strength of teeth - mounting of bevel gears.

UNIT V BEARINGS 9+3

Bearing - types - bearing loads - materials - anti friction bearings types. Fits and tolerance - dimensional control.

L:45+T:15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Pandya and Shah, “Machine Design”, Charotar Publishing House, New Delhi, 1991.
2. Gary Krutz, Lester Thompson and Paul Clear., “Design of Agricultural Machinery”, John Wiley and Sons, New York, 1984.

REFERENCES:

1. Sundararaja Moorthy, T.V., and Shanmugham, N., “Machine Design”, Khanna Publishers, New Delhi, 1991.

AI 9306 IRRIGATION DRAWING L T P C

0 0 3 2

OBJECTIVE:

At the end of the semester, the student shall be able to conceive, design and draw all types of irrigation structures in detail showing plan, elevation and sections.

UNIT I TANK IRRIGATION STRUCTURES 8

Tank bunds – Tank surplus weirs – Tank sluices weirs on pervious foundations - Drawings showing foundation, plan and elevation.

UNIT II IMPOUNDING STRUCTURES 7

Gravity Dams – Earth dams – Arch dams – Spill ways –Drawing showing plan, elevation, half sections including foundation

UNIT III CANAL TRANSMISSION STRUCTURES 7

Aqueducts – Syphon aqueducts – Super passage – Canal syphon – Canal drops – Drawing showing plan, elevation and foundation

UNIT IV CANAL REGULATION STRUCTURES 8

Canal head works – Canal regulator – Canal escape –Drawing showing detailed plan, elevation and foundation.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Garg, S.K., “Irrigation Engineering and Design of Structures”, New Age International Publishers, New Delhi, 1997.
2. Satyanarayana Murthy, “Irrigation Design and Drawing”, Published by Mrs. L. Banumathi, Tuni, East Godavari District, Andhra Pradesh, 1998.

REFERENCE

1. Sharma R.K., “Irrigation Engineering and Hydraulic Structures”, Oxford and IBH Publishing Co., New Delhi, 2002.

AI 9307 IRRIGATION FIELD LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- The students will get familiarized with agro- meterological station, data collection and recording
- The students get exposure in flow measurement at field level using various irrigation methods

1. Collection of data on agro-meteorological parameters
2. Estimation of soil moisture for irrigation scheduling
3. Measurement of infiltration
4. Demonstration on measurement of plant transpiration
5. Flow measurement in irrigated channels
6. Flow measurement in closed conduit
7. Evaluation of surface and micro irrigation systems

TOTAL: 45 PERIODS

REFERENCES:

1. Asawa, G.L., “Irrigation Engineering”, New Age International Private Limited, New Delhi, 1996.
2. Michael, A.M., “Irrigation Theory and Practice”, Vikas Publishing House, New Delhi, 1999.

GE 9371 COMMUNICATION SKILLS AND SOFT SKILLS L T P C
(LABORATORY COURSE) 0 0 2 1

AIM:

To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their jobs.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

A. VIEWING AND DISCUSSING AUDIO-VISUAL MATERIALS

UNIT I RESUME / REPORT PREPARATION / LETTER WRITING 2

Letter writing – Job application with Resume - Project report - Email etiquette.

UNIT II PRESENTATION SKILLS **1**

Elements of effective presentation – Structure of presentation - Presentation tools – Body language.

UNIT III SOFT SKILLS **1**

Time management – Stress management – Assertiveness – Negotiation strategies.

UNIT IV GROUP DISCUSSION **1**

Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.

UNIT V INTERVIEW SKILLS **1**

Kinds of interviews – Interview techniques – Corporate culture – Mock interviews. (Career Lab Software may be used for this section).

B. PRACTICE SESSION **(24 PERIODS)**

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. **4**
2. **Presentation Skills:** Students make presentations on given topics. **8**
3. **Group Discussion**: Students participate in group discussions. **6**
4. **Interview Skills**: Students participate in Mock Interviews **6**

TOTAL : 30 PERIODS

REFERENCES:

1. Paul V Anderson, **Technical Communication**, Thomson Wadsworth , 6th Edition, New Delhi, 2007.
2. Prakash P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., 2nd Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi 2004.
4. David Evans, **Decisionmaker**, Cambridge University Press, 1997.
5. Edgar Thorpe and Showick Thorpe, **Objective English**, Pearson Education, 2nd Edition, New Delhi 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addision Wesley Longman Ltd., Indian reprint 1998.

ME 9037 REFRIGERATION AND AIR-CONDITIONING **L T P C**

3 1 0 4

AIM:

To include the students with the knowledge of refrigeration and air conditioning.

OBJECTIVES:

- To understand the underlying principles of operation in different refrigeration & Air conditioning systems and components.

- To provide knowledge on basic design aspects of Refrigeration & Air conditioning systems.

UNIT I REFRIGERATION CYCLE 8+2

Review of thermodynamic principles of refrigeration. Concept of Air refrigeration system. Vapour compression refrigeration cycle – use of P.H charts – multistage and multiple evaporator systems – cascade system – COP comparison.

UNIT II REFRIGERANTS, SYSTEM COMPONENTS AND BALANCING 9+4

Compressors – reciprocating & rotary (elementary treatment) – condensers – evaporators cooling towers. Refrigerants – Properties – selection of refrigerants, Alternative refrigerants, cycle controls.

UNIT III PSYCHROMETRY 10+3

Psychrometric processes use of psychrometric charts – grand and room sensible heat factors – bypass factors – air washers, requirements of comfort air conditioning, summer and winter air conditioning.

UNIT IV AIR CONDITIONING SYSTEMS 9+3

Cooling load calculation working principles of – centralized Air conditioning systems, split, ductable split, packaged air conditioning, VAV & VRV systems. Duct design by equal friction method, indoor air quality concepts.

UNIT V UNCONVENTIONAL REFRIGERATION CYCLES 9+3

Vapor absorption systems – Ejector jet, steam jet refrigeration, thermo electric refrigeration.

Applications: ice – plant – food storage plants – milk chilling plants.

L:45+T:15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Manohar Prasad, “Refrigeration and Air Conditioning”, Wiley Eastern Ltd., New Delhi, 1983.
2. Arora, C.P., “Refrigeration and Air Conditioning”, Tata McGraw Hill, New Delhi, 1988.

REFERENCES:

1. Roy J. Dossat, “Principles of Refrigeration and Air Conditioning”, Pearson Education Pvt. Ltd., New Delhi, 1997.
2. Jordon and Priester, “Refrigeration and Air Conditioning”, Prentice Hall of India Pvt. Ltd., New Delhi, 1985.
3. Stoecker, N.F., and Jones, “Refrigeration and Air Conditioning”, Tata McGraw Hill, New Delhi, 1981.

CE 9036 INTEGRATED WATER RESOURCES MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- To introduce the student to the concept of Ecology, Environment, and Socio-economic disciplines in management of Water Resources.
- At the completion of the course the students should be able to understand the integrated effects of inter disciplinary approach in water resources management.

UNIT I IWRM CONCEPT 6

Integrated Water Resources Management (IWRM) Definition – Principles- Approaches- Global issues – food securities

UNIT II RIVER BASIN 12

River basin concept –Multi-sectoral use- Watershed topology - Stream network – Drainage density –problem – Effect of reservoir on watershed /river regime – river training measure – Reservoir sedimentation and measures.

UNIT III ENVIRONMENT 8

Impact of land use changes in basin morphology – impact of watershed changes an qualities and quantities

UNIT IV WATER ECONOMY 7

Economic view of water issues – Economic characteristics of water as good and services – Policy operation for water conservation and sustainable issue – Water budgeting-Auditing- Pricing.

UNIT V SPECIAL TOPICS 12

Eco restoration – Watershed management strategies – Wetlands – Legal and regulatory setting – Public Private Participation – PPP Objectives – Processes – Links between PPP and IWRM - Tamilnadu Farmers Management of Irrigation System (TNFMIS) Act

TOTAL: 45 PERIODS

REFERENCES:

1. Murthy, J.V.S., "Watershed Management in India", Wiley Eastern Ltd., New York, 1995.
2. Dalte, S.J.C., "Soil Conservation and Land Management", International Book Distribution, India, 1986.
3. Sithamparanathan, Rangasamy, A., and Arunachalam, N., "Ecosystem Principles and Sustainable Agriculture", Scir Publisher, Chennai, 1999.

AI 9351 TRACTORS AND FARM EQUIPMENTS L T P C
3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Farm Equipments and tractors, Working principles and Tractor Transmission
- Power tiller - special features, Makes of tractors and power tillersTillage, methods of ploughing, Secondary tillage implements and sowing methods
- Farm mechanization benefits and constraints, Identification of components of primary and secondary tillage implements.

UNIT I TRACTORS AND EQUIPMENTS 9

Tractor engines - constructional features and operation - valve actuation system -inlet and outlet valves - air cleaner - exhaust - silencer - 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 - clutch - mechanical and hydraulic - gear box - sliding mesh - constant mesh. Differential, final drive and wheels. Steering geometry - steering systems - front axle and wheel alignment. Brake - types - system - effort. Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction. Mechanics - stability - longitudinal and lateral. Controls - visibility - operators seat. Garage tools. Tractor fault diagnosis and disassembly. Disassembly of tractor engine and study of engine subsystems- their inspection - repair - assembly and adjustment. Tractor transmission - disassembly - assembly and adjustment. Maintenance and adjustment of steering, brakes, tyres, and hitch and hydraulics.

