

# Comprehensive ANSYS Intro Course

## Duration: 5 days

The overall goal is to produce “rational and intelligent usage” by teaching the philosophy and fundamentals of ANSYS Traditional & WB. The systematic integration of the two interfaces will be addressed. FE concepts will also be discussed (averaging, stress convergence, etc.).

The course is intended to give knowledge of the ANSYS product for developing simulation models and performing structural analyses. The concepts can be easily extended to other analysis types. This course is a prerequisite for more advanced courses.

### ANSYS Traditional Portion (2 Days):

- Processors (/PREP7, /SOLU, /POST1, /POST26) + overall philosophy
- Attributes: MAT, REAL, TYPE, SECN, ESYS
- Boundary Conditions
- Load Types (forces, pressures, accel, body temps etc.)
- Coordinate Systems (Global vs. Local)
- Discussion of elements
  - Types (0D, 1D, 2D, 3D) + new generation 18x series
  - Displacement functions (assumed response + limitations)
  - Integration point locations & interpolation/extrapolation
  - Integration schemes (reduced vs. full)
- Solution of Equations
  - $[K][x]=[F]$
  - Linear (i.e. small deflection) vs. Nonlinear analyses
- Post-Processing
  - Discuss results (poisson effect at constraints, comparison with closed form solutions –  $\sigma_x=My/I$ )
- Element averaging (nodal vs. element results) + singularities + stress convergence & mesh density
- Description of analysis types (Static, Modal, Harmonic, Random, Transient)
- APDL overview (review an input deck)
- Online Help Documentation (Guides, Commands, Elements, Theory, etc.) + Customer Portal

## **ANSYS Workbench Portion (2 Days):**

- WB GUI Overview + Philosophy (discuss main differences with Traditional)
- CAD Integration + Parameters (DM)
  - Design Modeler - brief discussion on what it is and what it's for.
  - Supported body types
- Local Coordinate Systems
- Mesh Controls
  - Global Details
  - Methods
  - Sizing (scoped geometry)
  - Refinement
  - Virtual Topology
- Contact:
  - Pair Definitions (automatic generation + manual)
  - Types, behaviors, algorithms etc.
  - How they are interpreted by the ANSYS solver (target vs. contact)
- Worksheets (Sorting, Go-To functionality, Export to Excel, etc.)
- Boundary Conditions and Loading (incl. symmetry, remote forces/disps)
- Solution
  - Environments
  - Options
- Results
  - Scoping
  - Reactions/Probes
  - Accuracy (stress convergence via adaptive refinement)
  - Animations, Export to Excel, Solution Combinations
- Multiple Environments/Models (Duplication)
- Report Generator
- Online Help Documentation + WB Forum

## Functional Integration of the Combined Interfaces (1 Day):

- WB Geometry Based (fully) vs. Geom+FE control
- Information Accessibility
- WB CAD Integration
- WB Multiple Models/Environments for comparative studies
- Sequential Analyses & Initial Conditions (Prestressed modal, thermal, etc.)
- WB Add-On Modules & Programs (DM, DX, Fatigue)
- Supported Capabilities in WB
- ETCONTROL (18x settings and defaults)
- WB Automatic Contact Generation + Options
- Output
- Interfacing Workbench with ANSYS Traditional
  - DM ANSYS Neutral File (ANF) CAD transfer
  - Input File (go through structure in detail) + Named Selections/Components
  - Direct (traditional within WB Environment)
  - Command Snippets (Part, Contact, Solution, & Postprocessing Levels)

The course will include similar tutorials in Workbench and Traditional in order to compare methodologies, strengths, and weaknesses of the two interfaces so that users will be able to choose the best method for future projects.

The final day is also intended to focus on comparing the two methods, and extend the functionality of Workbench through knowledge of ANSYS Traditional. This will provide the tools to combine the two methods and get the versatility of ANSYS Traditional with the productivity of the Workbench interface.