

UNIT I: First order ordinary differential equations

Formation of ODE. Solution of separable, homogeneous, exact, linear and Bernoulli linear equations. Applications to Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories and geometrical applications.

UNIT II: Second and higher order ODE with constant coefficients

Solution of second and higher order linear homogeneous differential equations. Non-homogeneous differential equations with RHS term of the type Method of variation of parameters. Applications to bending of beams, electrical circuits, simple harmonic motion.

UNIT III: Laplace transform and its application to ordinary differential equations

Laplace transform of standard functions - inverse Laplace transform - First shifting theorem, Transform of derivatives and integrals - Unit step function - Second shifting theorem - Differentiation and integration of transforms - Dirac's delta function. Convolution theorem - Periodic function - Application of Laplace transforms to ordinary differential equations

UNIT IV: Fourier series

Fourier series on the interval : Determination of coefficients, Fourier series of even and odd functions, convergence. Fourier series on an arbitrary interval. Half range Fourier cosine and sine series using even and odd extensions.

UNIT V: Partial differential equations

Formation of partial differential equations by eliminating arbitrary constants or arbitrary functions. Solutions of first order linear (Lagrange) equation. Solution of nonlinear first order equations (four standard types). Solution using separation of variables. Application to heat equation (one dimension), wave equation (one dimension) and Laplace equation (two dimensions).

TEXT BOOKS:

1. Advanced Engineering Mathematics: R.K. Jain and S.R.K. Iyengar. Narosa Publishing House.
2. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.
3. Higher Engineering Mathematics: B.S. Grewal, Khanna Publications.

REFERENCE BOOKS:

1. Schaum's outline series on Vector Analysis; Laplace Transforms; Differential Equations.