UNIT III FARM EQUIPMENTS 9

Power tiller - special features - clutch - gear box - steering and brake, Makes of tractors and power tillers. Bulldozer - special features of engine - Tracks and suspension - steering - operations using bulldozer - shovel and its actuation. Bulldozer track and blade adjustments.

UNIT IV TILLAGE AND INTERCULTURAL IMPLEMENTS 9

Tillage - objectives - furrows terminology - methods of ploughing - field capacity - 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. Sowing methods - equipment used - seed cum fertilizer drills and planters - components - functions. Plant protection equipment - sprayers - classification and uses. Dusters - types and uses. Intercultural implements - sweep - junior hoe - weeders - types and uses. Harvesting equipment - principles - components - function. Threshers - types - principle of operation, combine - functions - advantages.

UNIT V FARM POWER 9

Farm power sources - IC engines - non conventional energy sources - solar, wind, biogas and biomass - merits and demerits. Farm mechanization benefits and constraints - cost of operation of farm machinery and implements. Identification of components of primary and secondary tillage implements. Identification of components of seed drill - calibration. Identification of components of intercultural implements. Identification of components of plant protection equipment. Identification of components of paddy.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jain, S.C., and Rai, C.R., "Farm Tractor Maintenance and Repair", Standard Publishers and Distributors, New Delhi, 1999.
2. Barger, E.L., et al., "Tractors and their Power Units", John Wiley and Sons Inc., New York, 1951.

REFERENCES:

1. Herbert L. Nichols Sr., "Moving the Earth", D.Vannostrand Company Inc., Princeton, USA, 1959.
2. Bindra, O.S., and Harcharan Singh, "Pesticide Application Equipment", Oxford and IBH Publication Co., New Delhi, 1981.
3. Jagadishwar Sahay, "Elements of Agricultural Engineering", Agro Book Agency, Patna, 1992.
4. Srivastava, A.C., "Elements of Farm Machinery", Oxford and IBH Publication Co., New Delhi, 1990.

AI 9352 GEOGRAPHICAL INFORMATION SYSTEMS L T P C

3 0 0 3

OBJECTIVES:

To introduce the basic principles of geographical information systems

- To introduce the spatial data models, analysis and presentation techniques
- To describe various applications of Geographical Information Systems in Agriculture.

UNIT I INTRODUCTION 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 II DATA INPUT STORAGE 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

UNIT III DATA ANALYSIS AND MODELLING 9

Introduction – 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 IV DATA OUTPUT AND ERROR 9

Types of output data – Spatial and Non-spatial – Devices for output – Multimedia – Data quality – Source of errors – Types of errors – Modelling Errors – Managing Errors.

UNIT V GIS APPLICATIONS 9

Agriculture census – Agro economics – Integration of GPS for Precision Farming – Disease Tracking and control – Command area monitoring and management – Subsidy Administration – Case studies.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Ian Heywood., "An Introduction to GIS", Pearson Education, New Delhi, 2001.

REFERENCES:

1. Jeffery Star and John Estes, "Geographical Information System– An Introduction," Prentice Hall India Pvt. Ltd., New Delhi, 1998.\
2. Bettinger, P., and Michael, G.W., "Geographical Information System: Applications in Forestry and Natural Resources Management," Tata McGraw–Hill Higher Education, New Delhi, 2003.

AI 9353 DRAINAGE ENGINEERING AND LAND MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

- Students will be exposed to drainage concepts, and to planning, design and management of drainage related work.
- They will learn about the latest developments in drainage and land management on the basis of a clear understanding of the principles of drainage engineering.

UNIT I NEED AND HISTORY OF DRAINAGE 4

Need for land drainage – Progression of drainage from being an art to engineering science – Factors to be considered for land drainage.

UNIT II HYDRAULICS OF DRAINAGE 12

Basic concepts of ground water flow – Subsurface flow into drains – Static condition-Steady and unsteady state equations – Seepage from river into aquifers – Seepage from open channels.

UNIT III DRAINAGE CRITERIA 8

Water balance – Equations for water balance – Drainage surveys – Agricultural drainage criteria – Effect of field drainage systems on agriculture – Some examples of agricultural drainage criteria.

UNIT IV DESIGN AND MANAGEMENT OF DRAINAGE SYSTEMS 12

Drainage materials – Surface drainage systems, their components and applications in sloping areas – Subsurface drainage systems – Design of pipe drainage systems – Operation and maintenance of drainage systems – Drain line performance – Mole drainage – Tube well irrigation – Design procedure.

UNIT V SALINITY CONTROL 9

Salinity in relation to irrigation and drainage – Salt balance of the root zone – Leaching process – Bio drainage – Environmental aspects of drainage.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kessler, J., "Drainage Principles and Applications", Vol. II and IV, International Institute of Land Reclamation and Improvement, Netherlands, 1979.
2. Bhattacharya, A.K., and Michael, A.M., "Land Drainage –Principles, Methods and Applications", Konark Publishers Pvt. Ltd., New Delhi, 2003.

REFERENCES:

1. Ritzema, H.P., "Drainage Principles and Applications", Publication No. 16, International Institute of Land Reclamation and Improvement, Netherlands, 1994.
2. Sharma, R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Company, New Delhi, 1984.

AI 9354 SYSTEMS ANALYSIS IN IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- Students will be introduced to 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

TEXT BOOKS:

1. Gupta, P.K., and Man Mohan, "Problems in Operations Research", (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.
2. Hiller, F.S., and Liebermann, G.J., "Operations Research", CBS Publications and Distributions, New Delhi, 1992.

REFERENCES:

1. Taha, H.A., "Operations Research", McMillan Publication Co., New York, 1995.
2. Chaturvedi, M.C., "Water Resources Systems Planning and Management", Tata McGraw Hill, New Delhi, 1997.
3. Mays, L.W., and Tung, Y.K., "Hydrosystems Engineering and Management", McGraw Hill Inc., New York, 1992.
4. Goodman Alvin, S., "Principles of Water Resources Planning", Prentice Hall Inc., Englewood Cliffs, New Jersey, 1995.
5. Course material, Micro Computer Application to Systems Analysis in Irrigation Water Management, CWR, Anna University, 1992.
6. Wagner H.M., Principles of Operations Research with Application to Management Decisions, Prentice Hall, India, New Delhi, 1993.

AI 9355 CAD FOR AGRICULTURAL ENGINEERING L T P C
0 0 4 2

OBJECTIVE:

- Draft the agricultural engineering related machineries and structures manually and also by computer aided methods.
  1. Design and Drawing of Underground pipeline system
  2. Design and Drawing of Check dam
  3. Design and Drawing of Mould board plough
  4. Design and Drawing of Disk plough
  5. Design and Drawing of Post harvest technology units (threshers and winnowers)
  6. Design and Drawing of Biogas plant

TOTAL: 60 PERIODS

REFERENCES:

1. Srivastava, A.C. 1990. “Elements of Farm Machinery”, Oxford and IBH Publications Co., New Delhi.
2. Rai, G.D. 1995. “Nonconventional Sources of Energy”, Khanna publishers, New Delhi.
3. Michael, A.M. 1999. “Irrigation Theory and Practice”, Vikas Publishing House, New Delhi.

AI 9356 TECHNICAL SEMINAR L T P C
0 0 2 1

AIM:

To work on a specific technical topic in Civil Engineering and acquire the skill of written and oral presentation. To acquire writing abilities for seminars and conferences.

SYLLABUS:

The students will work for three hours per week guided by a group of staff members. They will be asked to talk on any topic of their choice and to engage in dialogue with the audience. A brief copy on their talk also should be submitted. Similarly, the students will have to present a seminar of not more than fifteen minutes on the technical topic. They should also answer the queries on the topic. The students as the audience also should interact. Evaluation will be based on the general and technical presentation and the report and also on the interaction shown during the seminar.

AI 9401 AGRICULTURAL ECONOMICS AND FARM MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Farm Management, and Basic Concept of Farm Management. Product Relationship and Law of diminishing return
- Type of resource and Investment analysis in agriculture sector
- Farm financial analysis, Investment and Budgeting for farms

UNIT I INTRODUCTION & SCOPE OF FARM MANAGEMENT 9

Farm Management - definition and scope - relationship between farm management and other sciences - Characteristics and significance. Farm management decision making process. Basic concepts in farm management. Factor and Farm layout - Farm records and Accounts - Farm Appraisal Techniques. Valuation and Depreciation – Factor

UNIT II LAWS OF ECONOMICS 9

Product relationship - Production function - definition & types - Impact of technology. Law of diminishing returns. Equi-marginal returns and Opportunity cost comparative advantage. Cost concepts & interrelations. Optimum level of input use and optimum

production. - Economies of scale external and internal economies and diseconomies. Returns to scale - Economies of size. Factor - Factor relationship.

