

LESSON PLAN
FINITE ELEMENT METHOD (MCE_17102)

Sl No	Syllabus	Details	Lecture Hours
1	Galerkin FE formulation, Methods of Finite element analysis, stiffness method	Residual minimization and Point collocation techniques for solving Governing Differential Equations, Galerkin weighted residual method, Weak formulation, Piece wise continuous formulations, Finite element formulations	06 hrs
2	Potential energy and Rayleigh-Ritz method	Functional and Differential equation forms, Principle of Stationary Total Potential (PSTP), Rayleigh Ritz method, Potential energy based finite element formulations	06 hrs
3	Application of FEM to solve problems of structural mechanics and solid mechanics, heat transfer and fluid flow problems (1-D problems)	General form for the total potential for 1-D, PE and GDE based Finite Element formulations for 1-D problems, Linear bar finite element, Quadratic bar finite element, Linear Beam element, and Linear Frame element, Application to analysis of Truss, Beams and Frame structures, heat transfer problems, fluid flow problems	10 hrs
4	Application of FEM to solve Plane stress & plane strain problems (2-D problems)	3-noded Triangular element, 4-noded rectangular element, six noded triangular element, Natural coordinates and coordinate transformation, Isoparametric formulation, Application to 2D problems.	10 hrs
5	Application of FEM to solve 3-D problems. Torsion, bending of plates and shells. Associated flowcharts and computer programming.	Explanation of the Finite Element Analysis of 3D problems through commercial FE codes using ANSYS Structural 20.0	02 hrs
6	FE formulations for vibrations analysis	Equation of motion based on weak form, Axial vibration of a rod, Transverse vibration of a rod, Equations of motion using Lagrange's approach, Consistent and Lumped Mass matrices, Finite Element formulation	06 hrs
TOTAL HOURS			40 hrs