

Objective

To acquaint and equip on the theory and application of the finite element methods for analyzing structural systems and heat transfer problems

UNIT I

Introduction, Historical background, Stresses and Equilibrium, Boundary conditions, Strain-Displacement relations, Stress-Strain relations, Plane stress, Plane strain problems, Discretization and error estimation -.Potential energy method.

UNIT II

Basic concepts: The standard discrete system, Finite elements of an elastic continuum-displacement approach, Generalization of the finite element concepts weighted residual and variational approaches.

UNIT III

Element types: triangular, rectangular, quadrilateral, sector, curved, isoparametric elements and numerical integration. Automatic mesh generation schemes. Application to structural mechanics problems: plane stress and plane strains.

UNIT IV

Asymmetric stress analysis, three dimensional stress analysis, bending of plates. Introduction to the use of FEM in steady state field problems-heat conduction.

UNIT V

Fluid flow and non-linear material problems, plasticity, creep etc. Computer procedures for Finite element analysis.

Suggested Readings

1. J N Reddy, An Introduction To The Finite Element Method, Mcgraw-Hill, New York, 1993. R D Cook, D S Malkus And M E Plesha, Concepts And Applications Of Finite Element Analysis, 3d Ed., John Wiley, New York, 1989.
2. K J Bathe, Finite Element Procedures In Engineering Analysis, Prentice-Hall, Englewood Cliffs, Nj, 1982.
3. T J T Hughes, The Finite Element Method, Prentice-Hall, Englewood Cliffs, Nj, 1986
4. C Zienkiewicz And R L Taylor, The Finite Element Method, 3d Ed. Mcgraw-Hill,1989