UNIT III COST CURVES 9

Principle of substitution - isoquant, isocline. Expansion path, ridge line and least cost combination of inputs. Product - Product relationship. Types of products. Production possibility curve, iso revenue line and optimum combination of outputs - Concepts of Risk and uncertainty – Product relationship - Cost curves, optimum input and output levels - Factor - Factor relationship least cost combination of inputs - Product - Product relationship - Preparation of Interview schedule and visit to a farm for data collection - Estimation of cost of cultivation and cost of production of annual and perennial crops.

UNIT IV MANAGEMENT OF RESOURCES 9

Types of uncertainty in agriculture - Managerial decisions to reduce risks in production process. Management of resources - Types of resources - land, labour, capital, and measurement of their efficiencies - mobilization of farm resources. Cost of maintenance of machinery and break even analysis - Estimation of cost of production. Dairy and poultry products - Investment analysis. Undiscounted and Discounted methods.

UNIT V FINANCIAL ANALYSIS 9

Farm Financial Analysis. Balance sheet - Income statement - Cash flow analysis - Ratio analysis. Farm Investment Analysis - Time comparison principles - Discounted and undiscounted measures. Farm planning and control - Elements of planning - Farm level management information systems- Farm Budgeting partial, enterprise and complete budgeting. Preparation of Balance sheet and income statement - Preparation of cash flow statement and ratio analysis - Estimation of 3Rs of credit - Preparation of Farm plan Enterprise budgeting - Partial budgeting and complete budgeting.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Johl, S.S., and Kapur, T.R., “Fundamentals of Farm Business Management”, Kalyani Publishers, Ludhiana, 2001.
3. Muniraj, R., “Farm Finance for Development”, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2000.

REFERENCES:

1. Raju, V.T., “Essentials of Farm Management”, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2002.
2. Sankhayan, P.L., “Introduction to Farm Management”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2001.
4. Subba Reddy, S., and Raghu Ram, P., “Agricultural Finance and Management”, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1996.

AI 9402 SOIL AND WATER CONSERVATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To present the basic principles and concepts of soil and water conservation so that students understand their importance to man and the environment.
- To enable the students to use the principles and concepts to solve problems of soil and water management.

UNIT I INTRODUCTION 12

Engineering properties of soils - fundamental definitions and relationships - index properties of soils – classification - permeability and seepage analysis - shear strength - Mohr's circle of stresses - active and passive earth pressures - stability of slopes. Hydrological cycle – measurement and analysis of precipitation data - abstraction – runoff - hydrograph analysis - stream flow measurement.

UNIT II SOIL EROSION 9

Causes and effects of soil erosion - water erosion - causes - erosivity and erodibility - Universal Soil Loss Equation - mechanics of water erosion - splash, sheet, rill and gully erosion - Erosion control measures for Agricultural lands - biological measures - contour cultivation - strip cropping - cropping systems - vegetative measures - mechanical measures - contour bund - graded bund - mechanical measures for hill slopes - bench terrace - contour stone wall – drainage structures – surface and sub-surface drainage structures.

UNIT III WIND EROSION 6

Factors influencing wind erosion - mechanics of wind erosion - suspension, saltation, surface creep-control measures - windbreaks and shelterbelts - sand dunes and their stabilization.

UNIT IV RAINWATER HARVESTING 9

In-situ soil moisture conservation - micro catchments – catchment yield - rainwater harvesting – methods - storage and its use for domestic and groundwater recharge - Farm ponds and percolation ponds.

UNIT V GROUNDWATER WELLS 9

Aquifers - types of wells and sizes - pumps - reciprocating pumps - centrifugal pumps - submersible pumps - jet pumps - airlift pumps - selection of pumps - operation and their maintenance.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Suresh, R., “Soil and Water Conservation Engineering”, Standard Publication, New Delhi, 1982.
2. Murthy, V.V.N., “Land and Water Management Engineering”, Kalyani Publishers, Ludhiana, 1998.

REFERENCES:

1. Ghanashyam Das, “Hydrology and Soil Conservation Engineering”, Prentice Hall of India Private Limited, New Delhi, 2000.
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.

AI 9403 FOOD PROCESSING ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Food, its properties and effect of heat
- Different methods of food processing
- Quality control in food processing

UNIT I FOOD AND ITS PROPERTIES 8

Constituents of food and its energy value-thermal processing of foods, thermal properties, thermal conductivity, specific heat & thermal diffusion-cooking, blanching, sterilization, pasteurization, canning.

UNIT II REACTION AND KINETICS 12

Interaction of heat energy on food components, reaction kinetics, Arhenius equation, Thermal death time curves, water activity, sorption isotherms, monolayer value, BET isotherms, Raoult’s law, Salwin-slawson equation.

UNIT III METHODS OF PROCESSING 8

Concentrations of foods, freeze concentration, osmotic and reverse osmotic concentration, drying and dehydration off food, tunnel, belt, vacuum and freeze drying, rehydration of dehydrated foods.

UNIT IV EXTRUSION PROCESSING 10

Extrusion processing of 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, principle and application.

UNIT V QUALITY CONTROL 7

Quality control of processed food products, Factors affecting quality. Food packaging, importance, flexible pouches-restorable pouches-aseptic packaging, granules, powder, and liquid packaging machines.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Charm, S.E., "Fundamentals of Food Engineering", AVI Pub.Co.Inc, New York, 1997.
2. Subbulakshmi.G., and Shobha A. Udipi, Food Processing and Preservation, New Age International Publications, New Delhi, 2007.

REFERENCES:

1. Karel Marcus, Fennama, R. O., and Dayal, L.B., "Principles of Food Science", Part 2: Physical Principles of Food Preservation, Marcel Dakker Inc., New York, 1997.
2. Toledo, R.T., "Fundamentals of Food Process Engineering", CBS Publishers and Distribution, New Delhi, 1997.

AI 9404 IT IN AGRICULTURAL SYSTEMS LT P C

3 0 0 3

OBJECTIVES:

Students will be introduced to some of the possible areas of agricultural systems in which IT and computers could play a major role. At the end of the course the students would have learned about the IT applications in agricultural systems in general and IT applications in precision farming, environmental control systems, agricultural systems management, and weather prediction models in particular.

UNIT I PRECISION FARMING 9

Precision agriculture and agricultural management, GIS and mapping software, Yield mapping systems, Ground based sensors, remote sensing, 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 a 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 FOR PROFITABLE AGRICULTURAL PRODUCTION 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 IT 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

TEXT BOOKS:

1. "Precision Agriculture in the 21st Century", (ISBN: 0309058937), National Academies Press, National Research Council, Canada, 1997.
2. "International Symposium on Models for Plant Growth, Environmental Control and Farm Management in Protected Cultivation", (ISBN: 9066050144) H. Krug, H.-P. Liebig, 1989.

REFERENCES:

1. Peart, R.M., and Shoup, W. D., "Agricultural Systems Management", (ISBN: 0824747836), Marcel Dekker, New **York**, 2004.
2. Hammer, G.L., Nicholls, N., and Mitchell, C., "Applications of Seasonal Climate", Springer, Germany, 2000.

AI 9405 IRRIGATION EQUIPMENT DESIGN L T P C
3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Pumps for Irrigation use
- Design of sprinkler & Drip irrigation components
- Design of valves and controls

UNIT I WATER PUMPS 9

Indigenous water lifts – types and their working-Types of pumps- Positive displacement and variable displacement pumps –Reciprocating pump- Principle- Components- Single acting and double acting- Work done – Coefficient of discharge- Slip- Centrifugal pump- Principle and working- Work done by centrifugal pump- Pump characteristics and efficiencies.

UNIT II SUBMERSIBLE AND DEEP WELL PUMPS 9

Multistage-Submersible- Turbine pumps mixed flow – Axial flow – Jet and Airlift pumps- Pump selection and installation- Pump troubles and Remedies.

UNIT III DRIP IRRIGATION DESIGN 9

Drip irrigation – advantages-Components- Dripper- types and equations governing flow through drippers- Wetting pattern- Filters and Fertigation tanks-

Derivation of equation for flow through pipes with uniform spaced outlets- Design of laterals- Submain- main lines- Pump capacity- Operation and maintenance of Drip irrigation system.

UNIT IV SPRINKLER IRRIGATION DESIGN 9

Sprinkler irrigation- Components- Sprinkler performance- Sprinkler discharge – Distance of throw- distribution pattern- Application rate- Droplet size, Sprinkler selection and spacing- Capacity of sprinkler system- Hydraulic design of sprinkler systems.

UNIT V VALVES 9

Surge and cablegation –Greenhouse irrigation system design- Types of valves-pressure relief valve- Gate valve- Non return valve- Butterfly valve- Solenoid valves.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Michael, A.M., “Irrigation Theory and Practice”, Vikas Publishers, New Delhi, 1990.
2. Jack Keller and Rond Belisher., “Sprinkler and Trickle Irrigation”, Van h’ostrand Reinhold, New York, 1990.

