Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

New Scheme Based On AICTE Flexible Curricula

BT401	**Mathematics-III**	**3L-1T-0P**	**4 Credits**

Course Objective: The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

- To introduce effective mathematical tools for the Numerical Solutions algebraic and transcendental equations.
- To enable young technocrats to acquire mathematical knowledge to understand Laplace transformation, Inverse Laplace transform ation and Fourier Transform which are used in various branches of engineering.
- To acquaint the student with mathematical tools available in Statistics needed in various field of science and engineering.

Unit I Numerical Methods – 1

Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Unit II Numerical Methods – 2

Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Unit III Numerical Methods – 3

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator -corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender -Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Unit IV Transform Calculus

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Unit V Concept of Probability

Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponenti al Distribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Met hods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, IV-Semester

AN402 Soil Mechanics

Course Objective: Describe the fundamentals of soil mechanics and to equip the students to understand the properties and behavior of soil for the design of foundations, earth and earth retaining structures.

Unit I

Nature of soil and functional relationships: Formation of soils - Soil type - 3 phase system -void ratio - specific gravity - dry density - porosity - water content - saturated unit weight -submerged unit weight - degree of saturation – Soil Structure: single grained, honey combed,flocculated and dispersed structure and their effects on the basic soil properties.

Laboratory and field identification of soils: Determination of water content by oven drying– Specific gravity using pycnometer and specific gravity bottle - Grain size analysis by sieve analysis, hydrometer analysis and pipette analysis - Atterberg limits and indices – Visualidentification by simple field tests – Field density by core cutter, sand replacement and wax coating methods

Classification of soils: Necessity - Principles of classification - I.S. classification – Plasticity charts – Group index.

Unit II

Soil water: Modes of occurrence – adsorbed and capillary water types - Total stress -Effective stress – Pore pressure - Pressure diagrams.

Permeability: Definition - Darcy's law - Factors affecting permeability – Laboratory determination - Stratified soils: average permeability.

Shear Strength: Definition - Mohr's strength and stress circles - origin of planes - Mohr's envelope - Mohr- Coulomb strength theory –Direct shear test – introduction to triaxial shear test- Measurement of pore pressure -Total and effective stressstrength parameters - UCC test - Vane shear tests - Choice of test conditions for fieldproblems.

Unit III

Consolidation: Definition –Spring analogy for primary consolidation - Terzaghi's theory of one dimensional consolidation – Concepts of coefficient of compressibility - Coefficient ofvolume change and compression index – Laboratory consolidation test - e-log p curves – pre-consolidation pressure - Time rate of consolidation - difference between consolidation andcompaction.

Compaction: Definition and objectives of compaction – Standard and Modified Proctor tests- Concept of OMC and maximum dry density - Zero air voids line - Factors influencingcompaction - Effect of compaction on soil properties - Field compaction methods – Proctorneedle for field control.

Unit IV

Earth pressure: Earth pressure at rest - Active and passive earth pressure for cohesionlessand cohesive soils - Rankine's and Coulomb's theories - Point of application of earth pressure
for cases of with and without surcharge in cohesionless and cohesive soils - Culmann's and Rebhan's graphical construction for active earth pressure-

Stability of slopes: Slope failure, base failure and toe failure - Swedish circle method – $\Phi = 0$analysis and $c = 0$ analysis - Friction circle method - Taylor's stability number –Stabilitycharts.

Practicals:

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

Course Outcome: Student understand the fundamentals of soil mechanics and able to understand the basic, index and engineering properties of soil and also understand the properties and behavior of soil for the design of foundations, earth and earth retaining structures.

References:

1. Arora K. R., *Soil Mechanics & Foundation Engineering*, Standard Publications, 1987. Murthy V. N. S., *Soil Mechanics & Foundation Engineering*, DhanpatRai, 1996 Punmia B. C., *Soil Mechanics & Foundations*, Laxmi Publications, 1988
2. Cudoto, Geotechnical Engineering Principles and Practices, Pearson Education, 2007 Gopal Ranjan & Rao A. S. R., Basic & Applied Soil Mechanics, New Age International Publishers, 2000
3. Khan I.H., Text Book of Geotechnical Engineering, Prentice Hall of India
4. Terzaghi K. & Peck R.B., Soil Mechanics in Engineering Practice, John Wiley & Sons, US, 1967.
5. Venkatramiah C., Geotechnical Engineering, New Age International Publishers, 2006

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, IV-Semester

AN403 Farm Machinery & Equipment-I

Course Objective: To familiarize the students with the relevance of farm machinery and its economic analysis and to impart knowledge about the various implements for primary, secondary tillage, seeding and planting, its components, construction, working and force analysis.

