Structural Analysis

Instructor: Prof. James Miller

Module 1: Basics of Structural Analysis

This module covers the foundational concepts in structural analysis, including types of structures (beams, trusses, frames), load types (dead, live, wind, seismic), and support systems. Students will learn the difference between determinate and indeterminate structures and the essential principles like equilibrium, compatibility, and boundary conditions. It sets the stage for understanding how forces act on structures and how to maintain their integrity.

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Module 2: Determinate Structure Analysis

Focusing on statically determinate structures, this module explains how to analyze simple beams, trusses, and frames. Key tools include shear force and bending moment diagrams, method of joints, and method of sections. Through problem-solving, students gain the skills to evaluate structural performance under various loading conditions.

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Module 3: Indeterminate Structures

This module introduces advanced methods to analyze statically indeterminate structures using the moment distribution method, slope deflection method, and force method. Students explore the impact of redundancy and how to calculate internal forces in over-constrained systems. These techniques are crucial for analyzing real-world structures like multistory buildings and bridges.

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Module 4: Influence Lines and Load Distribution

Students will understand influence lines and their application to moving loads. The module illustrates how loads shift across a structure and how to determine critical positions for maximum internal forces. It is especially useful in the design of bridges and long-span beams.

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Module 5: Structural Analysis Software Tools

The final module introduces software tools such as STAAD.Pro and ETABS. Students learn how to model, simulate, and analyze structures using real-world data. This provides a bridge between theoretical concepts and industry-level practices in structural analysis.

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