CIE 429 REINFORCED CONCRETE DESIGN

Course Description

The primary objective of the course is to extend the student's knowledge and proficiency in analysis and design of reinforced concrete structures. To accomplish this objective, the course will examine topics related to the behavior of beams, columns, one-way slabs, structural walls and foundations (as time permits). Current methods for design of these elements under axial, flexural and shear forces will be examined. Practical design problems will be solved as homework assignments.

Course Outline

1. Review of limit states and ultimate strength design concepts
2. Materials in reinforced concrete
3. Behavior of reinforced concrete members in the elastic, yielding and ultimate ranges
4. Analysis and design of beams and one-way and two-way floor slabs
5. Effect of shear on flexural members; design to resist the effects of shear
6. Serviceability considerations; cracking and deflections.
7. Behavior of members subjected to axial load and axial load combined with flexure and shear; methods to account for slenderness effects
8. Analysis and design of frames for gravity loads; direct design method; equivalent frame method (*time permitting*).

Course Conduct

1. Lectures: MoWe, 9:00 – 11:30 AM, Obrian 212
2. Office Hours: Friday, 2:00 – 4:00 PM, 206 Ketter Hall
3. Assigned work includes reading and written homework assignments as described below.

    a. *Reading*: The reading includes assignments in ACI 318-11, the textbook and other materials. Reading assignments from the text and ACI 318-11 are listed in the attached table. It is the student's responsibility to read the material indicated for each topic being covered in class.

    b. *Homework*: Homework problems will be assigned usually once per week. The assignments are due in class a week after they are assigned. Solutions will be posted online. Homework solutions should be prepared on engineering paper but it is essential that the solutions be neat and well organized. Points will be

deducted for poor organization and messy work. Late homework will not be accepted.

5. Student conduct is governed by the rules of the University and students are expected to know and abide by the University policies on academic honesty and integrity. These policies state "...students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and the respect of other's academic endeavors. By placing their name on academic work, students certify the originality of all work not otherwise identified by appropriate acknowledgements." Violation of these policies is subject to penalties that include receiving a failing grade in the course, suspension, and dismissal.

6. Two midterm exams and one final exam will be given.

7. Grading will be based on the following approximate weights:
   a. Homeworks: 20%
   b. Midterm exams: 40% (20% each)
   c. Final exam: 40%

8. Exact cutoffs for specific grades will depend on the level of difficulty of exams. These cutoffs will be determined once the final exam has been graded. However, the cutoffs will not exceed the following:

Composite score	Guaranteed grade
90%	A
80%	B
68%	C
58 %	D

Grade 'I' will be strictly limited to the circumstances for which the incomplete is intended; namely, satisfactory work to date and legitimate inability to complete the work within the semester. See UB policy (http://undergrad-catalog.buffalo.edu/policies/grading/explanation.shtml).

Required Textbooks

Wight, J. and MacGregor, J. *Reinforced Concrete: Mechanics and Design*, Prentice Hall, Sixth Edition, 2012.

ACI Committee 318, Building Code Requirements for Reinforced Concrete and Commentary, American Concrete Institute, 2011

Prerequisites

It is assumed that all students are proficient in structural analysis and mechanics and a basic course of civil engineering materials. A passing grade in CIE 324 is required.

Tentative Lecture Schedule

Lecture	Topic	Wight and MacGregor	ACI 318-11
1	Ultimate strength design	Chapters 1 and 2	8.0-8.3, 8.9, 9.1-9.3
2	Material properties	Chapter 3	3.1-3.5, 5.1-5.3, 8.5, 9.4
3-5	Behavior of reinforced concrete members in the elastic, yielding and ultimate ranges	Sections 4.1-4.2, 9.1-9.3	10.1-10.3, 10.5
	Analysis and design of beams and one-way floor systems (emphasis on flexure) including serviceability checks	Sections 4.3-4.4, 5.1-5.3, 5.5, 9.4-9.5	7.1-7.3, 7.5-7.7, 7.11-7.13, 8.6-8.7, 8.10-8.11, 9.5, 10.4-10.6
First mid-term exam (Chapters 1-5) on Monday, June 15, from 4:00 pm to 6:00 pm			
6-7	Effect of shear and design to resist shear	Sections 6.1-6.3, 6.5	11.0-11.3, 11.5, 11.11, 12.13
8-9	Bond, development and anchorage of reinforcement	Chapter 8	12.0-12.3, 12.5, 12.10-12.17
Second mid-term exam (Chapters 6 and 8) on Tuesday, June 30, from 4:00 pm to 6:00 pm			
10-11	Reinforced concrete columns; analysis and design of short columns for uniaxial bending and slenderness effects	Sections 11.1-11.6, 12.1-12.7	7.6-7.8, 7.10, 8.8, 9.3, 10.3, 10.8-10.13, 11.3, 11.11, 12.3, 12.16-12.17
12	Analysis and design of frames for gravity loads; direct design method; equivalent frame method	Section 10.1-10.3, 13.7, 13.8	8.3-8.4, 13.5-13.7
Final exam on Wednesday, July 08, from 3:00 pm to 6:00 pm			