REFERENCE

1. Modi, P.N., and Seth, S.M., “Hydraulics and Fluid Mechanics”, Standard Book House, New Delhi, 1991.

AI 9406 PRACTICAL TRAINING L T P C

- - 0 2

To train the students in field work so as to have a first hand knowledge of practical problems in carrying out engineering tasks. To develop skills in facing and solving the field problems.

The students individually undertake training in reputed civil 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.

AI 9451 PROJECT WORK L T P C

0 0 12 6

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.

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.

CE 9037 PARTICIPATORY WATER MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

- To introduce the student the concept of Peoples involvement in water management.
- At the completion of the course the students should be able to understand the value of
- Participatory approach for better performance of the completed systems and other facilities through their organized associations.

UNIT I FUNDAMENTALS OF SOCIOLOGY 6

Sociology – Basic concept – Perspectives of sociology – social system – Sociological Understanding.

UNIT II CONCEPT OF PARTICIPATION 10

Participatory approach – Necessity – Objectives of participation – Kinds of participation – Resource mobilization – Sustained system performance – Conflict management – Context of participation, factors in the environment.

UNIT III ORGANIZATIONAL DESIGN 9

Membership and decision making – Leadership and responsibilities – Development strategy – Channels for implementation – Improving agency relations – Technical co-operation – Special roles.

UNIT IV PARTICIPATION IN WATER MANAGEMENT 10

Cost of participation – Benefits of participation – Multiple use of water – Participation in domestic, irrigation, industrial sectors – User roles in participatory management – Participation of women – Incentives for participation.

UNIT V FARMER ORGANIZATION AND PARTICIPATION 10

Water user association – Activities in irrigation management – User roles in irrigation management – Irrigation groups – Supporting farmer organization and participation – Experimentation, phasing and flexibility -Bureaucratic reorientation-Irrigation management transfer.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Desai, A.R., “Rural sociology in India”, Popular Prakashan, Bombay, 1969.
2. Michael, C.M., “Putting People First, Sociology Variables in Rural Development”, Oxford University Press, London, 1985.
3. 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.

REFERENCES:

1. Chambers, R., “Managing Canal Irrigation”, Oxford IBM publishing Co. Pvt. Ltd., New Delhi, 1998.
2. Korten, F.F., and Robert, Y. Siy, Jr., “Transforming a Bureaucracy – The experience of the Philippines”, National Irrigation Administration, Ateneo De Manila University Press, Manila, 1989.

AI 9021 WATERSHED DEVELOPMENT L T P C

3 0 0 3

OBJECTIVES:

- To provide the technical know-how of analyzing the degradation of soil and water resources and implementation of the measures for soil and water conservation.
- To provide a comprehensive treatise on the engineering practices of watershed management for realizing the higher benefits of watershed management.

UNIT I INTRODUCTION 4

Concept and significance – morphological characteristics – elements – delineation – codification - basic factors influences watershed development.

UNIT II SOIL CONSERVATION PRACTICES 11

Types of erosion – wind erosion: causes, factors, effects and control – Water erosion: types, factors, effects and control – Methods of gully control – estimation of soil loss.

UNIT III WATER CONSERVATION AND HARVESTING 11

Types of storage structures – water yield from catchments – farm ponds-percolation ponds-losses of stored water – water conservation methods – water harvesting methods and techniques.

UNIT IV WATERSHED DEVELOPMENT 12

Definition of watershed management – strategies – identification of problems - watershed approach in Government programmes – watershed development plan - People's participation – entry point activities - evaluation of watershed management measures.

UNIT V SPECIAL TOPICS 7

Concept of priority watersheds – land capability classification – engineering measures for erosion control in agricultural and non-agricultural lands–agro-forestry-grassland management – wasteland development – case studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Tideman, E.M., "Watershed Management", Omega Scientific Publishers, New Delhi, 1996.
2. Glenn O. Schwab, "Soil and Water Conservation Engineering", John Wiley and Sons, New York, 1981.

REFERENCES:

1. Ghanashyam Das, "Hydrology and Soil Conservation Engineering", Prentice Hall of India Private Limited, New Delhi, 2000.
2. Gurmail Singh, "A Manual on Soil and Water Conservation", ICAR Publication, New Delhi, 1982.
3. Suresh, R., "Soil and Water Conservation Engineering", Standard Publication, New Delhi, 1982.

AI 9022 FLOOD AND DROUGHT MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:
Floods and Droughts represent the surplus and deficit of water in hydrology. This subject aims at making the students to understand these two phenomena along with their estimation, control and management.

UNIT I FLOOD ESTIMATION 9
Estimation of design flood – Empirical methods – Statistical methods – Frequency analysis – Unit hydrograph method – Flood estimation in small watersheds and mountainous region – Estimation by lumped, distributed model

UNIT II FLOOD ROUTING 9
Routing – Lumped – Distributed – Hydraulic and hydrological routing – Reservoir routing – ISD method.

UNIT III FLOOD MITIGATION 9
Flood mitigation measures – Storage methods – channel improvement and soil conservation measures – Levees and flood walls - Data communication and warning – Flood fighting

UNIT IV DROUGHT ANALYSIS 9
Definitions of drought – NCA classification – Economic, Environmental and social Impacts of drought – Meteorological, hydrological and agricultural drought assessments - IMD, Palmer, Herbst, Aridity Indices.

UNIT V DROUGHT CONTROL MEASURES 9
Drought control - Supply and demand oriented measures – Drought Prone Areas Programme (DPAP) – Criteria for identification of areas to be included/ excluded under DPAP.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Chow, V.T., Maidment, D.R., and Mays, L.W., “Applied Hydrology”, McGraw Hill Publications, New York, 1995.
2. Singh, V.P., “Elementary Hydrology”, Prentice Hall of India, New Delhi, 1994.

REFERENCES:

1. Yevjevich, V., “Coping with Droughts”, Water Resources Publications, Colorado State University, CO, USA, 1997.
2. http:\\eno.unl.edu/ndmc
3. http:\\www.nws.noa.gov/om/drought.htm
4. http:\\stormfax.com/drought.htm
5. http\\:www.uwex.edu/ces/news/info/drought.pdf

AI 9023 IRRIGATION WATER QUALITY AND MODELING L T P C

3 0 0 3

OBJECTIVE:

- This course introduces water quality concepts, its estimation and evaluation for irrigation purposes, besides relevant environmental problems and modeling of non-point pollution sources. 2. At the end of the course, the students will understand the importance of water quality for irrigation and environment and the collection and use of water quality data.

UNIT I HYDROCHEMISTRY 7

Physical and chemical properties of water – Suspended and dissolved solids – EC and pH – Trace constituents – Principles of water quality.

UNIT II WATER QUALITY ESTIMATION 9

Water quality investigation – Sampling design and samplers – automatic samplers and data collection platforms – Field kits and investigations – Water quality data storage, analysis and inference – Software packages – Demonstration on the collection and use data on water quality parameters.

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 irrigation: problems and prospects – Saline water irrigation – Future strategies.

UNIT IV WATER QUALITY MODELS 10

Water quality in irrigation systems – Diffusion and dispersion processes – Leaching of agrochemicals – Non Point Source (NPS) models – Agricultural Non Point Source (AGNPS) pollution model.

UNIT V ENVIRONMENTAL ISSUES RELATED TO WATER QUALITY 9

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

TOTAL: 45 PERIODS

REFERENCES:

1. Masters, G.M., Introduction to Environmental Engineering and Science, Pearson Education, Singapore, 2004.
2. American Public Health Association, Standard Methods for the Examination of water and waste water. APHA, New York, 2002.
3. Stum, M and Morgan, A., Aquatic Chemistry, Plenum Publishing company, USA, 1985.
4. Lloyd, J.W. and Heathcote, J.A., Natural inorganic chemistry in relation to groundwater resources, Oxford University Press, Oxford, 1988.
5. Newmann, E.I., Applied ecology, Blackwell Science ltd., Oxford, 1996.
6. Sithamparanathan, J., Rangasamy, A. and Arunachalam, N., Ecosystem principles and sustainable agriculture, Scitech Publishers, Chennai, 1999.

AI 9024 MINOR IRRIGATION AND COMMAND AREA DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Definition and Minor Irrigation development
- Operation and Maintenance, Components of tanks and People's participation in tank irrigation
- On farm structures, policy and operation and maintenance

UNIT I MINOR IRRIGATION 9

Definition – Minor Irrigation through wells, tanks, ooranies and canals – Minor Irrigation development in India.

UNIT II LIFT IRRIGATION 9

Dug wells and Tube well irrigation, conjunctive use of ground water – Operation and Maintenance – Ground water market – Tube well societies – GEC norms-Case studies.

UNIT III TANK IRRIGATION 9

Classification – Components of tanks, water distribution network, number of filling – Cascade of tanks – People's participation in tank irrigation and Maintenance – Turn over –Case studies.

UNIT IV COMMAND AREA DEVELOPMENT 9

On farm structures – Definition, policy – On farm development organization, operation and maintenance and water management – Farmer's participation – Turn over – Case studies.

