CE 329
Structural Analysis

Fall 2008

Objectives — General

- List Course Objectives
- Describe Topical Coverage for Class
- Provide the Formula for Computing your Course Grade
- Meet somebody new!

Objectives — Analysis Fundamentals

- Define the role of analysis in the design of structures
- List the equations of equilibrium for a planar structure
- Compute the resultant and centroid for a system of forces acting on a structure

Objectives — Analysis of Planar, Statically Determinate Structures

- Draw free body diagrams (FBD's) for idealized support conditions
- Solve for support reactions using equilibrium equations
- Define the Principle of Superposition and list the assumptions needed for it to be valid
- Compute the response of a structure with inclined supports and/or forces acting at an angle other than perpendicular to the axis of a member

Objectives — Analysis of Planar, Statically Determinate Structures

- Assess whether a structure is externally stable or unstable
- Identify whether a structure is statically determinate or indeterminate
- Compute the degree of indeterminacy for statically indeterminate structures

Objectives — Truss Analysis

- Summarize the assumptions used to analyze trusses
- Compute the determinacy of a planar truss
- Determine truss member forces using the method of joints
- Identify zero force members

Objectives — Truss Analysis

- Compute truss member forces using the method of sections
- **Recognize** which analysis method is appropriate for a given truss analysis problem

Objectives — Beam Analysis

- Compute internal axial force, shear force, and bending moment distributions in beams
- Draw axial force, shear force, and bending moment diagrams for general beam loading and support conditions
- Develop mathematical relationship between shear and moment along the length of a beam
- Calculate inflection points on a moment diagram

Objectives — Frame Analysis

- Draw axial force, shear force, and bending moment diagrams for general loading and support conditions for a frame

Objectives — Deflections

- Derive the Moment-Area Theorems
- Compute beam deflections using moment-area principles
- List the assumptions and limitations of using the moment-area theorems to compute deflections

Objectives — Deflections

- Compute deflections/rotations for structures with overhangs, hinges, and/or changes in stiffness using the moment-area theorems
- Apply the moment-area theorems to compute deflections/rotations in frames

Objectives — Statically Indeterminate Structures

- Explain why statically indeterminate structures are used for most applications
- Summarize different analysis approaches used to compute the response of statically indeterminate structures
- Apply the Flexibility (Force) Method to compute reactions and internal forces in statically indeterminate structures.

Objectives — Statically Indeterminate Structures (Flexibility Method)

- Define flexibility coefficient, redundant, primary structure
- Describe the procedure for establishing equations of compatibility
- Analyze statically indeterminate structures that are subjected to support settlements

Objectives — Statically Indeterminate Structures (Slope-Deflection)

- Compare/Contrast static indeterminacy and kinematic indeterminacy
- Analyze statically indeterminate structures using the Slope-Deflection Method

Objectives — Statically Indeterminate Structures (Moment Distribution)

- Analyze statically indeterminate structures with simple supports and/or overhangs using the slope-deflection method
- Utilize modified stiffness coefficients to analyze structures with simple supports at their ends
- Apply the slope deflection method to analyze frames that cannot sway

Objectives — Influence Lines

- Describe what Influence Lines represent
- Construct influence lines for *statically determinate* structures
- Determine the positioning of a moving live load to produce the maximum value for a reaction, shear, or moment at a given location

Objectives — Influence Lines

- Construct influence lines for statically determinate structures qualitatively (i.e., without setting up equilibrium equations) using the Muller-Breslau Principle

Objectives — Influence Lines

- Determine the maximum effect (shear, moment, or reaction) at a point due to a series of concentrated loads