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**

OBJECTIVES: 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 transformation 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.

Module 1: Numerical Methods – 1: (8 hours): 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.

Module 2: Numerical Methods – 2: (6 hours): 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.,

Module 3: Numerical Methods – 3: (10 hours): 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.

Module 4: Transform Calculus: (8 hours): 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.

Module 5: Concept of Probability: (8 hours): Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, 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 Technology, IV-Semester

AT402 Soil Technology –II

Course objectives: : The course introduces students to advance knowledge related to the management of soil health and improvement of soil fertility for higher crop production.

UNIT I

Soil as a source of plant nutrients; Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil; Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants; Measures to overcome deficiencies and toxicities

UNIT II

Problem soils-acid, salt affected and calcareous soils, characteristics, nutrient availabilities; Reclamation-mechanical, chemical and biological methods.

UNIT III

Movement of soil water - Saturated and unsaturated flow of water, Poiseuille's law, Darcy's law; Hydraulic conductivity, permeability and fluidity, hydraulic diffusivity; Infiltration, Percolation, Permeability, Drainage; Solute transport, movement of chemicals in soil-root continuum; Quality of irrigation water and its appraisal.

UNIT IV

Soil fertility-Different approaches for soil fertility evaluation; Methods, soil testing-Chemical methods, critical levels of different nutrients in soil; Soil test based fertilizer recommendation to crops; Factors influencing nutrient use efficiency (NUE) in respect of N,P,K,S, Fe and Zn fertilizer; Source, method and scheduling of nutrients for different soils and crops grown under rainfed and irrigated conditions.

Practicals:

1. Principles of analytical Instruments and their calibration and applications,
2. Colorimetry and flame photometry;
3. Estimation of cation exchange capacity;
4. Estimation of available N, P, K, S and Zn in soils;
5. Preparation of interpretative reports of soil analysis and fertilizer recommendation;
6. Lime requirement and gypsum requirement of problem soils;
7. Evaluation of liquid and plastic limits;
8. Soil compaction test;
9. Evaluation of water retention characteristics of soil;
10. Measurement of saturated hydraulic conductivity of soil;
11. Measurement of infiltration rate.

Course outcomes : After successful completion of course, students are expected to possess basic understanding and knowledge towards better management of soil fertility to support higher crop production and maintenance of soil health.

References:

1. Soils and soil fertility – C.M. Thomson and F.R. Troeh
2. Soil fertility and fertilizers – S.L.Tisdale, W.L.Nelson, J.D. Beaton and J.L. Havlin
3. Soil Chemistry – Kim H. Tan.

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Agriculture Technology, IV-Semester

AT403 Farm Machinery-I

Course Objective: Students should understand the technological introduction in different farm operations.

UNIT I

Objectives of farm mechanization. Classification of farm machines. Materials of construction & heat treatment. Principles of operation and selection of machines used for production of crops. Field capacities & economics.

UNIT II

Tillage; primary and secondary tillage equipment. Forces acting on tillage tools and their designs. Hitching systems and controls. Draft measurement of tillage equipment

Earth moving equipment - their construction & working principles viz., Bulldozer, Trencher, Elevators etc.;

UNIT III

Sowing, planting & transplanting equipment - their calibration and adjustments. Fertilizer application equipment including farm yard manure applicator.

UNIT IV

Weed control, Inter-culture and Plant protection equipment – weeders (manual, animal and power operated weeders) earthing and inteculture equipment), sprayers and dusters, their calibration, selection, constructional features of different components and adjustments.

UNIT V

Principles & types of cutting mechanisms. Construction & adjustments of shear & impact-type cutting mechanisms. Crop harvesting machinery: mowers, windrowers, reapers, reaper binders, combine harvesters and forage harvesters. Forage chopping & handling equipment. Specialized harvesting equipment such as Maize harvesting & shelling equipment, Root crop harvesting equipment-potato, groundnut etc., Cotton picking & Sugarcane harvesting equipment.

