REQUEST FOR COMMENTS ON PROPOSAL
FOR A NEW COURSE OFFERING

Distribution Date: September 20, 2013 Course: CE 540/640

TO: AEM: John Baker ECE: Tim Haskew
    CHE: John Van Zee ME: Clark Midkiff
    CS: David Cordes MTE: Viola Acoff
    DO: Dean Karr
    Assoc. Dean John Wiest
    Assoc. Dean Kevin Whitaker

FROM: Ken Fridley

SUBJECT: New Course Proposal

The faculty of the Department of Civil, Construction and Environmental Engineering has reviewed and endorsed the attached new course proposal and is submitting it to your department for review and comments.

If you deem it appropriate, please discuss the attached course proposal with any or all of your faculty. We would appreciate any comments concerning any aspect of the proposal. In the absence of any feedback within four weeks of the distribution date that would require further consideration by our faculty, I will ask the Dean to place the proposal on the agenda of the Dean's Advisory Council meeting for college approval.

Thank you.

COMMENTS:
COLLEGE OF ENGINEERING
PROPOSAL TO OFFER A NEW COURSE

DATE: ___________________________ DEPARTMENT: ______CCEE_________

COURSE NO: CE540/640 TITLE: Earthquake Engineering ________________

EFFECTIVE DATE: __________

PART ONE
(To be completed by the individual proposing the course)

I. GENERAL INFORMATION

A. Description (50 words or less)


B. 1. Prerequisite(s) CE 531 Structural Dynamics

2. Corequisite(s) ___________________________________________  

3. Other ____________________________________________________  

C. Course Level: Adv undergraduate / graduate

(undergraduate, adv. undergraduate, graduate etc.)

D. Format: _______3______ Hours of lecture per week

_______0______ Hours of discussion (recitation) per week

_______0______ Hours of laboratory (or field work) per week

Other instructional methods and modes: _________________________

E. Credit Hours: 3_______

________
II. ACADEMIC INFORMATION

A. Course objectives:

This course places emphasis of engineering concerns due to seismic hazard on civil engineering structures, namely buildings, bridges and industrial facilities. The goals are for students to gain basic understanding of the fundamental factors that influence the response of these structures respond to strong ground motions, and introduce means to reduce the response. Students will be exposed to probabilistic hazard analysis to aid the decision making process to reduce the damage due to seismic hazards. Current performance based framework is presented to establish the design and evaluation of earthquake resist structures. Finally, modern damper design and applications will provide the students with a fresh view of the future of earthquake engineering.

B. What course or courses, if any, will this course replace?

None.

Implementation of this course, if it does not replace an existing course, may cause enrollment reductions in other courses. Please list all courses in which such enrollment declines can be expected.

C. What is the justification for proposing the course at this time?

This course is necessary to provide foundational knowledge for students interested in understanding the consequences of strong earthquake, and the related earthquake resistance design to provide civil structures with desired performance under earthquake exposure. The course will present performance-based design framework, which represents the current codification standard, and therefore will be an essential component for civil engineering students to grasp before they go to job market.

D. Name the current faculty who are qualified to teach this course

Wei Song (CCEE).

What specific qualifications and capabilities must an individual have in order to teach this course?

Strong background in structural dynamics, earthquake design provisions.

E. This course is designed for the following curricula:

BS Civil Engineering, BS Construction Engineering, MS Civil Engineering, PhD Civil Engineering

F. This course will be required for the following majors and minors:

None.
G. Attach an outline of the course of at least one page in length and name any textbooks or principal readings which will be used. This outline must be in ABET format. (This request is not intended to bind future instructors to a detailed program -- but only to establish the general scope, nature, and level of the course.)
PART TWO
(To be completed by the department head alone or in consultation with the proposer.)

III. BUDGETARY INFORMATION

A. Anticipated frequency of offering:
   ______ sections each semester
   ______ sections each Fall Term
   1 section each Spring Term
   ______ sections during Summer School
   ______ according to demand

Other: _______________________________________________________________________

B. Estimated student interest per offering:

Estimated total enrollment:
   First Year:  15
   Second Year:  20
   Third Year:  25

C. Estimated capacity per section:
   Lecture ______ 30
   Discussion __________
   Laboratory ______ 30

D. If this course is approved:

1. Will additional faculty or staff members be needed? IF YES, DESCRIBE STAFF NEEDS.
   No. Plan to use existing faculty & staff.

