CE 537 NONLINEAR STRUCTURAL ANALYSIS

Location: 205 Kearney Hall  
Time: TR 8:30-9:50am

Instructor: Michael H. Scott, Ph.D.  
michael.scott@oregonstate.edu  
Office Hours: TR 1:00-3:00pm in 346 Owen Hall, or by appointment

Credit Hours: 3.0

Prerequisite: CE 585 (Matrix Structural Analysis)

Required Text: None. Handouts will be provided for most topics covered in the class.

Homework: There will be between four and five homework assignments that will involve the development and use of nonlinear structural analysis software along with the assessment and comparison of various nonlinear models and solution methods.

Exams: There will be one in-class midterm exam on a date to be determined. Advance notice of at least a week will be given prior to the midterm. There will be no final exam.

Technical Paper: The majority of work in CE 530 will be on a technical paper that explores in depth one or more of the topics covered in this course. If possible, your technical paper should relate to your graduate research or to a project in another graduate course. Please see the instructor to ensure your technical paper is appropriate for CE 530 or if you would like suggestions for a topic. Milestone deadlines for the technical paper (abstract, rough draft, peer review, final draft) will be announced during class.

Grading: 30% Homework, 30% Midterm exam, 40% Technical paper

Course Website: Course announcements and downloadable materials (handouts, notes, assignments, solutions, etc.) will be available through Blackboard at http://my.oregonstate.edu. Please see the instructor if you are not able to access Blackboard.

Software: We will use MATLAB, OpenSees, and Tcl/Tk. Familiarity with MATLAB is expected via CE 585. OpenSees and Tcl/Tk will be introduced during the course.

Learning Objectives
In completing this course, students must demonstrate the ability to:
1. Analyze the advantages and disadvantages of root-finding algorithms for nonlinear structural simulation.

2. Evaluate the difference between displacement-based and force-based frame elements.

3. Evaluate when to account for large displacements in a nonlinear structural analysis.

4. Analyze time history of static and dynamic structural response.

References


Course Topics

Sources of nonlinear structural response
Root-finding algorithms
Linear equation solvers
One-dimensional plasticity
Steel and concrete constitutive models
Fiber-discretized cross-section models
Material nonlinear beam-column formulations
Numerical integration
Pushover analysis
Large displacement beam-column formulations
Continuation methods
Nonlinear structural dynamics

Academic Integrity: Each student is expected to be honest and ethical in his or her academic work. A full statement of OSU’s policies regarding academic honesty can be found at http://oregonstate.edu/admin/stucon/achon.htm.

Disability Statement: Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 737-4098.