Unit I

Introduction to farm mechanization – Scope, Merits, Limitations, Status of mechanization in the country and state - History of farm mechanization - Research and developments in farm machinery - Classification of farm machines based on operation, power source, in relation to power unit etc. - Unit operation in crop production and related implements / machines - Power units / sources for farm machinery / implements, hitching systems and controls on farm machinery - Field capacities, field efficiency, different ploughing methods - Calculation of field capacity and field efficiency - Economics of machinery usage, fixed cost, variable cost - Methods for calculating depreciation - Estimation of cost of operation - Break even analysis – small, large and own, hired machine - Economic considerations in selection of farm implements and machinery.

Unit II

Land reclamation and earth moving equipment - Seed bed preparation operations and its classification - Concepts of deep tillage, rotary tillage and minimum tillage - Introduction to machines / implements used for primary and secondary tillage operations - Mould-board plough, disc plough: Functional components, type, constructional details, accessories and attachments - Chisel plough, sub-soiler: Functional components, type, constructional details, accessories and attachments - Horizontal suction, Vertical Suction of MB plough and Disc geometry of disc plough - Forces acting on tillage implements- Draft measurement of tillage implements and calculation of power requirement for the tillage implements - Study of cultivator - Study of harrows - Study of rotary tillers - Study of leveling and puddling implements.

Unit III

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

Unit IV

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

Practicals:

1. Familiarization with different farm implements and tools
2. Familiarization with different farm implements and tools
3. Study on hitching systems
4. Estimating field capacities, field efficiencies and related problems
5. Calculation of cost of operation of farm implements and machinery
6. Problems on selection of farm machinery – economic considerations
7. Study of MB plough
8. Study of Disc plough

9. Calculations of power and draft requirements
10. Study of secondary tillage implements
11. Measurement of draft
12. Study on seed drill
13. Study on planters
14. Study on transplanters
15. Calibration of seed drill
16. Identification of materials of construction in agricultural machinery and study of material properties
17. Study of heat treatment processes subjected to critical components of agricultural machinery

Course Outcome: The students will understand different farm machines/tools used in primary, secondary tillage operations along with their principle of operation

References:

1. Kepner R.A., Bainer R & Berger EL., 1978, Principles of Farm machinery, AVI Publ. Co.
2. Michael A M and Ojha, T.P. Principles of Agricultural Engineering. Jain Brothers 873, East Park Road, Karol Bagh, New Delhi.
3. C P Nakra, Farm Machines and Equipments, DhanpatRai Publishing Company Pvt. Ltd., 4787/23, Ansari Road, Dariyaganj, New Delhi.
4. Jain S C, Philip Grace, Farm Machinery – An approach. Standard Publishers and Distributors, 1705-B, NaiSarak, Post Box No.1066, New Delhi-110006.
5. RadheyLal and A.C.Dutta, Agricultural Engineering (Through Worked out examples), SarojPrakakshan, 646 Katra, Allahabad-2.
6. Sahay J. Elements of Agricultural Engineering. Irshad Ali, Kitab Mahal, Sarojini Naidu Marg, Allahabad.
7. Srivastav AC. 2001. Elements of Farm Machinery. Oxford & IBH 9. Bhattacharya T K. A Work Book of Practical Farm Machinery (Vol.I& II) Saroj Prakashan, Allahabad-211002.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, IV-Semester

AN404 Irrigation Engineering

Course Objective: To acquaint and equip the students with the basic principles of Soil-Plant Water relations and their interactions and to develop competency to design water conveyance systems and surface irrigation systems in the field.

Unit I

Water resources utilization & Irrigation development, Major and medium irrigation schemes of India, purpose of irrigation, environmental impact of irrigation projects, source of irrigation water, measurement of irrigation water: weir, flumes, orifices and other methods;

Unit II

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

Unit III

Soil water plant relationship: soil properties influencing irrigation management, soil water movement, infiltration, soil water potential, soil moisture characteristics, soil moisture constants, measurement of soil moisture, moisture stress and plant response; water requirement of crops: concept of evapotranspiration (ET), measurement and estimation of ET.

Unit IV

Irrigation requirement of crops, depth of irrigation, frequency of irrigation, irrigation efficiencies Surface methods of water application: border, check basin and furrow irrigation
adaptability, specification and design considerations.

Practicals:

1. Measurement of soil moisture by different soil moisture measuring instruments;
2. Measurement of irrigation water;
3. Measurement of infiltration characteristics;
4. Determination of bulk density,
5. Determination of Field capacity and wilting point;
6. Estimation of evapotranspiration-Direct methods.
7. Estimation of evapotranspiration-In Direct methods.
8. Land grading exercises
9. Design of underground pipeline system;
10. Estimation of irrigation efficiency;
11. Study of advance, recession and computation of infiltration opportunity time;
12. Infiltration by inflow-outflow method;
13. Evaluation of border irrigation method;
14. Evaluation of furrow irrigation method; Evaluation of check basin irrigation method.