UNIT V SPECIAL TOPICS 9

Institutional aspects – Socio economic perspective – Reclamation of salt affected soils – Seepage loss in command area – Water productivity.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Sathyanarayana Murthy, C., "Design of Minor Irrigation and Canal Structure", Wiley Eastern Ltd, New Delhi, 1989.

REFERENCE:

1. Brewer.J et.al, "Irrigation Management Transfer in India Policies, Processes and Performance" Oxford & IBH publishing Co. Pvt. Ltd., New Delhi, 1999.

AI 9025 ADVANCED IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- Students will be introduced to soil-water-plant relationship from the context of irrigation water management.
- At the completion of the course the students would have learnt about irrigation systems in general, and irrigation scheduling, irrigation water distribution, and design and evaluation of irrigation methods, in particular.

UNIT I DEVELOPMENT OF IRRIGATION 8

Importance of irrigation – Impact of irrigation on development of humanity – Need for irrigation in India – Development of irrigation in India – National Water Policy – Future developments in irrigation – Irrigation with canal, tank and ground water – Need for canal Irrigation management – Inadequacy of canal irrigation management – Objectives of and criteria for good canal irrigation.

UNIT II CROP WATER REQUIREMENT 8

Infiltration and movement of water in soil – Soil-water-plant relationship – Water requirement of crops – Evapotranspiration (ET) and consumptive use - Methods of estimating ET – Effective rainfall – Irrigation requirement - Duty of water – Irrigation of low land and upland crops.

UNIT III WATER DISTRIBUTION 9

Canal network and canal regulation – Design of irrigation canals – Methods of distribution: supply based and demand based – Delivery of water to farms – Measurement of water – Scheduling of irrigation – Criteria for scheduling – Frequency and interval of irrigation.

UNIT IV SURFACE IRRIGATION METHODS 11

Classification of irrigation methods – Border irrigation: design parameters, evaluation and ideal wetting pattern – Furrow irrigation: design parameters, types of furrows, evaluation, ideal wetting pattern and planting techniques – Basin irrigation: types of basins, suitable crops, soils and slopes, ideal wetting pattern, shapes and size – Efficiency of surface irrigation methods – Land leveling and shaping.

UNIT V DRIP AND SPRINKLER IRRIGATION METHODS 9

Drip irrigation: components, suitable crops and land types – Layout, design and evaluation of drip irrigation systems – Sprinkler irrigation: types, components, and suitable crops, slope, soils and climate – Design of sprinkler irrigation systems-Automated irrigation systems-Subsurface irrigation systems.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Majumdar, D.P., “Irrigation Water Management Principles and Practices”, Prentice Hall of India, New Delhi, 2000.
2. Asawa, G.L., “Irrigation Engineering”, New Age International Private limited, New Delhi, 1996.

REFERENCES:

1. Michael, A.M., "Irrigation Theory and Practice", Vikas Publishing House, New Delhi, 1999.
2. Irrigation and Drainage Paper 24, "Crop Water Requirement", FAO, Rome, 1977.
3. Irrigation and Drainage Paper 56, "Crop Water Requirement", FAO, Rome, 1998.
4. Van den Bosch, B.E., Hoevenaars J., and Broumer, C., "Irrigation Water Management", Training Manual No.1 to 7, FAO, Rome, 1999.

AI 9026 GEOLOGY FOR IRRIGATION ENGINEERING L T P C

3 0 0 3

UNIT I MINERALS AND ROCKS 9

Scope of geology in irrigation engineering – Minerals – Physical properties – 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 SOILS 9

Types of rock weathering – factors controlling weathering – products of weathering – methods – soil formation – types of soils – soil profile – Work of rivers – river deposition and its relevance to irrigation

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 GROUNDWATER 9

Distribution of groundwater – aquifers – groundwater in various geological formations – sources of groundwater – springs – wet lands – work of groundwater – groundwater quality – irrigation water quality – estimation of irrigation return flow.

UNIT V EXPLORATION GEOLOGY 9

Remote sensing methods – identification of soil and rock types – geological field methods – geophysical methods – seismic and electrical methods –electrical resistivity methods – groundwater exploration.

TOTAL: 45 PERIODS

REFERENCES:

1. Blyth, F.G.H., and Freitas, M.H.D., "Geology for Engineers", Edward Aronald, New York, 1984.
2. Parbin Singh, "Engineering and General Geology", Katson Publications, New Delhi, 2000.
3. Brady, N.C., and Weil, R R., "The Nature and Properties of Soils," 13th Edition, Prentice Hall, New York, 2002.

4. Daniels, R.B., and Hammer, R.D., “Soil Geomorphology”, John Wiley & Sons, New York, 2000.

AI 9027 BIO-TECHNOLOGY PRINCIPLES L T P C
3 0 0 3

OBJECTIVE:
To expose the students to the fundamental principles in bio-technology and bio-informatics.

UNIT I MOLECULAR BIOLOGY 9
Structure of Eukaryotic cell-Cell organelles-Chromosomes-Structure of DNA and RNA-Definition of gene-coding sequences-Types and process of replication-DNA repair.

UNIT II ENZYME TECHNOLOGY 9
Sterile techniques-cell culture-Isolation and purification of enzymes-Enzymes in food processing-Enzyme immobilization and applications-Basic modes of fermentation-Bioreactor design-screening and isolation of industrially important bacterial strains-Metabolic pathways and applications in food industry.

UNIT III PLANT BIOTECHNOLOGY 9
Germplasm-micropropagation-organ culture and embryo rescue-clonal propagation-Haploid production and application-Hybridization-gene transfer techniques-disease resistance-Mapping and cloning of plant genes.

UNIT IV ENVIRONMENTAL BIOTECHNOLOGY 9
Genetic basis of biodiversity-conservation and gene banks-Microbiology of waste water treatment-Genetically engineered microbes-Biofertilisers and bio-pesticides Bio-remediation methods-Bioleaching of soils-Biodegradation process-Bioenergy from waste.

UNIT V BIOINFORMATICS 9
Biology and bioinformatics-genomics and proteomics-Homology and diversity-DNA and protein sequencing-Human genome project-Biological databases-sequence and structural analysis-comparisons-Internet resources.

TOTAL: 45 PERIODS

REFERENCES:
1. Watson, J.D., Hopkins, N.H., Roberts, J.W., Steitz, J.A., and Weiner, A.M., “Molecular Biology of Gene”, The Benjamin Cummings Publishing Co., USA, 2004.
2. Bhojwani, S.S., and Razdan, M.K., (Eds.), “Plant Tissue Culture: Theory and Practice”, Elsevier Science, Amsterdam, 2004.
3. Ignacimuthu, S.J., “Applied Plant Biotechnology”, McGraw Hill Publications, New Delhi, 1996.
4. Palmer, “Enzymes”, Affiliated East West Press Pvt. Ltd, New Delhi, 2000.
5. Alwood, T.K., and Parry Smith, D. J., “Introduction to Bioinformatics”, Pearson Education, Singapore, 2004.

AI 9028 SEED TECHNOLOGY APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Scope and Importance of Seed production
- Principles and special techniques of seed production
  Seed treatment and Sowing technologies. Post harvesting seed management
- Planning seed production -procurement and pricing policy-economics of seed production

UNIT I INTRODUCTION 9

Scope and importance of seed production in horticultural crops-Traditional practices-area-seed demand and production.

UNIT II PRINCIPLES AND SPECIAL TECHNIQUE 9

Principles and special techniques for seed production of important commercial horticultural crops-vegetables-flower crops- fruits-spices and condiments - plantation crops.

UNIT III SEED PROCESSING AND TREATMENT 9

Seed treatment and sowing-technologies for hybrid seed production-seed extraction methods- processing-treating and packaging- seed health management. harvesting indices- post harvest seed management techniques seed extraction-seed processing-drying-cleaning-upgrading-seed treatment- packaging-storage and seed health management-marketing etc., seed legislation and seed law enforcement-certification and seed law enforcement-seed testing-seed standards.

UNIT IV ORGANIZATIONS 9

Organization set up of seed company- organizations involved in seed production i.e., public, quasi, co operative, private etc. Visit to seed farms and study the production technologies and field standards- visit to private-state- national and multinational seed companies within and outside Tamil Nadu state. Market analysis of seed demand and supply.

UNIT V PLANNING FOR SEED PRODUCTION 9

Planning seed production programme- seed farm organistion-procurement and pricing policy-economics of seed production of different crops-government policy in seed? production and study of export potential of seeds. Working out seed production programme for small, medium and large scale entrepreneurs- preparing seed projects for credit facilities- export procedures and formalities and seed / plant quarantine methods.

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCES

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

AI 9029 POST-HARVESTING TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Post harvest properties of Agricultural materials
- Threshing and processing of harvested crops
- Processing, Grading, milling and storage of crops

UNIT I ENGINEERING PROPERTIES OF AGRICULTURAL MATERIALS 4

Post harvest engineering of crops-objectives-post harvest losses in agricultural commodities-optimum stage of harvest-engineering properties of agricultural material.

UNIT II THRESHING 12

Threshing-traditional methods- mechanical threshers-types-principles and operation-moisture content-measurement-direct and indirect methods- moisture meters-equilibrium moisture content-psychometry-drying -principles-constant and falling rate of drying- thin layer and deep bed drying- source of heat-types of dryers.