2. Will additional space, equipment, special library materials, computer time, or any major
   expenses be involved? IF YES, DESCRIBE THESE EXPENSES.
   Course will share laboratory facilities and equipment with CE 531: Structural Dynamics. Primary expenses are expected to be limited to replacing consumable supplies (bolts and nuts to complete structural assemblies and install sensors, cable and wires to connect sensors, single use PPE such as earplugs and latex gloves).

3. Please describe any unusual expense items such as team teaching, guest lecturers, travel, etc.
E. Has this proposal been discussed with other related disciplinary areas within the division? Outside the division?

No related disciplines at UA.

F. Is there any indication that this course duplicates course work offered elsewhere in The University?

No.

II. EVALUATION

A. Describe the system of evaluation that will be used to determine whether this course should be continued in the departmental program. It would be helpful to relate this system of evaluation to the kinds of information requested in Part One, Section II, and Part Two, Section I.

Graduate level course in support of research, so enrollment and research activities will dictate continuation of the course.

Proposed by: Wei Song
Date: __________________________

Proposed by: ______________________
Date: __________________________

Approved by
Department Head: Ken Fridley
Date: September 20, 2013

Approved by
Dean: ______________________
Date: __________________________

Conditions of approval, if any:

Upon approval by the dean, a copy to be forwarded with the course inventory form to the Office of Academic Affairs.
CE 540/640 Earthquake Engineering

Credit and contact hours: 3 semester hours, 42 contact hours

Course coordinator and instructor’s names: Wei Song, no others at this time


Specific course information:

a. Catalog description: This course integrates the knowledge from several engineering and science disciplines, to develop an understanding of the effect of earthquake ground motions on the civil engineering structures, and lead to the design of earthquake resistant structures. The topics include engineering seismology, ground motion characterization, probabilistic hazard analysis, response spectra, inelastic structural analysis and performance-based earthquake-resistant design. The course will also introduce the recent development in the use of supplemental damping and seismic isolation systems to improve the seismic performance of buildings and bridges.

b. Prerequisites and co-requisites: CE 531 Structural Dynamics

c. Status in the programs: Upper level undergraduate elective and graduate level class

d. Graduate student requirements in addition to undergraduates: Graduate students will be required to conduct a course project and make in-class presentation to demonstrate the result.

Specific goals for the course:

a. Course objectives: This course places emphasis of engineering concerns due to seismic hazard on civil engineering structures, namely buildings, bridges and industrial facilities. The goals are for students to gain basic understanding of the fundamental factors that influence the response of these structures respond to strong ground motions, and introduce means to reduce the response. Students will be exposed to probabilistic hazard analysis to aid the decision making process to reduce the damage due to seismic hazards. Current performance based framework is presented to establish the design and evaluation of earthquake resist structures. Finally, modern damper design and applications will provide the students with a fresh view of the future of earthquake engineering.

b. Relation of course to BSCE and BSConE Program Outcomes:

<table>
<thead>
<tr>
<th>Outcome (level at graduation)</th>
<th>Outcome Description (level achieved in this course)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 (Level 3)</td>
<td>Solve problems in mathematics through differential equations, probability and statistics, calculus-based physics, general chemistry, and one additional area of science.</td>
</tr>
<tr>
<td>T1 (Level 4)</td>
<td>Analyze and solve problems in material science and engineering mechanics.</td>
</tr>
<tr>
<td>T3 (Level 3)</td>
<td>Apply relevant knowledge, techniques, skills, and modern engineering tools to identify, formulate, and solve engineering problems, including problems</td>
</tr>
<tr>
<td>T6 (Level 5)</td>
<td>Design a system or process in more than one program-relevant civil or construction engineering specialty field to meet desired needs, including sustainability and within other realistic constraints</td>
</tr>
</tbody>
</table>
T7 (Level 2) **Explain** key aspects of at least one traditional or emerging program-relevant area of advanced specialization.

P1 (Level 4) **Analyze** a situation involving multiple conflicting professional, legal, and ethical interests to determine an appropriate course of action.

P2 (Level 4) **Organize** and **deliver** effective written, verbal, graphical and virtual communications.

P4 (Level 3) **Demonstrate** attributes supportive of the professional practice of engineering; **apply** leadership principles to direct the efforts of a small group to solve a relatively constrained problem; and **function** effectively as a member of a multidisciplinary team to solve open-ended engineering problems.

