

2012-13

**VVP SIDDHARTHA INSTITUTE OF TECHNOLOGY
(COURSE STRUCTURE FOR AUTONOMOUS SCHEME)**

I Year M. Tech. (Machine Design) M.E.

**T P C
5 0 4**

MEMD1T5A - COMPUTATIONAL METHODS

(Elective I)

Unit – I

Introduction to numerical methods applied to engineering problems: Examples, solving sets of equations – Matrix notation – Determinants and inversion – Iterative methods – Relaxation methods – System of non-linear equations – computer programs

Unit – II

Numerical integration: Newton-Cotes integration formulas – Simpson's rules, Gaussian quadrature. Adaptive integration

Unit – III

Optimization: One dimensional unconstrained optimization, multidimensional unconstrained optimization – direct methods and gradient search methods, constrained optimization

Unit – IV

Boundary value problems and characteristic value problems: Shooting method – Solution through a set of equations – Derivative boundary conditions – Rayleigh – Ritz method – Characteristic value problems.

Unit – V

Numerical solutions of partial differential equations: Laplace's equations – Representations as a difference equation – Iterative methods for Laplace's equations – Poisson equation – Examples – Derivative boundary conditions – Irregular and non-rectangular grids – Matrix patterns, sparseness – ADI method – Finite element method.

Unit – VI

Parabolic partial differential equations: Explicit method – Crank-Nickelson method – Derivative boundary condition – Stability and convergence criteria – Finite element for heat flow – computer programs.

Unit – VII

Hyperbolic partial differential equations: Solving wave equation by finite differences- stability of numerical method – method of characteristics-wave equation in two space dimensions-computer programs.

Unit – VIII

Curve fitting and approximation of functions: Least square approximation fitting of non-linear curves by least squares – regression analysis- multiple linear regression, non linear regression - computer programs.

TEXT BOOKS:

1. Steven C.Chapra, Raymond P.Canale “Numerical Methods for Engineers” Tata Mc-Graw hill
2. Curtis F.Gerald, partick.O.Wheatly,”Applied numerical analysis”Addison-wesley,1989
3. Douglas J.Faires,Riched Burden”Numerical methods”Brooks/cole publishing company,1998.Second edition.

References:

1. Ward cheney &David Kincaid “Numerical mathematics and computing”Brooks/colepublishing company1999,fourth edition.
2. Riley K.F.M.P.Hobson&Bence S.J,” mathematical methods for physics and engineering” Cambridge university press,1999.

