Subject Code : P8APE1

ELECTIVE COURSE – I
NUMERICAL METHODS AND COMPUTER PROGRAMMING

Unit I Errors and the measurements

General formula for errors – Errors of observation and measurement – Empirical formula – Graphical method – Method of averages – Least square fitting – curve fitting – parabola, exponential.

Unit II Numerical solution of algebraic and transcendental equations

The iteration method – The method of false position – Newton – Raphson method – Convergence and rate of convergence – C program for finding roots using Newton – Raphson method.

Simultaneous linear algebraic equations

Gauss elimination method – Jordon's modification – Gauss–Seidel method of iteration – C program for solution of linear equations.

Unit III Interpolation

Linear interpolation – Lagrange interpolation Gregory – Newton forward and backward interpolation formula – Central difference interpolation formula – Gauss forward and backward interpolation formula – Divided differences – Properties – Newton's interpolation formula for unequal intervals – C programming for Lagrange's interpolation.

Unit IV Numerical differentiation and integration

Newton's forward and backward difference formula to compute derivatives – Numerical integration : the trapezoidal rule, Simpson's rule – Extended Simpson's rule – C program to evaluate integrals using Simpson's and trapezoidal rules.

Unit V Numerical Solutions of ordinary differential equations

N^{th} order ordinary differential equations – Power series approximation – Pointwise method – Solutions of Taylor series – Euler's method – Improved Euler's method – Runge-Kutta method – second and fourth order – Runge-Kutta method for solving first order differential equations – C program for solving ordinary differential equations using RK method.

Books for study and Reference :

1. Introductory Methods of Numerical analysis – S.S. Sastry, Prentice – Hall of India, New Delhi (2003) 3rd Edition.
2. Numerical Methods in Science and Engineering – The National Publishing Co. Madras (2001).
3. Numerical Recipes in C, W.H. Press, B.P.Flannery, S.A.Teukolsky, W.T. Vetterling, Cambridge University (1996).
4. Monte Carlo : Basics, K.P.N. Murthy, ISRP, Kalpakkam, 2000.
5. Numerical Methods in C and C++, Veerarajan, S.Chand, New Delhi (2006).