UNIT III GRADING PRINCIPLES & SEED TREATMENT 12

Cleaning and grading-principles- air screen cleaner-cylinder separator-spiral separator-magnetic separator- color sorter -inclined belt separator-effectiveness of separation and performance index- shelling and decortication-principles and operation- maize Sheller-husker Sheller for maize- ground nut decortication- seed processing - sequence-equipments- seed treatments- layout of seed processing units.

UNIT IV PADDY PROCESSING 12

Paddy processing- parboiling of paddy-methods-merits and demerits-dehusking of paddy-methods-merits and demerits- rice polishers-types- construction details and adjustments- degree of polishing- layout of modern rice mill- process for making beaten, expanded and puffed rice. Wheat milling processes and equipments - processing of pulses and corn.

UNIT V MILLING & STORAGE 5

Milling equipments- material handling- belt conveyor- screw conveyor and bucket elevators-storage conditions for safe storage- bag and bulk storage- modified and controlled atmosphere storage.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Chakraverty, A., "Post Harvest Technology of Cereals, Pulses and Oilseeds", Oxford and IBH Publishing Company, Calcutta, 1995.
2. Sahay, K.M., and Singh, K.K., "Unit operations of Agricultural Processing", Vikas Publishing House Pvt. Ltd., New Delhi, 1994.

REFERENCE:

1. Mohsenin, N.N., "Physical Properties of Plant and Animal Materials", Gordon and Breach Publishers, New York, 1970.

AI 9030 BIO ENERGY RESOURCE TECHNOLOGY L T P C

3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- 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- parameters affecting gas production- Types of biogas plants- Construction details- operation and maintenance.

UNIT II BIO ENERGY 9

Slurry handling- enrichment and utilization – Bio gas appliances- Bio chemical characteristics of bio resources- Bio energetics –Bio catalysis –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- Anti biotics- enzymes- principles of thermo chemical conversion combustion- pyrolysis- Gasification – types of gasifies.

UNIT V ENERGY AND ENVIRONMENT 9

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

TOTAL: 45 PERIODS

TEXT BOOKS:

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

REFERENCE:

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

AI 9031 COMMERCIAL MICRO IRRIGATION ENGINEERING L T P C

3 0 0 3

OBJECTIVE:

To expose the students to micro engineering and commercial practice of the technologies in agricultural engineering.

UNIT I DRIP IRRIGATION SYSTEM AND DESIGN 9

Modern method of irrigation- Pressure irrigation-Basic principles soil moisture plant relationship-Drip irrigation concept- Drip irrigation advantages limitation – Layout Design main, sub-main and lateral- Selection of material for pipes, emitter selection-Problems on drip irrigation design- Layout planning for agricultural crops.

UNIT II ECONOMICS OF DRIP IRRIGATION 9

PUMP-selection- Cost economics of drip irrigation- Problems based on cost economics-- Basic survey of Drip irrigation systems in field- Installation of drip system.

UNIT III SPRINKLER IRRIGATION SYSTEM 9

Sprinkler irrigation concept- Types of sprinkler- Factors governing efficiency, pipe friction-Factors governing adaptability of sprinkler irrigation.

UNIT IV DESIGN OF SPRINKLER IRRIGATION SYSTEM 9

Design of lateral, main-Design of sprinkler head and installation- Problems on the design of sprinklers-selection pumps for sprinklers- Operation and maintenance of sprinklers.

UNIT V ECONOMICS OF SPRINKLER IRRIGATION 9

Economics of sprinkler irrigation- Problems on economics of sprinklers- Exposure to manufacturing firms- Installation of sprinkler system- Basic survey for sprinkler systems and data analysis- plan preparation- commodities and futures.

TOTAL: 45 PERIODS

TEXTBOOK:

1. Pete Melby, “Simplified Irrigation Design”, John Wiley and Sons, New York, 1995.

AI 9032 DAIRY ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Properties of Milk
- Processing of Milk and Manufacture of dairy products
- Sanitation and effluent treatment in dairy industry

UNIT I PROPERTIES OF MILK 7

Milk-Types-Composition-Physical-Chemical and Thermal Properties-Heat Capacity-Density-Freezing-Boiling point-Expansion-Agitation-Viscosity-Classification of milk-Market and Special Milk Handling-effects of Merits on Milk-toxicity of metals.

UNIT II PROCESSING OF MILK 8

Processing of Milk-Staining-Filtering and Clarification of Milk-cream separation-Pasteurization.-Homogenization-Methods and Equipments-Emulsification-Fortification

UNIT III DAIRY PRODUCTS 10

Manufacture of dairy products-Butter properties-Process involved in Manufacture of butter-Market Grades of butter-Manufacturing of Cheese-Classification-Composition-Methods and Equipment-Ghee Processing-Methods and Equipments-Processing of ice cream-Classification-Composition-Methods and Equipments.

UNIT IV MILK POWDER PROCESSING 8

Condensed Milk-Composition-Properties-Methods and Equipments-Processing of Milk Powder-Properties-Composition-Types-Manufacture of Milk Powder. Drum and Spray driers-Types of atomizers and flow patterns-droplet trajectory of milk.

UNIT V SANITATION AND EFFLUENT TREATMENT 12

Processing of Milk Products-Skim milk-Butter milk-Flavoured Milk, whey, casein, yoghurt and panner.Packaging of Milk and Milk Products-Fillers-Cippers-pouch fillers-Transporation of Milk-Flexible paucher Milk-Storage Tanks-Storage of icecream etc. in freezers-Cleaning and Sanitation-Importance-Detergents-Properties-Cleaning procedures-Cleaning in place-Sanitation-Dairy effluent treatment and disposal.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Ananthakrishnan, C.P., and Sinha, N.N., “Technology and Engineering of Dairy Plant Operations, Laxmi Publications, New Delhi. Pp.319, 1984.
2. Warner, J.N., “Principles of Dairy Processing”, Wiley Eastern Pub. Co., New York, 1975.

REFERENCE:

1. Tufail Ahmed., “Dairy Plant Engineering and Management”, Kitab Mahal Publishers, Allahabad, 1997.

AI 9033 INSTRUMENTATION AND CONTROL ENGINEERING L T P C

3 0 0 3

OBJECTIVE :

Control Engineering serves as an analytical tool to study the behaviour of any system and Instrumentation Engineering provides the necessary information and interface to study the behaviour.

UNIT I PRINCIPLES OF MEASUREMENT AND INSTRUMENTATION 12

General concepts of measurement systems – General performance characteristics – Static- Dynamic characteristics – Errors in measurement – Elements of Transducers – Definition – Classification – Transducers for Sensing – Strain – Displacement – Velocity –Acceleration – Pressure – Flow – Temperature – Humidity – Moisture Content and Electromagnetic Radiation

UNIT II SIGNAL CONDITIONING CIRCUITS AND DATA ACQUISITION 9

Instrumentation Amplifiers – Filters – LP, HP, BR, Active Filters, - Integration and Differentiation – Voltage to Frequency Converters – Frequency to Voltage Converters – A/D and D/A Converters – Data Loggers – Data Analyzers

UNIT III CONTROL SYSTEM REPRESENTATION AND CONTROL COMPONENTS 9

System Concept – Differential Equations – Transfer Functions – System Components – Gyroscope – Synchors - Tachometer - AC and DC Servomotor, Valves – Applications.

UNIT IV TIME DOMAIN AND FREQUENCY DOMAIN ANALYSIS 6

I and II Order Systems – Performance Specifications – Analysis Methods – Stability.

UNIT V CLOSED LOOP CONTROL SYSTEMS 9

Controllers – P, PI, PID - Closed Loop Control – System Application – Speed – level – Pressure – Flow – Bio-systems

TOTAL: 45 PERIODS

TEXT BOOKS :

1. Doebelin, E. O., “Measurement System –Applications and Design”, McGraw Hill Int. Edition, New York, 2002.
2. Gopal, M., “Control Systems: Principles and Design”, Tata Mc Graw Hill, New Delhi, 1997.

REFERENCES:

1. G. S. Ranjan, G. R. Sharma and V. S. V. Mani, “Instrumentation Devices and Systems”, TMH, 1983.
2. A. K. Sawhney, “A Course in Electrical and Electronics Measurement and Instrumentation”, Dhanpat Rai & Co., 2002.
3. Benjamin, C. Kno, “Automatic Control Systems”, Prentice Hall of India, 1995.

AI 9034 MANUFACTURING PROCESSES L T P C

3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Classification of Manufacturing Processes, Rolling Process principles
- Basic components - Principles of operation
- Quality control in Manufacturing Processes

UNIT I ENGINEERING MATERIALS 9

Engineering Materials**,** Wood - uses- structure and grain in wood- seasoning- varieties of timber. Ferrous metals- Cast iron, Steel - applications - Heat treatment of steels. Non-ferrous metals - properties- application-Plastics and Rubber-Classification-Properties-Applications.