---

**Brief list of topics covered (with contact hours allocated):**

1. Introduction of Earthquake Engineering Design Philosophies 1
2. Characterization of Earthquake Ground Motions 2
3. Response of SDOF System to Earthquake Ground Motions 3
4. Response of MDOF System to Earthquake Ground Motions 3
5. Development of Earthquake Design Spectra: Linear 3
7. Seismic Design 9
9. Recent Advancement and Applications 3
10. Presentation and Reports 3
11. Exam 3
CE 540/640 Syllabus

Course: Earthquake Engineering

Introduction: This course integrates the knowledge from several engineering and science disciplines, to develop an understanding of the effect of earthquake ground motions on the civil engineering structures, and lead to the design of earthquake resistant structures. The topics include engineering seismology, ground motion characterization, probabilistic hazard analysis, response spectra, inelastic structural analysis and performance-based earthquake-resistant design. The course will also introduce the recent development in the use of supplemental damping and seismic isolation systems to improve the seismic performance of buildings and bridges.

Instructor: Dr. Wei Song (wsong@eng.ua.edu)

Prerequisite: Structural Dynamics or equivalent.


Office Hours: Thursday 10am - noon at SERC 2037F, or by appointment.

Homework: Homework will consist of problems, projects and laboratory writeups. Matlab will be used for many of these.

Grades: Homework/Projects 1/3
Lab Writeups 1/3
Final Exam 1/3

Final: TBA (About 2/3 of the way into the semester)

Goals: This course places emphasis of engineering concerns due to seismic hazard on civil engineering structures, namely buildings, bridges and industrial facilities. The goals are for students to gain basic understanding of the fundamental factors that influence the response of these structures respond to strong ground motions, and introduce means to reduce the response. Students will be exposed to probabilistic hazard analysis to aid the decision making process to reduce the damage due to seismic hazards. Current
performance based framework is presented to establish the design and evaluation of earthquake resist structures. Finally, modern damper design and applications will provide the students with a fresh view of the future of earthquake engineering.

**LIST OF TOPICS**

<table>
<thead>
<tr>
<th>CLASS</th>
<th>TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction of Earthquake Engineering Design Philosophy</td>
</tr>
<tr>
<td>2</td>
<td>Characterization of Earthquake Ground Motions: I. Time Records</td>
</tr>
<tr>
<td>3</td>
<td>Characterization of Earthquake Ground Motions: II. Earthquake Intensity</td>
</tr>
<tr>
<td>4</td>
<td>Characterization of Earthquake Ground Motions: III. Time-domain and Frequency-domain properties</td>
</tr>
<tr>
<td>5</td>
<td>Structural Responses to Ground Motion: I. SDOF</td>
</tr>
<tr>
<td>6</td>
<td>Structural Responses to Ground Motion: II. MDOF</td>
</tr>
<tr>
<td>7</td>
<td>Development of Earthquake Design Spectra: I. Linear</td>
</tr>
<tr>
<td>8</td>
<td>Development of Earthquake Design Spectra: II. Nonlinear</td>
</tr>
<tr>
<td>9</td>
<td>Seismic Design Codes: I</td>
</tr>
<tr>
<td>10</td>
<td>Seismic Design Codes: II</td>
</tr>
<tr>
<td>11</td>
<td>Seismic Design Codes: III</td>
</tr>
<tr>
<td>12</td>
<td>Performance Based Design and Evaluations</td>
</tr>
<tr>
<td>13</td>
<td>Applications</td>
</tr>
</tbody>
</table>
Exams and Assignments:

Homework assignments are due at the beginning of class on the due date. No late homework will be accepted. Homework should be written on only one side of the paper. Each problem will be self-contained (begin a new problem on a new page). Work must be neat and organized. Use a straight edge to prepare sketches, to underline important information at intermediate steps in the solution, and to box the final answer. Use of a French curve is expected for drawing deflected shapes. Provide sketches to aid in illustrating intermediate steps and the solution when necessary.

No further homework extension, making up quizzes and exams will be granted, except due to legitimate circumstances beyond the student’s control. In such a case, the student has to notify the instructor by email before the beginning of class or exams.

Academic Honor Code:

“a. All students in attendance at The University of Alabama are expected to be honorable and observe standards of conduct appropriate to a community of scholars. The University of Alabama expects from its students a higher standard of conduct than the minimum required to avoid discipline. At the beginning of each semester and on tests and projects, at the discretion of the course instructor, each student will be expected to sign an Honor Pledge.”