Course Outcome: By the end of the semester, the students will understand the basic principles of Soil-Plant Water relations and their interactions and to able to design water conveyance systems and surface irrigation systems in the field.

References:

1. Allen R. G., L. S. Pereira, D. Raes, M. Smith. 1998. Crop Evapotranspiration guidelines for computing crop water requirement. Irrigation and drainage Paper 56, FAO of United Nations, Rome.
2. Israelsen O.W, Hansen V. E and Stringham G. E. 1980.Irrigation Principles and Practice, John Wiley & Sons, Inc. USA.
3. MajumdarD. K.2013. Irrigation Water Management Principles.PHI learning Private Limited New Delhi 2nd Edition.
4. Michael A.M. 2012. Irrigation: Theory and Practice. Vikas Publishing House New Delhi.
5. Murthy VVN. 2013. Land and Water Management Engineering. Kalyani Publishers, New Delhi.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, IV-Semester

AN405 Agriculture Production Technology –II

Course Objective: The course introduces students to package of practices of crop production and environmental issues related to sustainable agro-ecosystems management.

Unit I

Concept of Mono-cropping, Double cropping, Multiple cropping, Sequential cropping, Intercropping, Mixed cropping, Alley cropping, Relay cropping, Cropping intensity, Land equivalent ratio.

Unit II

Environmental Issues and their Impact on Agriculture: Global climate change, emission of green house gases from Indian agriculture, different indices for environmental monitoring such as- Air quality index (AQI), Biocide residue index (BRI), Ecological footprint, Environmental sustainability index (ESI), Environmental performance index (EPI), Environmental vulnerability index (EVI), Global warming potential (GWP), *P* index, *T* value (Soil loss tolerance), Soil quality indicator (SQI), Soil sustainability index (SSI), Soil threat index (STI), Sustainable yield index (SYI), Water quality index (WQI) etc.

Unit III

Concept of organic farming, its objectives and promotion, certification and inspection regime, niche areas and crops for organic farming, myth and concerns.

Unit IV

Agronomic package of practices for cultivation of major pulses oil seed and fodder crops, highlighting Scientific name, family, origin, climatic requirement, sowing time, land preparation, seed rate, sowing methods, Important varieties, fertilizer requirement, water requirement, inter-culture operations, plant protection measures, harvesting etc.

Practicals:

1. Identification of major pulse, oil seed and fodder crops and their phenotypic differences
2. Identification of major weeds of these crops,
3. Composting techniques,
4. Measurement protocols of green house gases,
5. Visits to farms engaged in organic farming

Course outcomes: After successful completion of course, students are expected to possess basic understanding and knowledge about the package of practices for the production of important pulse, oil seed and fodder crops, different types of cropping, recycling of rural wastes and protocols of GHGs measurements.

References:

1. Annonymus: Latest edition of *Handbook of Agriculture* published by Directorate of Knowledge Management in Agriculture, ICAR New Delhi.
2. Principles of Plant Nutrition by Konrad Mengel and Ernest A. Kirkby.
3. Textbook of Field Crop Production by Rajendra Prasad.
4. Introduction to Agronomy & Principles of Crop Production by S.R.Reddy.
5. Principles of Agronomy by T.Y.Reddy and G.H.S.Reddy

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Agriculture Engineering, IV-Semester

AN406 Computer Programming (C Language)

C language alphabet set, identifiers, Variables and constants Data types, Builtin and user Defined Data types Arrays operators and expressions Simple assignment and Input-output statements, preprocessor directives writing simple 'C' programs, compiling and executing 'C' Programs.

Conditional statements and loops: IF statement IF–ELSE statement, SWITCH statement, FOR statement, WHILE and Do WHILE statement.

Function: Function declaration or prototype. Function definition, function calling: call by value, call by reference, Recursion.

Introduction to pointers, File processing: concept of files, file opening, editing, reading and writing.

References:

1. Programming in ANSI C, by Balagurusamy, Tata McGraw Hill
2. The C programming Language. By Brian W. Kernighan and Dennis M. Ritchie. Published by Prentice-Hall
3. Let us C by Y.Kanetkar, BPB Publication

Lab assignments :

1. Design and execute a 'C' program for multiplying two nXn matrics.
2. Design a 'C' program to calculate Average of 'n' numbers.
3. Design a 'C' program to add two numbers using call by value parameter passing mechanism.
4. Design a 'C' program to swap the contents of two variables using call by reference parameter passing mechanism.
5. Design a 'C' program to open a file and add contents to modify the file.