UNIT II PRIMARY MANUFACTURING PROCESSES 9

Primary manufacturing Processes**,** Classification of Manufacturing Processes - Casting Process. classification. Principles of different casting techniques; Forging Process advantages - basic forging operations. Rolling Process principles - advantages; Extrusion Process - advantages of extrusion. Press Working of Sheet Metal - bending and drawing.

UNIT III PRINCIPLES OF MANUFACTURING MACHINES 9

Principles of metal cutting Lathe - basic components - Operations on lathe. Drilling machine, Milling machine, Shapers, planners, and slotters - principles of operation ? applications. Grinding, broaching and metal sawing - principles. Jigs and fixtures - uses? - Introduction to computer numeric control (CNC).

UNIT IV WELDING, FINISHING AND MOULDING 9

Classification of common welding processes - advantages - applications - soldering bracing. Surface finishing processes - applications. Moulding of thermoplastics - injection moulding - blow moulding. Quality control - specification - standardisation.

UNIT V SMITHY AND FOUNDRY 9

Smithy - handling of tools - firing the hearth - making `s` hook - triangular link - bullring - chain link - fullering, drawing and necking down - making bolt. Foundry - moulding sand - conditioning - tempering - use of tools - moulding practice using patterns like loose piece pattern, split piece pattern, flat back pattern, sweep pattern and moulding using cores.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Hajra Choudhury, “Elements of Workshop Technology”, Vol.1. Media Promoters and Publishers, Mumbai, 1993.
2. Sharma, P.C., “A Textbook of Production Technology”, S. Chand & Co. Ltd., New Delhi, 1996.

REFERENCE:

1. Haslehurst, M., “Manufacturing Technology”, ELBS, Sevenoaks, Kent, UK, 1990.

AI 9035 UNIT OPERATIONS IN BIO-PROCESSING L T P C
3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Evaporation and Types of evaporators in Agricultural Processing
- Filtration, Sedimentation Fundamentals
- Processing, Characteristics of mixtures and Sieve analysis
- Crystallization and Distillation in processing of Agricultural produce.

UNIT I EVAPORATION 8

Introduction-Unit operations involved in agricultural processing-examples-Conservation of mass and energy-Overall view of an engineering process-Evaporation-Definition-Liquid characteristics-Single and multiple effect-Types of evaporators-Once through and circulation evaporators-Short tube evaporators and long tube evaporators –Agitated film evaporator-Performance of evaporators and boiling point elevation-Single effect evaporator –Multiple effect evaporator-Capacity-Economy and heat balance- Solving problems in single and multiple effect evaporators

UNIT II FILTRATION 7

Filtration-Definition –Filter media-Types and requirements-Constant rate filtration-Constant pressure filtration-Filter cake resistance-Filter equipment-Rotary vacuum filter-Filter process- Solving problems on filtration process.

UNIT III SEDIMENTATION AND SEPARATION 10

Sedimentation-Gravitational sedimentation of particles in a fluid-Stoke's law-Sedimentation of particles in a gas –Cyclones –Settling under combined forces-Centrifugal separations-Rate of separations-Liquid-Liquid separation-Centrifugal equipment-Size reduction –Grinding and cutting-Principles of communition-Characteristics of communited products-Sieve analysis-Particle size determination –Particle size distribution of communited products –Solving problems on size reduction-Particle size distribution and mixing of solids ,liquids and pastes.

UNIT IV PROCESSING 12

Reduction equipment-Crushers-jaw crushers-Gyratory crusher-Construction and operation –Crushing rolls-Grinders-Hammer mills-Rolling compression mills –Construction and operation-Attrition mills –Revolving mills –Rod mills –Ball mills and tube mills –Construction and operation-Mixing of solids, liquids and pastes-Characteristics of mixtures-Mixing-Blending-Emulsification-Crushing efficiency-Energy and power requirements in communition –Rittenger's-Bond's-Kick's laws of crushing-Mixing equipment-Liquid mixers-Mixers for pastes and high viscous masses-Criteria of mixer –Effectiveness-Mixing index-Agitation of liquids-Equipments-Impeller-Propeller-Flow patterns-Mass transfer and diffusion-Examples-Fick's law of molecular diffusion-Equilibrium processes-Properties of tower packing-Types-Construction-Flow through packed towers-Equipment for leaching coarse solids-Intermediate solids –Basket extractor –Extraction of fine material –Dorr agitator-Continuous leaching –Decantation systems-Extraction towers.

UNIT V CRYSTALLISATION AND DISTILLATION 8

Crystallization-Equilibrium –Rate of crystal growth stage-Equilibrium crystallization-Crystallizers-Equipment-Classification- Construction and operation – Crystallizers-Tank-

Agitated batch-Swenson-Walker and Vacuum crystallizers-Distillation-Binary mixtures-Flash and differential distillation-Steam distillation –Theory-Continuous distillation with rectification –Vacuum distillation -Batch distillation-Operation and process-Advantages and limitation-Distillation equipments- Construction and operation-Factors influencing the operation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1.Earle, R.L., "Unit operations in Food Processing", Pergamon Press, Oxford, U.K, Pp.210, 1985.
2. McCabe, W.L., and Smith, J.C., "Unit Operations of Chemical Engineering", Mc-Graw-Hill Inc., Kosaido Printing Ltd., Tokyo, Japan, Pp.1028, 1990.

REFERENCE:

1. Coulson, J.M., and Richardson, J.F., "Chemical Engineering", Vol. 1, The Pergamon Press, New York, Pp.810, 1977.

GI 9030 REMOTE SENSING AND GIS FOR AGRICULTURE AND FORESTRY **L T P C 3 0 0 3**

OBJECTIVES:

This course enables 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

REFERENCES:

1. Srinivas, M.G. (2001). Remote Sensing Applications. Narosa Publishing House, New Delhi. Pp:763.
2. Andrew Rencz. (1999). Manual of Remote Sensing. Vol.3. Edn.3. Remote Sensing for the Earth Sciences. American Society for Photogrammetry and Remote Sensing. John Wiley & Sons, Inc., New York. Pp:707.
3. Jensen, J.R. (2001). Remote Sensing of the Environment – An Earth Resource Perspective. Dorling Kindersley (India) Pvt. Ltd., New Delhi. Pp:492.
4. Agarwal, C.S. and P.K.Garg (2000). Textbook on Remote Sensing in Natural Resources Monitoring and Management. Wheeler Publishing, New Delhi. Pp:196.
5. Narayan, L.R.A. (2001). Remote Sensing and its Applications. Universities Press (India) Ltd., Hyderabad. Pp:215.

AI 9036 AGRICULTURAL BUSINESS MANAGEMENT L T P C

3 0 0 3

OBJECTIVES:

At the end of the course the students would be exposed to fundamental knowledge in

- Importance of Agri. business- management and characteristics
- Principles, Management approaches
- Functional areas of Agri-business, Marketing management
- Product pricing methods, Market potential assessment

UNIT I SCOPE OF AGRICULTURAL BUSINESS 9

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

UNIT II AGRI – BUSINESS ORGANIZATION 9

Principles, forms of agri-business organisations, staffing. Directing - principles, elements, 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. Personnel management. Recruitment, selection and training. Marketing management- Marketing environment, marketing mix. Financial management. Acquiring capital- Budget analysis. Concepts and determinants- Agricultural input marketing firms-types and distribution channels. Management Information System. Concept and applications.

UNIT IV AGRICULTURAL BUSINESS FINANCE 9

Forms of agri-business organizations. Role of lead bank in agribusiness finance. 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

Food products marketing promotion activities - product pricing methods. District Industries Centre - Consumer survey - Market potential assessment - Return on Investment- Agricultural inputs retailing - Human Resource Management.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Chandra Prasanna, “Projects: Preparation, Appraisal, Budgeting and Implementation”, Tata McGraw Hill Publications, New Delhi, 2001.
2. Kenneth, D.D., “Principles of Management in Agri-business”, Reston Publishing Company Inc., Virginia, 1979.

REFERENCES:

1. Hadgets, R.M., “Effective Small Business Management”, Academic Press College and D.F.Kuratko Division, New York, 1986.
2. Kanter Jerome, “Management Information Systems”, Prentice Hall of India Private Limited, New Delhi, 1987.
3. Kotler, P., “Marketing Management. Analysis, Planning and Control”, Prentice Hall Inc., New York, 2001.
4. Massie, J.L., “Essentials of Management”, Prentice Hall of India Private Limited, New Delhi, 1980.
5. Rao, V.S.P., and Narayana, P.S., “Principles and Practices of Management”, Konark Publishing Private Limited, New Delhi, 2001.
6. Tripathy, P.C., and Reddy, P.N., “Principles of Management”, Tata McGraw Hill Publications, New Delhi, 2000.
7. Wills, W. J., “An Introduction to Agri-business Management”, The Interstate Printers and Publishers, New York, 1979.

CE 9401 PRINCIPLES OF MANAGEMENT L T P C

3 0 0 3

OBJECTIVE:

To introduce the basic concepts of management needed for an Agricultural Engineer

UNIT I BASIC CONCEPTS IN MANAGEMENT 9

Types of business operations -Sole proprietorship – Partnership – Company – Public and private sector enterprises / Joint ventures, collaborations.

