

Course Title	Course Code	Credit Hours
Finite Element Method	AE-461	2-1

Textbook:

- Daryl L. Logan, “A First Course in the Finite Element Method”, Cengage Learning

Reference Book/ Material:

- Robert Davis Cook, “Finite Element Modelling for Stress Analysis”, Wiley
- Software: “MATLAB” and “ANSYS”

Course Objectives:

This course aims to introduce students to Finite Element Methods (FEM) for Structural Analysis, covering Modeling, element types, and fundamental concepts. It includes Static Structural analysis, Heat Transfer, Thermal, and Dynamic Analysis.

Course Outline:

- Introduction to the Finite Element Method
- Introduction to Stiffness Method and its Application in Finite Element Analysis
- Development and Formulation of Truss Equations for One-Dimensional Truss Elements
- Performance, Types, and Convergence of Finite Element Simulations for 2D Elements
- Preliminary Decisions and Sources of Errors in Static Structural Analysis with 3D Elements
- Formulation and Development of Beam Element Equations
- Formulation of Planar Elements for Structural Analysis
- Heat Transfer Analysis: Boundary Conditions and Steady-State Temperature Field Analysis
- Thermal Stress Analysis in the Context of Heat Transfer Problems
- Introduction to Dynamic Analysis and Modal Analysis Techniques
- Detailed Discussion on Stiffness Methods Used in Finite Element Analysis
- Development of Finite Element Equations for Truss Elements and their Applications

- Simulation Exercises Focusing on the Performance and Types of 2D and 3D Elements
- Formulation of Beam Equations and their Implementation in Structural Analysis
- In-Depth Formulation and Application of Planar Elements in Finite Element Modelling
- Analysis of Heat Transfer Problems and Implementation of Boundary Conditions
- Steady-State Temperature Field Analysis and its Implications for Thermal Stress
- Introduction to Modal Analysis and its Role in Dynamic Analysis
- Review of Prerequisites and Fundamental Concepts Relevant to Finite Element Analysis
- Sources of Errors in Static Structural Analysis and their Impact on Results