ENGINEERING MATHEMATICS-II

Subject Code : 14MAT21	IA Marks : 25
Hours/Week : 04	Exam. Hours : 03
Total Hours : 50	Exam. Marks :100

Course Objectives :
To enable students to apply knowledge of Mathe-matics in various engineering fields by making them to learn the following'
- Ordinary differential equations
- Partial differential equations
- Double and triple integration
- Curvilinear co-ordinates
- Laplace transform

Module – 1

Differential equations - 1 :
Linear differential equations with constant coefficients : Solutions of second and higher order differential equations - inverse differential operator method, method of undetermined coefficients and method of variation of parameters.   **10 Hours**

Module – 2

Differential equations - 2 :
Solutions of simultaneous differential equations of first order.
Linear differential equations with variable coefficients : Solution of Cauchy's and Legendre's linear differential equations.
Nonlinear differential equations : Equations solvable for p, equations solvable for y, equations solvable for x, general and singular solutions, Clairauit's equations and equations reducible to Clairauit's form. **10 Hours**

Module – 3

Partial Differential equations :
Formulation of PDE by elimination of arbitrary constants/functions, solution of non-homogeneous PDE by direct integration, solution of homogeneous PDE involving derivative with respect to one independent variable only. Derivation of one dimensional heat and wave equations and their solutions by variable separable method.

Double and triple integrals :

Evaluation of double integrals. Evaluation by changing the order of integration and changing into polar coordinates. Evaluation of triple integrals.

10 Hours

Module – 4

Integral Calculus :

Application of double and triple integrals to find area and volume. Beta and Gamma functions, definitions, Relation between beta and gamma functions and simple problems.

Curvilinear coordinates :

Orthogonal curvilinear coordinates - Definition, unit vectors and scale factors. Expressions for gradient, divergence and curl. Cylindrical and spherical coordinate systems.

10 Hours

Module – 5

Laplace Transform :

Definition and Laplace transforms of elementary functions. Laplace transforms of $e^{at} f(t), t^n f(t) and \frac{f(t)}{t}$ (without proof), periodic functions, unit-step function and Impulse function - problems

Inverse Laplace Transform :

Inverse Laplace Transform - problems, Convolution theorem and problems, solution of linear differential equations using Laplace Transforms.

10 Hours

Course Outcomes :

On completion of this course, students are able to,

- Use ordinary differential equations to model engineering phenomena such as electrical circuits, forced oscillation of mass spring and elementary heat transfer.
- Use partial differential equations to model problems in fluid mechanics, electromagnetic theory and heat transfer.
- Evaluate double and triple integrals to find area , volume, mass and moment of inertia of plane and solid region.
- Use curl and divergence of a vector function in three dimensions, as well as apply the Green's Theorem, Divergence Theorem and Stokes' theorem in various applications like electricity, magnetism and fluid flow.

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- Use Laplace transforms to determine general or complete solutions to linear ODE

Scheme of examination :

- Two full questions (with a maximum of four sub questions) of twenty marks each to be set from each module. Each question should cover all the contents of the respective module.
- Students have to answer five full questions choosing one full question from each module

Text Books :

1. B.S.Grewal, **"Higher Engineering Mathematics"**, Khanna publishers, 42nd edition, 2013.
2. Ervin Kreyszig, **"Advanced Engineering Mathematics"** - Vol-I & II, Wiley, 2013

Reference Books :

1. B.V.Ramana **"Higher Engineering M athematics"** Tata Mc Graw-Hill, 2006
2. N.P.Bali and Manish Goyal,**"A text book of Engineering mathematics"**, Laxmi publications, latest edition
3. H.K.Dass and Er.Rajnish Verma,**"Higher Engineerig Mathematics"**, S.Chand publishing, 1st edition, 2011.

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