“b. The Academic Honor Pledge reads as follows: I promise or affirm that I will not at any time be involved with cheating, plagiarism, fabrication, or misrepresentation while enrolled as a student at The University of Alabama. I have read the Academic Honor Code, which explains disciplinary procedures that will result from the aforementioned. I understand that violation of this code will result in penalties as severe as indefinite suspension from the University.”

General Course Policies:

You are expected to arrive in class and be seated on time and not leave the classroom before the instructor dismisses class except for emergency reasons (emergency call or restroom use). If you will not be arriving on time or have to leave early because of your engagement in a university activity or a doctor’s appointment, please let the instructor know beforehand.

If you have a course-related question, please see the instructor or the TA during their respective office hours. Questions posed through email may not be answered quickly, depending on the availability of the instructor/TA or the nature of the question. If you cannot come to office hours, please ask for an appointment with the instructor/TA.

If you are expecting an emergency phone call or text message, you need to let the instructor know before the class. Otherwise, all cell phones, mobile devices including instant messaging/texting devices, and computers have to be turned off. No exceptions. Turning the sound off is not sufficient. Please be respectful towards your classmates and the instructor, and do not disturb the flow of the class.

Activities not related to the immediate classroom meeting such as reading unassociated documents such as newspapers or magazines, solving homework problems, chatting, texting, etc. are not permitted. If you are sure you should rather be doing something else (like chatting, texting, listening to music, following the latest news on Facebook, Twitter, etc., doing homework, reading, or sleeping), you are welcome not to come to the class.

Note that if you are absent from a classroom meeting, you are responsible for catching up with the class.
Individuals engaged in any activity that disturbs the attention of the class, including the instructor’s, will be asked to leave the classroom immediately. Persistent nuisance makers will be reported for disciplinary action.

Commercialization of lecture notes and university-provided course materials is not permitted in this course.

Collaboration Policy:

Homework: It is strongly encouraged that you solve the homework problems on your own. Collaboration and discussion are permitted. However, in any case, your solution write-up should be, by definition, yours. Photocopy submissions will receive zero/F grade.

Exams and quizzes: No collaboration or sharing of any kind is allowed. Zero-tolerance against transgressions. Actions violating the University academic integrity and honesty policies or, simply, the course honor code, will result in failure in the course. You may be asked to show your UA issued action card in exams.

Attendance:

It is highly recommended that you attend classroom meetings. No attendance will be taken except in special circumstances to be decided by the instructor. The University policy for attendance is as follows:

“Students are expected to attend classes as scheduled.”

Policy on Academic Misconduct:

All students in attendance at the University of Alabama are expected to be honorable and to observe standards of conduct appropriate to a community of scholars. The University expects from its students a higher standard of conduct than the minimum required to avoid discipline. Academic misconduct includes all acts of dishonesty in any academically related matter and any knowing or intentional help or attempt to help, or conspiracy to help, another student.

The Academic Misconduct Disciplinary Policy will be followed in the event of academic misconduct.

Disability Statement:

If you are registered with the Office of Disability Services, please make an appointment with the instructor as soon as possible to discuss any course accommodations that may be necessary. If you have a disability, but have not contacted the Office of Disability Services, please call (205) 348-4285 (Voice) or (205) 348-3081 (TTY) or visit 133-B Martha Parham Hall East to register for services. Students who may need course adaptations because of a disability are welcome to make an appointment to see the instructor during office hours. Students with disabilities must be registered with the Office of Disability Services, 133-B Martha Parham Hall East, before receiving academic adjustments.

Absence due to Health Problems/Concerns:

If you think you may have a cold, flu, or any other contagious disease, or simply not feeling well, please: 1) see your doctor or visit Student Health Center immediately; 2) do not come to class; you may safely consider yourself excused from attending class. You do not need to provide doctor’s report for occasional
appointment note stating that you have seen a doctor is not sufficient documentation to be exempt from an exam.

Students missing classroom meetings are responsible for catching up with the rest of the class.

**Emergencies and Other Circumstances beyond One’s Control:**

In case of a campus emergency closure, severe weather condition, any pandemic or other emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. You can communicate your questions or concerns to the instructor directly. The suggested way is to send email to the instructor.