

MA6459 NUMERICAL METHODS

DETAILED SYLLABUS

OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

UNIT II INTERPOLATION AND APPROXIMATION

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

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION

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

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

Single Step methods - Taylor's series method - Euler's method - Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne's and Adams- Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

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

TEXT BOOKS:

1. Grewal. B.S., and Grewal. J.S., "Numerical methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi, 2007.
2. Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.

REFERENCES:

1. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5th Edition, New Delhi, 2007.
2. Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi, 2007.
3. Sankara Rao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.