

Branch Name:	Mechanical Engineering
Semester/Year:	Semester VIII / Forth Year
Subject Title:	Finite Element Analysis
Subject Code:	1ET1010804
Pre-requisite:	Zeal to learn the Subject

Course Objectives:

1. To illustrate the principle of mathematical modeling of engineering problems
2. To introduce the basics and application of Finite Element Method

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	00	02	04	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weightage (%)	
1	Introduction: Historical Background, Basic Concept of Finite Element Methods, Approaches of FEM: Discrete, Variational and Weighted Residual.	08	25	
2	Direct Problems: Spring, Hydraulic Network, Resistance Network and Truss Systems	08	25	
3	1-D Field and Beam Bending Problems: Formulation using Galerkin and Rayleigh-Ritz approaches, Derivation of elemental equations and their assembly, Solution and its post processing.	12	25	
4	2-D and Axisymmetric Field and Stress Problems: Formulation using Galerkin and Rayleigh-Ritz approaches, Derivation of elemental equations and their assembly, Solution and its post processing.	08	15	
5	3-D Field and Stress Problems: Formulation using Galerkin and Rayleigh-Ritz approaches, Derivation of elemental equations and their assembly, Solution and its post processing; Eigen value and time dependent problems; Discussion about preprocessors, postprocessors and finite element packages.	06	10	

Course Outcomes:

The student will be able to

Upon completion of the course, students will understand the FEM formulation and its application to simple structural and thermal problems

List of Reference Books:

1. Reddy J.N., An Introduction to Finite Element Method, 3rd ed., Tata McGraw Hill
2. Seshu P., Text Book of Finite Element Analysis, Prentice Hall, New Delhi

3. Rao S.S., The Finite Element Method in Engineering, 3rd ed., Butterworth Heinemann
4. Chandraputla & Belegundu, Introduction to Finite Elements in Engineering, 3rd ed., Prentice Hall

List of Practical:

1. Introduction to Finite Element Analysis software tool
2. Analysis of 1D – Structural, thermal and fluid problems using FEA software and manually.
3. Analysis of Plane truss problems, using FEA software and manually. Include problems with symmetry.
4. Analysis of Beam problems with different boundary and loading conditions using FEA software and manually.
5. Analysis of at-least two planar problems.
6. Analysis of axisymmetric problems.
7. Analysis of at dynamic problems.

E-Resources:

1. <https://nptel.ac.in/courses/112104116/>