AMPR07 NUMERICAL METHODS

UNIT-1 SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

1.1 Solution of algebraic and transcendental equations
1.2 Fixed point iteration method
1.3 Newton Raphson method Solution of linear system of equations
1.4 Gauss elimination method- Pivoting- Gauss Jordan method- Iterative methods of Gauss Jacobi and Gauss Seidel
1.5 Matrix Inversion by Gauss Jordan method- Eigenvalues of a matrix by Power method.

UNIT-2 INTERPOLATION AND APPROXIMATION

2.1 Interpolation with unequal intervals- Lagrange's interpolation
2.2 Newton's divided difference interpolation- Cubic Splines
2.3 Interpolation with equal intervals
2.4 Newton's forward and backward difference formulae.

UNIT-3 NUMERICAL DIFFERENTIATION AND INTEGRATION

3.1 Approximation of derivatives using interpolation polynomials
3.2 Numerical integration using Trapezoidal,
3.3 Simpson's 1/3 rule and Romberg's method
3.4 Two point and three point Gaussian quadrature formulae
3.5 Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT-4 INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

4.1 Single Step methods
4.2 Taylor's series method
4.3 Euler's method - Modified Euler's method
4.4 Fourth order RungeKutta method for solving first order equations
4.5 Multi step methods- Milne's and Adams- Bashforth predictor corrector methods for solving first order equations.

UNIT-5 BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

5.1 Finite difference methods for solving two-point linear boundary value problems
5.2 Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain
5.3 One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods
5.4 One dimensional wave equation by explicit method.

References Books

1. Chapra. S.C. and Canale.R.P. "Numerical Methods for Engineers, Tata McGraw-Hill, New Delhi, 5th Edition, 2007.