UNIVERSITY OF MASSACHUSETTS AMHERST
Department of Civil and Environmental Engineering

CEE433 Design of Reinforced Concrete Structures
Course Syllabus – Spring 2008
http://www.courses.umass.edu/cee433/

Instructor:

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Structural Engineering
Room 235A Marston Hall
545-0349; brena@ecs.umass.edu
Office Hours: Mon,Wed: 9:00-10:00 am
Tu, Th: 2:30-3:30 pm (other times by appointment)

Class Time and Location:
Lectures: Tu-Th 9:30-10:45
Marston Hall – Room 211

Course Objective:
The objective of this course is to understand the behavior and design of reinforced concrete members. The course will focus on explaining the background of current design specifications for reinforced concrete structures. Students will gain experience by solving problem assignments throughout the semester.

Course Format:
The course will be presented in two 75-minute lectures per week. Lectures presented by invited speakers may be incorporated into the course during the semester. These lectures may take place during usual class time or at other specified times as part of a structures seminar. Attendance to lectures presented by invited speakers is expected from all students.

Course Outcomes:
Projected outcomes of the course are:
1. Ability to apply knowledge of mathematics, science, and engineering to calculate the capacity of common reinforced concrete elements.
2. Ability to define problems for design of reinforced concrete elements that meet code requirements based on strength, stiffness and serviceability considerations.
3. Ability to work productively in groups in the solution of design problems.
4. Ability to express ideas effectively through written homework assignments.
5. Knowledge of current code requirements for the design of reinforced concrete elements.
6. Ability to use techniques, skills, and modern engineering tools in the design of reinforced concrete structures.

Course Outcome Measures and Assessment:
Measures and assessment of the outcomes will be made by:
1. Periodic homework assignments.
2. Two 2-hour exams during semester.
3. One 2-hour final exam.
4. Course and instructor evaluation to provide student feedback on the perceived quality of the course and effectiveness of the instructor.

Textbook (Required):

Wang, C. K., Salmon, C.G., and Pincheira, J.A. *Reinforced Concrete Design*, 7th Edition, John Wiley, 2007.

Code:
ACI Committee 318, *Building Code Requirements for Structural Concrete (ACI318-08) and Commentary (ACI318R-08),* American Concrete Institute, Farmington Hills, MI, 2008.

References:
1. McGregor, J.G., *Reinforced Concrete: Mechanics and Design*, 3rd Edition, Prentice Hall, 1997.

2. Ferguson, P.M., Breen, J.E., and Jirsa, J.O., *Reinforced Concrete Fundamentals*, 5th Edition, John Wiley & Sons, 1988.

3. Park, R. and Paulay, T., *Reinforced Concrete Structures*, John Wiley & Sons, 1975.

4. Nilson, A.H., Darwin, D., and Dolan, C.W., *Design of Concrete Structures*, 13th Edition, McGraw-Hill, 2004.

Prerequisites:

CEE331 Structural Analysis

Grading:
1. First exam (Topics 1 – 2: mid March) 25%
2. Second exam (Topics 3 – 4: mid April) 25%
3. Homework 25%
4. Final exam (during finals week) 25%

Attendance:
Students are expected to attend all classes or other class related activities (e.g. seminars, visits).

Academic honesty:
The University Academic Honesty Policy applies and can be found in the UMass 2000/01 Undergraduate Catalog (page 9). This policy covers plagiarism, cheating, fabrication, and facilitation of dishonesty.

Important Dates:
February 18 – Holiday (Presidents' Day); No class Feb. 19 (Monday schedule).

March 17-21 – Spring Break
March 25 – Last day to drop with W (withdrawn); mid-semester date.
April 21 – Holiday (Patriot's Day); class not affected.
May 13 – Last day of classes
May 15-22 – Final examinations

Lecture Topics:

1. Introduction – *Chapters 1,2*
    a. Structural Analysis – Loads, load combinations (use of RISA-2D)
    b. Design Philosophy
    c. Load and Resistance Factors
    d. Material Properties

2. Flexure (Bending) – *Chapter 3*
    a. Behavior of Reinforced Concrete Elements in Bending
    b. Strength of Singly Reinforced Sections in Bending
    c. Design of Singly Reinforced Sections in Bending
    d. Strength of Doubly Reinforced Sections in Bending
    e. Design of Doubly Reinforced Sections in Bending
    f. Serviceability – deflections/crack control (*Chapter 4*)

3. Shear – *Chapter 5 (5.1 – 5.13)*
    a. Shear Transfer Mechanisms
    b. Truss Models
    c. Concrete Contribution to Shear
    d. Steel Reinforcement Contribution to Shear

4. Bond and Development of Reinforcement – *Chapter 6*
    a. Factors Affecting Bond and Development of Reinforcement
    b. Anchorage of Reinforcement
    c. Development Length of Reinforcement

5. Axial Load and Flexure – *Chapter 13*
    a. Behavior of Axially Loaded Members
    b. Members Under Axial Load and Bending
    c. Interaction Diagrams
    d. Members Under Axial Load and Biaxial Bending

6. Continuous Beams: ACI moment coefficients, moment redistribution – *Sections 7.1-7.6, 10.12*

7. Design of Common Structural Components: Brackets, footings (time permitting)