Engineering Mathematics-I

Subject Code	:	14MAT11	IA Marks	:	25
Hours/Week	:	04	Exam. Hours	:	03
Total Hours	:	50	Exam. Marks	:	100

Course Objectives

To enable students to apply knowledge of Mathematics in various engineering fields by making them to learn the following:

- n^{th} derivatives of product of two functions and polar curves.
- Partial derivatives, indeterminate form and jacobian.
- Vectors and Curve tracing.
- Reduction formulae; First order differential equations.
- Solution of system of equations and quadratic forms.

Module –1

Differential Calculus -1:

Determination of n^{th} order derivatives of Standard functions - Problems. Leibnitz's theorem (without proof) - problems.

Polar Curves - angle between the radius vector and tangent, angle between two curves, Pedal equation for polar curves. Derivative of arc length - Cartesian, Parametric and Polar forms (without proof) - problems. Curvature and Radius of Curvature – Cartesian, Parametric, Polar and Pedal forms and problems. **10hrs**

Module –2

Differential Calculus -2

Taylor's and Maclaurin's theorems for function of one variable(statement only)- problems. Evaluation of Indeterminate forms.

Partial derivatives – Definition and simple problems, Euler's theorem – problems, total derivatives, partial differentiation of composite functions, Jacobians-definition and problems, extreme values of functions of two variables . **10hrs**

Module –3

Vector Calculus:

Derivative of vector valued functions, Velocity, Acceleration and related problems, Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. Vector identities - div (Φ A), curl (Φ A), curl (grad Φ), div (curl A).

Differentiation under integral sign using Leibnitz rule with constant and variable limits.

Curve Tracing - General rules to trace Cartesian, polar and parametric curves. **10hrs**

Module- 4

Integral Calculus:

Reduction formulae $\int Sin^n xdx, \int Cos^n xdx, \int Sin^m xCos^n xdx$ (m and n are positive integers), evaluation of these integrals with standard limits (0 to $\pi/2$) and problems.

Differential Equations:

Solution of first order and first degree differential equations – Exact, reducible to exact and Bernoulli's differential equations. **Applications**- orthogonal trajectories, Newton's law of cooling, flow of electricity, laws of decay and growth. **10hrs**

Module –5

Linear Algebra

Rank of a matrix by elementary transformations, solution of system of linear equations - Gauss-elimination method, Gauss-Seidel method and L-U decomposition method.

Linear transformation, diagonalisation of a square matrix, Quadratic forms, reduction to Canonical form by orthogonal transformation, Rayleigh's power method to find the largest Eigen value and the corresponding Eigen vector. **10hrs**

Course Outcomes:

On completion of this course, students are able to

- Use partial derivatives to calculate rates of change of multivariate functions.
- Analyze position, velocity, and acceleration in two or three dimensions using the calculus of vector valued functions.
- Trace the curves which are useful in applications of integration in finding the length, area and volume.

- Recognize and solve first-order ordinary differential equations, model simple electrical circuits, projectile motion and Newton's law of cooling and laws of decay and growth, and
- Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra.

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 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. Erwin 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. RajnishVerma, **"Higher Engineerig Mathematics"**, S.Chand publishing, 1st edition, 2011.