CE 591, Earthquake Engineering

Instructor: Jim Richardson

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Catalog Description
CE 591. Earthquake Engineering. 3 hours. Prerequisite: CE 331 Introduction to Structural Engineering. Analysis of the dynamic response of structures to earthquakes.

Prerequisites
CE 331: Introduction to Structural Engineering

Corequisites
none

Course Objectives
Students will learn to analyze the response of civil structures to earthquake loads.

Course Website
richardson.eng.ua.edu/EQ_Eng

Required Texts and References

Suggested Texts and References
none

Grading
Exams 75%
Homework, In-class Assignments & Course Notebook 10%
Projects 15%

Attendance Policy
Students are expected to attend all lectures. In an absence is unavoidable, the student should contact the instructor before the class meets. Excessive unexcused absences may result in grade reductions.

Homework Policy
HW assignments are due at the beginning of class. Late assignments will be accepted only with prior approval from the instructor.

Exam Policy
Make-up exams will only be given with prior approval of the instructor.

Policy on Missed or Late Coursework
Homework will be accepted late only with prior approval of the lab instructor.
Course Notebook  

The CE program requires every student in every class to develop a separate, three-ring binder of course notes, handouts, homework, quizzes, and exams. The notebooks may be collected and may be graded prior to, or during, the final exam. The intent of this requirement is to provide every CE student with a well organized library of reference material that they can use in their professional career. The instructor of each course may also make a copy of representative notebooks for review of the course by a faculty committee.

The following material (if applicable) with tabs should be included: notes (with daily handouts integrated into notes); reference handouts; homework assignments; lab assignments and reports; quizzes; exams; and projects.

At the end of the course you should number the notebook pages and add an index page. The binder itself should have the course name on the spine and on the cover.

Notebook Grading  

Notebooks will be graded using the following criteria:
- Completeness (Does the notebook contain all of the course materials?)
- Legibility (Are the notes easy to read?)
- Organization (Is specific material easy to find?)

Academic Misconduct  

Any act of dishonesty in any work constitutes academic misconduct. The Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct and will be handled by the Dean’s office.

Accommodations  

Reasonable accommodations are made on an individualized basis. It is the responsibility of persons with disabilities, however, to seek available assistance and make their needs known. The University has designated the Office of Disability Services as the campus coordinating office for the provision and delivery of services and reasonable accommodations that ensure the University's programs, services, and activities are accessible to students with disabilities. The Office of Disability Services is available to assist any student who has a qualified and documented disability. Please contact the Office of Disability Services at 348-4285 for additional information.
Schedule/Topic Outline

- Overview of designing structures to resist earthquakes
- Single-Degree-of-Freedom (SDOF) Systems
  - Formulation of the Equations of Motion
  - Undamped Free Vibration
  - Damped Free Vibration
  - Response to Harmonic Loads
  - Response to General Loads by Numerical Integration
  - Earthquake Response of Linear Structures
  - Earthquake Response of Nonlinear Structures
- Multi-Degree-of-Freedom (MDOF) Systems
  - Formulation of the Equations of Motion
  - Undamped Free Vibration: Frequencies and Mode Shapes
  - Mode-Superposition Procedure
- Practical Analysis of Response of Structures to Earthquakes
  - Equivalent Lateral Force Procedure
  - Modal Response Spectral Analysis

Important Dates: See the course calendar on the class website for important dates including exam dates, HW due dates, and project due dates.
As required for the accreditation of our BSCE program, the Civil Engineering program at The University of Alabama, in full consultation with its various constituencies, including alumni and employers, has established the following overarching student outcomes. These outcomes describe what students are expected to know or be able to do by the time of graduation from our program. At a minimum, the outcomes that have been checked will be addressed specifically and directly in this course. Other outcomes may be addressed to a lesser extent.

Graduates must demonstrate an understanding and reasonable compliance with the following as they apply to Civil Engineering:

- An ability to apply knowledge of mathematics (through differential equations and probability/statistics), science (including physics and chemistry), and engineering.
- An ability to function on multidisciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to effectively communicate by speaking.
- An ability to effectively communicate by writing.
- A knowledge of contemporary issues.
- An ability to design and conduct experiments, as well as analyze and interpret data.

- Graduates will be capable of performing civil engineering design to meet desired needs.

Graduates will understand civil engineering professional practice issues such as:

- Procurement of work and the interaction of design & construction professionals.
- The impact of civil engineering solutions in a global and societal context.
- The importance of professional licensure, lifelong learning, and continuing education.

Graduates will have proficiency in at least four of the following areas:

- Environmental Engineering
- Structural Engineering
- Geotechnical Engineering
- Water Resources Engineering
- Transportation Engineering