



IFS ACADEMY

Training For The Future!!

Finite Element Analysis using ANSYS Mechanical APDL & ANSYS Workbench

Course Curriculum (Duration: 120 Hrs.)

Section I: ANSYS Mechanical APDL

Chapter 1: Before you start using ANSYS

- a. Introduction to the Finite Element Method
- b. What is the Finite Element Method?
- c. History
- d. General Steps of the Finite Element Method
- e. Explanation of 1D, 2D and 3D Elements with examples of ANSYS Elements
- f. Need of FEM
- g. Enlisting different FEM methods and detailed explanation of any one
- h. Derivation of stiffness matrix equation
- i. Types of analysis that can be done using ANSYS
- j. Advantages of the Finite Element Method
- k. Limitations of FEA
- l. About ANSYS Inc.
- m. ANSYS Family of products with their capabilities
- n. Introduction to the ANSYS GUI
- o. Operation Modes of ANSYS
- p. Product Launcher
- q. Launcher Tasks
- r. Use Custom Memory Settings
- s. Launcher Menu Options
- t. The ANSYS GUI
- u. The Icon Toolbar Menu
- v. Quitting Ansys

Chapter 2: Selection Logic

- a. Plotting
- b. Pan-Zoom-Rotate
- c. Picking
- d. Coordinate Systems
- e. Select Logic

Chapter 3: Solid Modeling

- a. An Overview of Solid Modeling Operations
- b. Working with Boolean operations
- c. Working Plane
- d. Importing of 3D models

Chapter 4: Meshing

- a. Free meshing or Mapped meshing
- b. Setting Element Attributes
- c. Selecting Element Type
- d. Shape Function
- e. Defining Element Types
- f. Real Constants
- g. Defining Section Properties
- h. Assigning Element Attributes before meshing
- i. Mesh Controls
- j. The ANSYS MeshTool
- k. Smartsizing
- l. Meshing

- m. Free Meshing
- n. Mapped Meshing
- o. Hybrid meshing
- p. Mesh Extrusion
- q. Volume Sweeping

Chapter 5: Material Properties

- a. Material Library
- b. Specifying properties

Chapter 6: Boundary Conditions

- a. Types of Loads
- b. Applying loads

Chapter 7: Solvers

- a. Types of Solvers
- b. Solver Setup
- c. Load Step Options
- d. Solving Multiple Load Steps

Chapter 8: Post-processing

- a. Contour Plot Viewing
- b. Path Operations
- c. Estimating Solution Error
- d. Time History Postprocessor (POST26)
- e. Report Generator

Chapter 9: Static Structural Analysis

- a. Workshops, Exercises and Case Studies

Chapter 10: Modal Analysis

- a. Workshops, Exercises and Case Studies

Chapter 11: Thermal Analysis

- a. Workshops, Exercises and Case Studies

Chapter 12: Introduction to Non-Linear Analysis

Chapter 13: Tips & Tricks

- a. Using the Toolbar & Creating Abbreviations
- b. Introduction to APDL
- c. Using Parameters
- d. Using the Start File
- e. Using the Session Editor
- f. Using Input Files

Chapter 14: Coupling & Constraint Equations

- a. Coupling
- b. Constraint Equations
- c. Workshops

Chapter 15: Beam Modeling

- a. Beam properties
- b. Beam meshing
- c. Loading, Solution & Results

Chapter 16: Macro Basics

- a. Creating a Macro
- b. Macro with Arguments
- c. Branching
- d. Looping
- e. General guidelines
- f. Workshop

Section II: ANSYS Workbench

Chapter 1: Introduction to FEA and ANSYS Workbench

- a. Introduction to the Finite Element Method
- b. What is the Finite Element Method?
- c. History
- d. General Steps of the Finite Element Method
- e. Explanation of 1D, 2D and 3D Elements with examples of ANSYS Elements
- f. Need of FEM
- g. Enlisting different FEM methods and detailed explanation of any one
- h. Derivation of stiffness matrix equation
- i. Types of analysis that can be done using ANSYS
- j. Advantages of the Finite Element Method
- k. Limitations of FEA
- l. ANSYS Workbench Overview
- m. Hosting Applications
- n. Mechanical Overview
- o. Starting Mechanical
- p. The Workbench Environment
- q. The Toolbox
- r. The Project Schematic
- s. Workbench File Management
- t. Working with Units

Chapter 2: DesignModeler

- a. Introduction to DesignModeler
- b. Planes and Sketches
- c. Modeling
- d. Geometry Simplification and Repair
- e. CAD Connections
- f. Parameterization
- g. Beams and Shells
- h. Lines and Surfaces

Chapter 2: Mechanical Basics

- a. Basic Analysis Procedure
- b. The Mechanical Interface
- c. Menus
- d. Toolbars
- e. Graphics Control and Selection
- f. Outline Tree and Details
- g. Graphics Window
- h. The Mechanical Application Wizard
- i. Scoping Loads and Supports
- j. The Engineering Data Application
- k. Workshop

Chapter 3: General Preprocessing

- a. Geometry Branch
- b. Contact
- c. Meshing
- d. Named Selections
- e. Coordinate Systems
- f. Remote Boundary Conditions
- g. Selection Information
- h. Workshop – Mesh Control

Chapter 4: Meshing

- a. Global Meshing Controls
- b. Local Meshing Controls
- c. Meshing Troubleshooting
- d. Virtual Topology
- e. Workshops

Chapter 5: Static Structural Analysis

- a. Basics of Static Structural Analysis
- b. Geometry
- c. Material Properties
- d. Contact
- e. Analysis Settings
- f. Loads
- g. Supports
- h. Nodal Loads and Supports
- i. Solving Models
- j. Results and Postprocessing
- k. Workshops
- l. Case Studies: Any two

Chapter 6: Vibration Analysis

- a. Basics of Free Vibration
- b. Geometry
- c. Contact
- d. Solution Setup
- e. Modal Results
- f. Vibration with Prestress
- g. Workshops
- h. Case Studies: Any two

Chapter 7: Thermal Analysis

- a. Basics Steady State Heat Transfer
- b. Geometry
- c. Material Properties
- d. Thermal Contact
- e. Thermal Boundary Conditions
- f. Solution Options
- g. Results and Postprocessing
- h. Workshops
- i. Case Studies: Any two

Chapter 8: Results and Postprocessing

- a. Viewing Results
- b. Scoping Results
- c. Exporting Results
- d. Coordinates Systems
- e. Solutions Combinations
- f. Stress Singularities
- g. Error Estimation
- h. Convergence
- i. Workshops

Chapter 9: CAD & Parameters

- a. CAD Import
- b. Defining Parameters in Workbench
- c. Using the Parameter Workspace
- d. Updating CAD Parameters
- e. Workshops

Chapter 10: Advanced Named Selection

- a. Named Selection Basics
- b. Direct Named Selections
- c. Criteria Named Selections
- d. Named Selection Summary
- e. Workshops

Chapter 11: Constraint Equations

- a. Constraint Equations

- b. Constraint Equation Worksheet
- c. Workshops
