Catalog Data: CE 331. Structural Analysis I. Four hours. Prerequisite: ESM 250, Mechanics of Materials. Theory and principles of structural analysis of determinate and indeterminate structures. (ES = 3, ED = 1)

Prerequisites: AEM 250: Mechanics of Materials.

Textbook: none

Course Objectives: Students will learn to analyze the response of typical civil engineering structures to gravity and sidesway loads in the context of the design process. Specifically, students will learn to:

- Calculate the loads on a component (truss, joist or frame) of a typical civil structure
- Calculate the approximate structural response of the component
- Model the structural response of the component on a commercial structural analysis computer program
- Calculate stresses and deflections of the component due to combined dead loads, movable live loads and sidesway loads as specified in typical building codes
- Interpret the analysis results and determine if the component meets code-specified strength and serviceability requirements
- Document the analysis procedure and results in written reports
- Summarize the analysis procedure and results in oral presentations

Course Topics:

- Bar forces in trusses*
- Stability and determinacy of trusses
- Prediction of truss failure loads
- Movable loads and influence diagrams for trusses
- Deflection of trusses
- Loads on joists and frames using tributary area*
- Approx. analysis of trusses using the beam analogy*
- Bending moments in simply-supported beams*
- Design of Trusses using a commercial computer program

- Beam failure modes and associated stresses for wood and steel
- Bending moments in continuous beams by moment distribution*
- Movable loads and influence diagrams for continuous beams
- Bending moments in frames due to gravity loads*
- Bending moments in frames due to sidesway loads*
- Unbraced lengths of joists, girders and columns
- Stability and determinacy of beams and frames
- Deflection of beams and frames
- Design of Beams and Frames using a commercial computer program

Class schedule: Class meets each week three times @ 50 minutes and once @ 3 hours = 5.5 contact hours per week

Contribution of course to meeting professional component: (see Course Objectives above)

Relation of course to program objectives:

Students apply knowledge of mathematics, science and engineering (CE Program Objective 1a) and formulate and solve engineering problems (1c) as they analyze the response of civil structures to typical loads. Students learn the analysis procedures in the context of three three-week design projects. In the design projects, students emulate practicing structural engineers (4b) by working in teams (1b), designing structural components (2), and communicating their design processes in written and oral reports (1e.1, 1e.2). For two of the projects, students measure failure loads versus unbraced lengths and fit an equation to the data (accounting for uncertainty) to predict the failure loads for their designs (1g).

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Instructor Information  
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Grading:
- Quizzes and Exams  55%
- Homework and In-class Assignments  10%
- Projects  30%
- Course notebook  5%

Class Policies:
- A passing grade (70%) on quizzes covering each of the course topics marked with an asterisk is required to pass the course.
- Homework is due at the beginning of class. No late homework will be accepted.
- No makeup exams will be given.
- Students will keep all course material in a 3-ring notebook. The notebook will contain all material from the instructor and all completed student work (including copies of team project reports). Material in the notebook will be organized into four sections separated by labeled tabs. Every page in a section will be numbered and the section will have a table of contents.
  1. Class Notes, including handouts from the instructor
  2. Homework, include the assignment sheet, the student solution, then the solution from the instructor (if provided) for each homework assignment
  3. Quizzes and Exams, include the quiz, student work (if on different pages), then the solution from the instructor (if provided)
  4. Projects, include the project assignment sheet, the project report (students will need to photocopy the report for team assignments so that each student has a copy). Presentations should be documented with PowerPoint slides.
- Students with disabilities should notify the instructor and accommodations will be made.

Class Website:  
richardson.eng.ua.edu/CE_331