ADVANCED COMPUTATIONAL METHODS

Subject Code : 13BM2101 **L P C**
4 0 3

Course Outcomes:

At the end of the Course, Student will be able to:

CO1 : Discuss several important methods with widespread application for solving large system of equations

CO2 : Appraise the importance of eigen value problems in engineering sciences.

CO3 : Analyze experimental data by fitting a polynomial or estimating the derivative or finding the integrals or performing Fourier analysis.

CO4 : Prepare mathematical model for physical situations and numerically analyze the corresponding ordinary linear/nonlinear, initial/boundary value differential equations.

CO5 : Prepare mathematical model for physical situations and numerically analyze the corresponding partial linear/nonlinear, initial value/ initial boundary value differential equations.

UNIT-I

Linear System of Equations: Gauss elimination method, Triangularization method, Cholesky method, Partition method, Error Analysis for Direct Methods.

Iteration Methods: Jacobi Iteration Method, Gauss Seidel Iteration Method, SOR Method

UNIT-II

Eigenvalue and Eigen Vectors, Bounds on Eigen values, Jacobi Method for symmetric Matrices, Givens Method for Symmetric Matrices, Householders Method, Power Method

UNIT-III

Numerical differentiation: Introduction, Methods based on undetermined coefficients, Optimum choice of step length, Extrapolation Methods, Partial Differentiation

Numerical Integration: Introduction, Open type integration rules, Methods based on undetermined coefficients: Gauss-Legendre, Gauss-Chebyshev, Romberg Integration.

Double integration: Trapezoidal method, Simpson's method.

UNIT-IV

Numerical Solutions of Ordinary Differential Equations (Boundary Value Problem): Introduction, Shooting Method: Linear and Non Linear Second order Differential Equations.

UNIT-V

Numerical Solutions of Partial Differential Equations: Introduction, Finite difference Approximation to Derivatives. Laplace equation-Jacobi method, Gauss Seidel Iteration Method, SOR Method. Parabolic Equations, Iterative methods for Parabolic Equations, Hyperbolic equations.

TEXT BOOKS:

1. M.K. Jain, S.R.K. Iyengar and R.K.Jain, "*Numerical Methods for Scientific and Engineering Computation*", New Age International (P) Limited, Publishers, 4th edition, 2003.

2. S.S. Sastry, "*Introductory Methods of Numerical Analysis*", Prentice Hall India Pvt., Limited, 4th edition, 2009.

REFERENCE:

1. Samuel Daniel Conte, Carl W. De Boor**,** "*Elementary Numerical Analysis: An Algorithm Approach*", 3rd edition, McGraw-Hill, 2005.