ANSYS Essentials

Target Audience:

This course is designed for civil and structural engineers, engineering students, and professionals who want to enhance their skills in structural analysis using ANSYS. It is ideal for those involved in designing, analyzing, and validating structural components and systems in various engineering projects.

Course Objective:

The objective of this course is to equip participants with a solid understanding of structural analysis principles using ANSYS. Learners will explore the software's tools and workflows to model structures, apply loads and boundary conditions, and interpret results for stress, strain, and deformation analysis.

Course Outcomes:

By the end of the course, participants will be able to confidently perform structural analysis tasks in ANSYS, including static and dynamic simulations, evaluate structural integrity, and optimize designs based on simulation outcomes. They will also be capable of handling real-world structural problems using simulation-driven approaches.

Prerequisites:

Basic knowledge of structural mechanics, strength of materials, and finite element concepts is required. Familiarity with engineering drawing and a working knowledge of computers is also recommended. No prior experience with ANSYS is necessary, though it will be helpful.

Course Outline:

The course comprises **40-hours** of theory and labs and is divided into **10** different chapters. Each chapter will be followed by **hands-on lab exercises** to reinforce learning and gauge understanding of the topics covered.

Chapter 0: INTRODUCTION

- Overview
- The process
- The ansys workbench interface
- The ansys workbench help system
- Summary

Chapter 1 – SOLID MODELING FUNDAMENTALS

- Overview
- Introduction
- Tutorial 1a - extrusion
- Tutorial 1b – revolution
- Tutorial 1c – sweep
- Sketching
- Summary
- Problems

Chapter 2 – PLACED FEATURES, ASSEMBLY

- Overview
- Introduction
- Tutorial 2a - adding a hole to the extrusion
- Tutorial 2b - adding a round to the extrusion
- Tutorial 2c - adding a chamfer to the extrusion
- Tutorial 2d – patterns
- Tutorial 2e – clevis assembly
- Tutorial 2f – alternate solid modeler
- Summary
- Problems

Chapter 3 – MODELING TECHNIQUES

- Overview
- Introduction
- Tutorial 3a – parameters
- Other cad systems

Chapter 7 – HEAT TRANSFER & THERMAL STRESS

- Overview
- Introduction
- Heat transfer
- Tutorial 7a – temperature distribution in a cylinder
- Thermal stress
- Tutorial 7b – uniform temperature change
- Thermal stress
- Tutorial 7c – thermal stress in a cylinder
- Summary
- Problems

Chapter 8 – SURFACE & LINE MODELS

- Overview
- Introduction
- Tutorial 8a – sheet with circular hole – plane stress
- Tutorial 8b – pressure vessel
- Tutorial 8c – bracket
- Tutorial 8d – line-body model
- Summary
- Problems

Chapter 9 – NATURAL FREQUENCIES & BUCKLING LOADS

- Overview
- Introduction
- Tutorial 9a – simply supported beam frequencies
- Tutorial 9b – natural frequencies of a chime
- Tutorial 9c – natural frequencies of an assembly
- Buckling loads
- Tutorial 9d – fixed-free column (flagpole)
- Tutorial 9e – buckling of a pinned-pinned column
- Tutorial 9f – buckling of a built-up structure
- Summary
- Problems

Chapter 10 – NONLINEAR PROBLEMS

- Overview
- Introduction
- Tutorial 10a – cantilever beam
- Tutorial 10b – snap buckling of a cylindrical panel
- Tutorial 10c – elasto-plastic deformation of a beam
- Incompressible mateials
- Tutorial 10d – hyperelastic cylinder
- Summary
- Problems