IMA-201: Mathematics –II **L T P**

(B Tech., II Semester) **3 1 0**

Unit –I: Differential Equations:

First order differential equations as mathematical models, Existence and uniqueness of solutions of initial value problems, Solution of linear and nonlinear models, Systems: linear and nonlinear models and their solutions: Solution of higher order linear differential equation with constant coefficients, Solution of second order differential equations by changing dependent and independent variables, Methods of diagonalization, undetermined coefficients and variation of parameters: Cauchy- Euler equations, Nonlinear equations, Linear and nonlinear models, Initial value and boundary value problems, Systems of linear and nonlinear differential equations and models solutions, Introduction to local and global system stability analysis.

Unit –II: Series Solutions and Special Functions:

Ordinary and singular points of an equation, Power series solutions, Frobenius method, Bessel's and Legendre's equations and their series solutions, Properties of Legendre's polynomials and Bessel's functions, Generating functions, Fourier- Bessel series and Fourier-Legendre series expansions, Sturm- Liouville Problem.

Unit –III: Partial Differential Equations and Fourier Series:

Development of partial differential equations and solutions, Solution of first order partial differential equations, Solutions of linear higher order partial differential equations with constant coefficients, Classification of second order partial differential equations.

Orthogonal functions, Fourier series, existence conditions, Fourier series of even and odd functions, Convergence of Fourier series, Fourier half range series, Harmonic analysis, Complex Fourier series and frequency spectrum.

Unit –IV: Laplace Transform:

Laplace transform, Existence conditions and ROC, Inverse Laplace transform, Operational properties, Convolution, Unit step function, Dirac-Delta function, Periodic functions, Applications to solve IVP and BVP: Linear ordinary differential equations, Integral equations, Integro-differential equations, Transfer function and control system analysis.

Unit –V: Modeling and Boundary-Value Problems:

Modeling of heat flow and vibrating string: derivation of heat flow, wave and Laplace equations in rectangular coordinates, Boundary value problems and their solutions by the method of separation of variables, Nonhomogeneous equations and boundary conditions, Orthogonal series expansions, Fourier series in two dimensions, Boundary value problems in polar, cylindrical and spherical coordinate systems and their solutions.

Books Recommended:

1. Dennis G, Zill & Michael R. Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers. 2nd Edition.
2. R. K. Jain & S. R. K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
3. Erwin Kreyszig; Advanced Engineering Mathematics, John Wiley & Sons 8th Edition.