

2012-13

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

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

**T P C
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MEMD1T4 - FINITE ELEMENT METHODS

UNIT - I

Formulation Techniques: Methodology, Engineering problems and governing differential equations, finite elements, Variational methods-potential energy method, Raleigh Ritz method, strong and weak forms, Galerkin and weighted residual methods, calculus of variations, Essential and natural boundary conditions.

UNIT – II

One-dimensional finite element methods: Bar elements, temperature effects. Element matrices, assembling of global stiffness matrix, Application of boundary conditions, Elimination and penalty approaches, solution for displacements, reaction, stresses, temperature effects, Quadratic Element, Heat transfer problems: One-dimensional, conduction and convection problems. Examples: - one dimensional fin.

UNIT – III

Trusses: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses, temperature effects.

UNIT – IV

Beams and Frames: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses.

UNIT - V

Two dimensional problems: CST, LST, four noded and eight noded rectangular elements, Lagrange basis for triangles and rectangles, serendipity interpolation functions. Axisymmetric Problems: Axisymmetric formulations, Element matrices, boundary conditions. Heat Transfer problems: Conduction and convection, examples: - two-dimensional fin.

UNIT – VI

Isoparametric formulation: Concepts, sub parametric, super parametric elements, numerical integration.

UNIT – VII

Finite elements in Structural Dynamics: Dynamic equations, eigen value problems, and their solution methods, simple problems.

UNIT – VIII

Convergence: Requirements for convergence, h-refinement and p-refinement, complete and incomplete interpolation functions, pascal's triangle.

Text Book:

1. Finite element methods by Chandrabatla & Belagonda.

References:

1. J.N. Reddy, Finite element method in Heat transfer and fluid dynamics, CRC press,1994. Zienkiwicz O.C. & R. L. Taylor, Finite Element Method, McGraw-Hill,1983.
2. J. N. Oden, Finite Element of Nonlinear continua, McGraw-Hill, New York, 1971.
3. K. J. Bathe, Finite element procedures, Prentice-Hall, 1996.