Threshing, threshing principles and different types of threshers. Straw handling equipment such as Straw combines, residue mulcher,etc

.**Practicals:**

1. Introduction to various farm machines, visit to implements shed and research hall;
2. Field capacity and field efficiency measurement for at least two machines/implements;

3. Calibration of seed drills
4. Draft& fuel consumption measurement for different implements
5. Study of sprayers, dusters, measurement of nozzle discharge, field capacity etc.
6. Visit to Agricultural implements manufacturing industry to identify the different types of implements and their use.

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.

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Agriculture Technology, IV-Semester

AT404 Hydrology

Course Objective: Introducing the students about the hydrological cycle, hydrographs and flood routing techniques, so that the students would able to find out the water balance and estimated runoff from a given rainfall event.

UNIT I

Introduction; Hydrologic cycle; Precipitation-forms, Weather systems for precipitation, Characteristics of precipitation in India; Rainfall measurement, rain gauge network, optimum number; Representation of rainfall data-Mass curve, hyetograph, Moving average curve etc; Mean precipitation over an area-Different methods.

UNIT II

Frequency analysis of point rainfall, Calculation of rainfall return period and probability, plotting position; Estimation of missing data, test for consistency of rainfall records; Double mass curve technique; Abstractions from precipitation- interception; Depression storage; infiltration; evaporation; evapo-transpiration - estimation and measurement; Reservoir evaporation-methods of reduction, Infiltration indices.

UNIT III

Geomorphology of watersheds - stream number, stream length, stream area, stream slope and Horton's laws; Runoff - factors affecting, measurement; Runoff characteristics of streams, estimation of peak runoff rate and volume; Rational method, Cook's method, SCS Curve number method.

UNIT IV

Stream flow- measurement of stage and velocity, rating curve, extension of rating curve; Hydrograph; components, Factors affecting the shape of hydrograph, base flow separation, unit hydrograph theory – Assumptions, applications, derivation of unit hydrographs, unit hydrograph of different durations, dimensionless unit hydrograph, distribution hydrograph, synthetic unit hydrograph, uses and limitations of unit hydrograph.

UNIT V

Floods-Terms and definitions, Head water flood control - methods, retards and their location; flood routing – graphical methods of reservoir flood routing; Channel routing-Muskinghum method; Hydrology of dry land areas - drought and its classification; introduction to watershed management and planning.

Practicals:

1. Visit to meteorological observatory to study different types of rain gauges;
2. Exercise on analysis of rainfall data;
3. Exercise on Double mass curve technique;
4. Determination of average depth of rainfall and frequency analysis;
5. Study of stage recorders and current meters;
6. Exercise on estimation of peak runoff rate and runoff volume;
7. Exercises on hydrograph and unit hydrograph;
8. Exercises on flood routing problems.

Course Outcome: By the end of the semester, the students will understand the estimation of runoff and flood routing techniques

References:

1. Chow, V.T. (1964). Hand Book of Applied Hydrology. Mc Graw Hill, New York.
2. Linsley, R.K., Kohler, M.A., and Paulhus, J.L.H. (1984). Hydrology for Engineers. Mc Graw Hill Pub.Co. Japan.
3. McCuen, R. H. (1989). Hydrologic Analysis and Design. Printice Hall.
4. Mutreja, K.N. (1990). Applied Hydrology. Tata Mc Graw Hill Pub. Co., New York.
5. Raghunath, H.M. (2006). Hydrology-Principles, Analysis and design. New age International (P) Ltd.
6. Singh, V. P. (1992). Elementary Hydrology. Prentice Hall India.
7. Subrahmanya, K. (1987). Engineering Hydrology. TataMcGrawHillPub.Co. New Delhi.

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Agriculture Technology, IV-Semester

AT-405 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

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Agriculture Technology, IV-Semester

AT-406 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.

Reference Books :

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.