

ST1 C05: STATISTICAL COMPUTATIONAL TECHNIQUES

UNIT I

Solution to algebraic and transcendental equations:- Bisection Method, Iteration method, Regula -falsi method, Newton-Raphson method. Solution to Simultaneous linear equations:- Gauss elimination method, Gauss-Jordan methods, Jacobi's method, Gauss-Seidel method, solution to non-linear equations – Newton Raphson method.

UNIT II

Interpolation - Newtons forward interpolation formula, Lagrange's interpolation formula, Numerical integration- General Quadrature formula, Newton-Cotes formula, Trapezoidal, Simpson's (1/3), Simpson's (3/8) and Weddle's formula, Romberg integration and errors in numerical integration formulas.

UNIT III

Monte Carlo methods, Random Number Generation- Basic principles of Random number generation, inversion method, accept-reject method, Random number generation from Uniform, Exponential, Cauchy, Normal, Beta, Gamma densities, Random number generation from Binomial, Poisson and Geometric.

UNIT IV

Introduction to statistical software R, Data objects in R, Manipulating vectors, matrices, lists, importing of files, data frame, and computations of descriptive statistics measures. R- Graphics- Histogram, Box-plot, Stem and leaf plot, Scatter plot, Plot options; Multiple plots in a single graphic window, frequency table, Plotting of probability distributions and sampling distributions, Controlling Loops- For, repeat, while, if , if else etc. Implementation of numerical methods in unit I, unit II and Unit III using R.

Reference Books:

1. Sastry S.S. (1998) Introductory methods of numerical analysis. Third edition, Printice Hall, New Delhi.
2. Mohanan J.F (2001) Numerical methods of statistics, Cambridge University Press.
3. Srimanta Pal (2009) Numerical Methods- Principles, Analysis and Algorithms. Oxford University Press.
4. Alain F. Zuur, Elena N. Ieno, and Erik Meesters (2009) A Beginner's Guide to R, Springer, ISBN: 978-0-387-93836-3.
5. Michael J. Crawley (2005) Statistics: An Introduction using R, Wiley, ISBN 0-470-02297-3.
6. Phil Spector (2008) Data Manipulation with R, Springer, New York, ISBN 978-0-387-74730-9.
7. Maria L. Rizzo (2008) Statistical computing with R, Chapman & Hall/CRC, Boca Raton, ISBN 1-584-88545-9.
8. Fishman G.S. (1996) Monte Carlo: Concepts, Algorithms, and Applications (Springer).
9. Purohit S.G., Gore S.D. and Deshmukh S.R. (2008) Statistics Using R. Narosa Publishing House, New Delhi.