Functions of Management -Principles of management – Functions of management – Functions of a manager.

Production Management -Planning – scheduling – procurement – Inventory control – management tools – L.P. – PERT, CPM, etc.

UNIT II INTRODUCTION TO MARKETING AND FINANCIAL MANAGEMENT 9

Market – Marketing, Segmentation, Positioning, Marketing Research, Market Planning, Scope of financial management – Cost accounting Vs Financial accounting, Appraisal of projects, Investment decisions – concept of pay back.

UNIT III MATERIALS AND EQUIPMENT MANAGEMENT 9

Planning – Identification, Procurement, Schedule and Cost control – systems approach in resource management – ABC analysis, VED analysis, FSN analysis, vendor rating evaluation, buying versus leasing of equipment

UNIT IV HUMAN RESOURCE MANAGEMENT 9

Scope and objectives of HRM – Man power policy and planning – Recruitment and selection – Training performance appraisal – Wage policy and compensation systems – Company union relationship and collective bargaining – Accidents – Absenteeism and turn over – Grievances / conflicts – Identification and resolution.

UNIT V INTRODUCTION TO COMPUTER APPLICATION IN CONSTRUCTION MANAGEMENT 9

Planning – Scheduling and Resource analysis - Recording and operations- Project accounting, costing and finance – usage of project management software.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Konni, Donnel C.O., and Weighnrich, H., “Management” Eighth Edition, McGraw Hill International Book Company, New York, 1997.
2. Philip Kotler, “Marketing Management”, Prentice-Hall of India, New Delhi, 1998.

REFERENCES:

1. Momoria, “Personnel Management”, Himalaya Publishing Co., New Delhi, 1992.
2. Sharma, J.L., “Construction Management and Accounts”, Sathya Prakashan, New Delhi, 1994.
4. Srinath, L.S., “An Introduction to Project Management”, Tata McGraw Hill Publications, New Delhi, 1995.

MA 9267 STATISTICS AND LINEAR PROGRAMMING L T P C
3 1 0 4

AIM:

Probability and statistics appear explicitly or implicitly in many disciplines including computer and information sciences, economics, biology, operations research and all branches of engineering, linear programming is a mathematical technique designed to assist an organization in allocating its limited resources. This course aims at providing necessary tools for solving engineering and management problems.

OBJECTIVES:

At the end of the course, the student would

- Have a fundamental knowledge of the basic probability concepts.
- Have a well – founded knowledge of standard distributions, which can describe real life phenomena.
- Be introduced to the notation of sampling distribution and would have acquired a knowledge of statistical techniques useful in making rational decision in management problems.
- Be able to identify and mathematically formulate allocation problems involving linear objective functions and linear constraints and be able to obtain the optimal solution.
- Have acquired an ability to solve certain class of allocation problems, which can be modeled as a Transportation or Assignment problems.

UNIT I PROBABILITY AND RANDOM VARIABLE 12

Axioms of probability – Conditional probability – Total probability – Baye's Theorem – Random variables – Discrete and Continuous.

UNIT II STANDARD DISTRIBUTION 12

Binominal, Poisson, Geometric, Uniform, Normal, Exponential and Gamma distributions – Expectations – Variance – Moments – Moment generating function and their properties.

UNIT III TESTING HYPOTHESIS 12

Statistical hypothesis – General concepts – Test of hypothesis for mean, difference of mean, variance, ratio of variance, independence of attributes and goodness of fit using Normal, t, Chi-Square and F distributions.

UNIT IV DESIGN OF EXPERIMENTS 12

Analysis of variance – one-way classification – Completely randomized design – Two-way classification – Randomized block design – Latin square design.

UNIT V LINEAR PROGRAMMING 12

Formulation of linear programming problem – Graphical solution – Simplex algorithm – Transportation and assignment models.

L:45+ T:15 TOTAL: 60 PERIODS

TEXT BOOKS:

1. Walpole, R. E., Myers, R.H., Myers, S.L., and Ye, K., "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearson Education, Delhi, 2002.
2. Taha, H.A., "Operation Research –An Introduction", Seventh Edition, Pearson Education Edition Asia, New Delhi, 2002.

REFERENCES:

1. Johnson, R.A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000.
2. Manmohan, P.K., and Gupta, S.C. "Operation Research", Ninth Edition, Sultan Chand & Co., Delhi, 2001.

ME 9355 HEAT AND MASS TRANSFER L T P C
3 0 0 3

OBJECTIVES:

- The course is intended to build up necessary background for the understanding of the physical behavior of the various modes of heat transfer, like, conduction, convection and radiation.
- To understand the application of various experimental heat transfer correlations in engineering calculations.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

UNIT I CONDUCTION 11

Basic concepts – Mechanism of heat transfer – Conduction, convection and radiation – General differential equation of heat conduction – Fourier law of conduction – Cartesian and cylindrical coordinates – one dimensional steady state heat conduction – Conduction through plane walls, cylinders and spherical systems – Composite systems – Conduction with internal heat generation – Extended surfaces – Unsteady heat conduction – Lumped analysis – Use of Heislers chart.

UNIT II CONVECTION 10

Basic concepts – Convective heat transfer coefficients – Boundary Layer concept – Types of convection – Forced convection – Dimensional analysis – External flow – Flow over plates, Cylinders and spheres – Internal flow – Laminar and turbulent flow – Combined Laminar and turbulent flow – Flow over bank of tubes – Free convection - Dimensional analysis – Flow over vertical plates, horizontal plate, inclined plate, cylinders and spheres.

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS 9

Nusselts theory of condensation – Pool boiling, flow boiling, correlations in boiling and condensation, types of heat exchangers – LMTD method of heat exchanger analysis – Overall heat transfer coefficient – Fouling Factors.

UNIT IV RADIATION 8

Basic concepts, law of radiation – Stefan Boltsmann law, Kirchoff law – Block body radiation – Grey body radiation shape factor algebra – Electrical analogy – Radiation shields – introduction to gas radiation.

UNIT V MASS TRANSFER 7

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: 45 PERIODS

TEXT BOOKS:

1. Sachdeva, R.C., "Fundamentals of Engineering Heat and Mass Transfer", New Age International, New Delhi, 1995.
2. Yadav, R., "Heat and Mass Transfer", Central Publishing House, New Delhi**,** 1995.

REFERENCES:

1. Ozisik, M.H., "Heat Transfer", McGraw Hill Book Co., New York, 1994.
2. Nag, P.K., "Heat Transfer", Tata McGraw Hill Book Co., New Delhi**,** 2002.
3. Holman, J.P., Heat and Mass transfer, Tata McGraw Hill Book Co., New York, 2002.
4. Kothandaraman, C.P., "Fundamentals of Engineering Heat and Mass Transfer", New Age International, New Delhi, 1998.
5. Incropera, F. P., and Dewitt, D. P., "Fundamentals of Engineering Heat and Mass Transfer", John Wiley and Sons, New York, 1998.
6. Velraj, R., "Heat & Mass Transfer", Ane Books, New Delhi, 2004.

GE 9075 INTELLECTUAL PROPERTY RIGHTS (IPR) L T P C

3 0 0 3

UNIT I 5

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i). Movable Property ii. Immovable Property and iii. Intellectual Property.

UNIT II 10

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

UNIT III 10

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV **10**

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V **10**

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Subbaram N.R. " Handbook of Indian Patent Law and Practice ", S. Viswanathan Printers and Publishers Pvt. Ltd., 1998.

REFERENCES:

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707_gibbs.html.]

GE 9072 INDIAN CONSTITUTION AND SOCIETY **L T P C**
3 0 0 3

UNIT I **9**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II **9**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III **9**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV **9**

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

UNIT V **9**

Society : Nature, Meaning and definition; Indian Social Structure; Castle, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, " Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

GE 9073 CONTRACT LAWS AND REGULATIONS L T P C

3 0 0 3

UNIT I CONSTRUCTION CONTRACTS **10**

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts

UNIT II TENDERS **10**

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Transparency in Tenders Act.

UNIT III ARBITRATION **05**

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs

UNIT IV LEGAL REQUIREMENTS **10**

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning –

Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations

UNIT V LABOUR REGULATIONS 10

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws

TOTAL: 45 PERIODS

REFERENCES:

1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M.Tripathi Private Ltd., Bombay, 1982
2. Tamilnadu PWD Code, 1986
3. Jimmie Hinze, Construction Contracts, Second Edition, McGraw Hill, 2001
4. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, Sixth Edition, McGraw Hill, 2000.

GE 9022 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 under 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 manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA 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 – Cost of Quality – Performance measures.

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 – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL: 45 PERIODS

TEXT BOOK

1. Dale H.Besterfiled, et at., "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, 3rd 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.

GE 9021 PROFESSIONAL ETHICS IN ENGINEERING L T P C

3 0 0 3

AIM

To sensitize the engineering students on blending both technical and ethical responsibilities.

OBJECTIVES

- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one's own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I 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 – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk – Assessment of Safety and Risk – Risk Analysis – Reducing Risk – The Government Regulator's Approach to Risk - l Case Studies Chernoby and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS 9

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 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)