

JSS MAHAVIDYPEETHA

JSS SCIENCE AND TECHNOLOGY UNIVERSITY(SJCE), MYSURU

SYLLABUS FOR Ph.D PROGRAM IN MATHEMATICS

1. Basic Concepts of Real and Complex Analysis: Limits, Continuity, Uniform Continuity, Differentiability, Riemann Integral, Metric space, Sequence and series; Vector differentiation, directional derivatives, gradient, divergence, curl; irrotational and solenoidal vector fields; Algebra of complex numbers, Analytic functions, Power series, Taylor's and Laurent's series, Theory of Residues conformal mapping, bilinear transformation, complex integration, Cauchy's theorem, Cauchy's integral formula.

2. Topics in Algebra: Partially ordered sets, Lattices, Complete Lattices, Distributive lattices, Complements, Boolean algebra, Elements of Graph Theory, Eulerian and Hamiltonian graphs; Group theory; groups, subgroups, normal subgroups, quotient groups, homomorphisms, Automorphisms, Cayley's theorem, permutation groups, Sylow's theorem, Rings and fields, Vector space, Subspace, Linear dependence, Basis, Linear transformation, Algebra of matrices, Rank of matrix, Determinants, Linear equations, eigen values and eigen vectors, Quadratic forms.

3. Differential Equations: First order ODE, singular solutions, initial value problem of first order ODE, and general theory of homogeneous and non-homogeneous linear ODE, variation of parameters. Cauchy's homogeneous linear DE, Legendre's linear DE, Partial differential equations, formation of PDE, Solution of PDE by direct integration, Method of separation of variables.

4. Basic concepts statistics and probability: Measures of dispersion Mean, Mode, median, quartile's, Skewness, kurtosis, curve fitting by least square method, Correlation, Regression analysis. Sample space, discrete probability, simple theorems on probability, independence of events, Bayes Theorem. Discrete and continuous random variables, Binomial, Poisson, Uniform, Exponential, Weibull and Normal distributions; Joint probability distribution.

5. Integral calculus: Reduction formulae, Multiple integrals; Double and Triple integrals and their applications.

Fourier series: Fourier series of an even and odd function, Fourier series for functions having period $2L$, half-range Fourier series, Harmonic analysis.

Laplace transforms: properties, Convolution theorem, Applications of Laplace transform to solve differential equations and Inverse Laplace transforms.

6. Numerical Methods: Roots of algebraic and transcendental equations, Regula-falsi method, Newton-Raphson method. Interpolation techniques, Numerical Differentiation and Integration. Numerical Solution of First order ordinary differential equations. Numerical Methods in linear algebra: Gauss-Seidal & Jacobi's iterative methods. Eigen values and eigen vectors by Rayleigh's power method.

Reference books: 1. Complex Analysis- Lars Ahlfors

2. Topics in Algebra – I. N. Herstein

3. Advanced Engineering Mathematics- Erwin Kreyzig.

4. Linear Algebra- Gilbert Strang, Schaum's Series.

5. Introduction to Probability and Statistics- Schaum's Series.

6. Applied Numerical Methods – Schilling and Harris.