MA 403: Numerical Analysis (3-0-2:4)

Definitions and source of errors, floating point number system, floating point arithmetic.

Iterative method for non-linear equations: bisection method, fixed point iteration schemes, Newton's method, secant method, accelerating convergence, roots of polynomials.

Systems of linear equations: linear algebra review, Gaussian elimination, pivoting strategies, vector and matrix norms, error estimates and condition number, LU decomposition, direct factorization, iterative techniques for linear systems: Jacobi, Gauss Seidel, SORmethods, conjugate gradient method.

Eigenvalues and eigenvectors: power method, inverse power method, deflation, reduction to symmetric tridiagonal form, eigenvalues of symmetric tridiagonal matrices.

Interpolation: Lagrange form of the interpolating polynomial, Newton form of the interpolating polynomial, piecewise linear interpolation, cubic spline interpolation, Hermite interpolation.

Numerical differentiation, Richardson extrapolation, numerical integration-Newton-Cotes quadrature, composite Newton-Cotes quadrature, Gaussian quadrature, adaptive quadrature.

Numeric for ordinary differential equations, single step methods, multi-step methods.

Text Books and References

1. M. K. Jain, S. R. K. Iyengar, and R. K. Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International.
2. M. T. Heath, "Scientific Computing: An Introductory Survey", McGraw-Hill.
3. D. Kincaid and W. Cheney, "Numerical Analysis: Mathematics of Scientific Computing", AMS.
4. B. Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Prentice Hall.
5. G. M. Phillips and P. J. Taylor, "Theory and Applications of Numerical Analysis", Academic Press.