

MA2264 NUMERICAL METHODS L T P C

AIM:

L = 45 T = 15 TOTAL = 60 PERIODS

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES:

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

- I. The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- II. When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- III. The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- IV. Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

Solution of equation –Fixed point iteration: $x=g(x)$ method - Newton's method – Solution of linear system by Gaussian elimination and Gauss-Jordon method– Iterative method - Gauss-Seidel method - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

UNIT II INTERPOLATION AND APPROXIMATION

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulas.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION

Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulae – Double integrals using trapezoidal and Simpsons's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL

EQUATIONS

Single step methods: Taylor series method – Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL

DIFFERENTIAL EQUATIONS

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TEXT BOOKS

1. Veerarjan, T and Ramachandran, T. 'Numerical methods with programming in 'C'
Second Edition, Tata McGraw-Hill Publishing.Co.Ltd. (2007).
2. Sankara Rao K, 'Numerical Methods for Scientists and Engineers' – 3rd edition
Printice Hall of India Private Ltd, New Delhi, (2007).

REFERENCES

1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata
McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P.O., "Applied Numerical Analysis", 6th Edition, Pearson
Education Asia, New Delhi, 2006.
3. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 6th
Edition, Khanna Publishers, New Delhi, 200479