CE 354 REINFORCED CONCRETE I

Required Course

Spring 2009

Instructors: *Name:* Cengiz Karakoç, Cem Yalçın

Office Hours: Karakoç. M 15:00-17:00, Yalçın:MTWThF 12

Course Data: *Hours*: Karakoç: WWThTh 3434, Yalçın:TTThTh 3434

Course Description (Catalog):

CE354 Reinforced Concrete I **(4+1+0)4**

Mechanical properties of structural concrete. Behavior of reinforced concrete elements under different natural and physical conditions and under normal force, shear, moment and torsion. Ultimate design of reinforced concrete beams, floor systems and columns. Introduction to Turkish Standard Reinforced Concrete Design and the codes related of the American Concrete Institute for reinforced concrete buildings.

Prerequisite: CE212 Engineering Materials, CE246 (Strength of Materials)

Course Objectives (Learning Outcomes):

To develop an understanding of and appreciation for basic concepts in the behavior and design of reinforced concrete systems and elements.

To introduce the basic concepts and steps for reinforced concrete sectional design mainly in accordance with ultimate strength design.

To help the student develop an intuitive feeling about structural and material wise behavior and design of reinforced concrete systems and elements.

To underline and discuss basic principles of mechanics regarding the analysis and design of reinforced concrete systems and elements.

Textbook:

A.H. Nilson, D. Darwin, C.W. Dolan, "Design of Reinforced Concrete Structures," 13th Ed., McGraw-Hill, 2003

Reference Books:

Park and Paulay, "Reinforced Concrete," John Wiley & Sons, 1975.

Ersoy, Özcebe, Tankut "Reinforced Concrete," METU, 2008.

TS 500, "Betonarme Yapıların Tasarım ve Yapım Kuralları," Türk Standartları Enstitüsü, Şubat 2000.

ACI, "American Concrete Institute Building Code," ACI, 2008

Curricular Context

This required course constitutes a transition from fundamental math and science topics to specific applications within the context of reinforced concrete design. Estimated design content is 70%.

Laboratory and Computer Usage:

Laboratory experiments on reinforced concrete beams shall be conducted.

Class Policies:

Midterms: Two exams, each 20% of the course grade; Attendance and Laboratory Work: 10% of the course grade; Design Project: 20% of the course grade; Final Exam: 30% of the course grade.

Contribution of the Course to Program Outcomes:

(a) An ability to apply knowledge of mathematics, science and engineering

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(c) An ability to design a system, component, or process to meet desired needs

(e) An ability to identify, formulate and solve engineering problems

(h) The broad education necessary to understand the impact of eng. solutions in a global and societal context

(i) A recognition of the need for, and ability to engage in life-long learning

(k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Course Assessment:

Course will be assessed on the basis of the accomplishments regarding the course objectives and the contributions to the program outcomes. The evaluation will consist mainly of the responses from the students, who will provide their comments to various course related questions in the final week of the semester.

Week	Topics	Reading Assignments	Suggested Problems	Objectives
1 Feb. 17 Feb. 19	Introduction	Chap. 1		Introduction to reinforced concrete structures, loads, capacity-demand concept, structural safety, fundamental assumptions, national codes (TS500, ACI)
2 Feb. 24 Feb. 26	Materials	Chap. 2		Concrete materials and proportions, short and long term effects on concrete, reinforcing steel
3 Mar. 03 Mar. 05	Flexural Analysis and Design of Beams	Chap. 3	1, 2	Behavior of R/C sections in flexure, stress blocks for elastic and ultimate design methods
4 Mar. 10 Mar. 12	Flexural Analysis and Design of Beams	Chap. 3	9, 12	Moment-curvature analysis, rectangular stress block, design examples for beams
5 Mar. 17 Mar. 19	Flexural Analysis and Design of Beams	Chap. 3	13, 14	T-beams and other cross-sections, design examples for beams
6 Mar. 24 Mar. 26	Behavior of R/C Members in Shear	Chap. 4	2, 4	Diagonal tension, web reinforcement, design of beams for shear
7 Mar. 31 Apr. 02	Bond, Anchorage, Development Length and Serviceability Criteria MIDTERM I (April 02 at 17:30)	Chap. 5 & 6	5.1, 5.2, 5.6 6.1	Bond and development lengths, and design considerations in serviceability
8 Apr. 07 Apr. 09	Design of Short Columns	Chap. 8	1, 3	Strength design of short columns
9 Apr. 14 Apr. 16	Design of Slender Columns	Chap. 9	1	Design of columns considering slenderness ratio and lateral deformations
10 Apr. 21 ~~Apr. 23~~	Analysis and Design of Slabs	Chap. 13	2	Design of one-way slabs
11 Apr. 28 Apr. 30	SPRİNG BREAK			
12 May 05 May 07	Analysis and Design of Slabs MIDTERM II (May 07 at 17:30)	Chap. 13	10	Design of two-way slabs
13 May 12 May 14	Design for Torsion	Chap. 7	2	Design of members subjected to torsion
14 ~~May 19~~ May 21	Design of Indeterminate Beams and Frames	Chap. 12	1	Design of indeterminate structures through analysis using approximate methods by determining plastic hinge zones