I Year M.Tech. Chemical Engg., I Semester **L T P TO C**

(CH501) APPLIED NUMERICAL METHODS

Objective of the Course :

Through the course the student will learn to use a variety of numerical techniques/computational methods to solve numerical problems encountered in engineering. Students will be able to make a judicious choice of the best numerical method for a given problem, including choices of algorithms that can take advantage of parallel computer architecture and other powerful tools for solving practical mathematical problems in analysis and design that occur throughout engineering.

UNIT - I

Solution of Simultaneous Linear Algebraic Equations: Introduction, Engineering Applications, Basic Concepts of Solution, Linearly Independent Equations and conditioned equations, Matrix Inversion, Equation with special form of coefficient matrix, Over – determined, Undetermined, and Homogeneous Equations.

UNIT - II

System of Equations: Simultaneous equations in matrix form, consistency of equations, types of solutions, methods of solving simultaneous equations: Giraff'S root square method, determinant method, Tri - Diagonal Matrices, Inverse Matrix, LU Factorization, Cholesky, Jacobi, Pivoting Methods, Iterative Refinement, Linear Programming-Simplex Method.

UNIT - III

Interpolation and Polynomial Approximation: Lagrange polynomial Interpolation and Approximation, Newton Interpolation Polynomial, Hermite Polynomial Interpolation, Legendre Polynomials.

UNIT - IV

Curve Fitting: Least Squares Lines, Least Squares Polynomials, Nonlinear Curve Fitting, Logistic Curve, FFT and Trigonometric Polynomials, Conic Fit, Circle of Curvature.

UNIT - V

Numerical Integration: Midpoint Rule, Newton-Cotes Integration, Trapezoidal Rule for Numerical Integration, Simpson's Rule for Numerical Integration, Simpson's 3/8 Rule for Numerical Integration, Adaptive Simpson's Rule, Gauss-Legendre Quadrature, Cubic Spline Quadrature, Monte Carlo Pi, Monte Carlo Integration, 2D Trapezoidal and Simpson Rules.

TEXT BOOKS:

1. Dr.B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 37th ed.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons,7th ed., 2001.
3. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI Publishers, 4th ed.,
4. Singeresu S.Rao, "Applied Numerical Methods", Pearson Education Inc., Illustrated, 2001.

REFERENCE BOOKS:

1. Santosh K Gupta, "Numerical Methods for Engineering", New Age International Publishers, 1st ed.,
2. M.K.Jain, S.R.K.Iyengar and R.K.Jain, "Numerical Methods for Scientific and Engineering Computation", 5th ed.,New Age International Publication, 2007.