

**Department of Civil and Environment Engineering
Colorado State University**

CIVE 467–Design of Reinforced Concrete Structures–Tentative Syllabus

Spring 2018

MWF 12:00-12:50pm Glover 201

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Office Hours: MWF 8-9 am, 10-11 am and 1-2 pm

I will do my best to be available at these times. Also, if my door is open at other times feel free to stop by. If you have trouble reaching me please schedule an appointment via email.

Course Website: Canvas

Course Objectives:

A student successfully completing this course will be able to:

1. Describe the process and objectives of structural design and explain the importance of design philosophies (in particular Strength Design) and design codes and specifications.
2. Determine dead and live loading for design of basic structural elements using ASCE 7 minimum load requirements and tributary areas.
3. Describe how the material properties and behavior of concrete and mild steel reinforcement affect design of reinforced concrete (RC) elements.
4. Use methods presented in ACI 318 to analyze and design RC beams and one-way slabs loaded in flexure and shear, considering both strength and serviceability limit states.
5. Use ACI 318 and appropriate design aids to analyze and design RC columns and beam-columns – particularly “short” columns
6. Create designs meeting the detailing requirements of ACI 318 including development and splice lengths, minimum and maximum bar spacings, and minimum cover.
7. Explain and consider in their designs, design constraints related to safety (strength limit states), economy (least member size) and constructability.

Topics:

1. Design process and philosophies
2. Structural Loads
3. Material properties of concrete and reinforcement
4. Design Methods
5. Flexure of beams, T-Beams and one-way slabs
6. Shear strength and design for shear
7. Detailing requirements
8. Analysis procedures for continuous beams and one-way slabs
9. Design of one-way slabs
10. Design of Slab-Beam-Girder and Joist floor systems (as time permits)
11. Columns and Beam Columns
12. Footings

Textbooks:

Required:

ACI 318-14 Building Code Requirements for Structural Concrete and Commentary. American Concrete Institute, Farmington Hills, MI: 2014.

Everyone needs access to this code. You should bring the code to class with you **EVERY DAY**. An important part of the course is becoming familiar with the code and learning how to interpret its provisions. You will need to have your code to work in-class problems.

In order to get the student discounted price of \$165.77 you will need to become a student member of ACI and order your code. Detailed ordering directions are posted on Canvas. Code orders should be placed by **January 18, 2017** in order to receive your code in time to keep up with the class. You can purchase a hardcopy or digital version. If you purchase the digital version you will need to print portions of the code to use on exams.

Recommended:

Wight, J.K. *Reinforced Concrete: Mechanics and Design*, 7th ed. Pearson, Hoboken, NJ: 2016.

Wang, Salmon, Pincheira, Parra-Montesinos: 8th ed. Oxford University Press, New York, NY 10016

I strongly recommend that you consider purchasing either of the aforementioned textbooks. Either will give you access to alternative explanations and more examples. If your career interest is in structural engineering I especially recommend that you buy one of these books for future reference. The latter is the more recent of the two and in my opinion, the superior text.

Prerequisites: CIVE 367

Assignments and Grading:

Homework (10%)

Homework problems will be assigned as needed, roughly once a week. At times we will start working on these problems in class and you will need to take them home to finish them. In class you will work on these problems in groups, and you can continue to work in groups outside of class. However, each student should prepare their own assignment for submission. I want to remind you that homework is intended to give you valuable practice with course concepts. If you always rely on your group members to understand what is going on, you will do poorly on the exams.

Assignments will need to be scanned and submitted via Canvas. Assignments will be due by midnight of the due date, and **late assignments will not be accepted**

Engineers must be able to communicate their work to each other. Hand calculations are part of the design documentation process. Homework should be completed on one side of engineering paper. Your submitted work should document your complete process, including all the steps you took to reach the solution, references to equations and code sections that you used, and listing any necessary assumptions. Organization, professionalism, neatness, and completeness (in terms of solution process) will count for 20% of the grade on each homework assignment. This part of the grade will be assigned at the grader's discretion; but I will instruct them to grade this component harshly. A sample of the required homework format and layout are given on Canvas.

Semester Design Project (15%)

This semester we will work on designing the major components of a simple RC building. The project will be broken into a series of design assignments that will build on each other over the course of the semester. Some of these assignments will be individual assignments, and some assignments will be group assignments.

Canvas Quizzes (5%)

In order to be prepared to work on problems during class times, I will assign readings or possibly videos for you to study outside of class. There will be short Canvas quizzes over the key concepts to help

encourage you to be prepared for class sessions. Depending on the material we are currently covering, we may have several short quizzes in a single week. Canvas will be set to allow you to take each quiz twice.

Exams (70%)

There will be two midterms (20% each) in this class and a final (30%). All tests will be cumulative with an emphasis on more recent material. **Students must use a FE approved calculator on exams.** Students will be allowed to use their copy of ACI 318 and a single page (8½ x 11, front and back) formula sheet during tests. Students may write in manuals as they see fit, and they may use SMALL tabs to mark significant pages, but larger tabs/post-its with notes are NOT ALLOWED.

Midterms will be announced in class at least one week prior to the test date. I am tentatively planning to have them in class on Wednesday, February 4th and Wednesday March 7th. The final exam will be given on Wednesday, May 9th from 7:30am-9:30am as scheduled by the university. Make-up exams will be given only in extraordinary, documented circumstances.

Final Grades

Term grades for this course will be assigned using +/- grading. Remember these grades are a reflection of your work throughout the semester. You need to start worrying about your final grade NOW. By the time we get to May it is too late to make big changes.

Academic Integrity:

This course will adhere to the Academic Integrity Policy of the Colorado State University General Catalog (<http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academic-integrity>) and the Student Conduct Code (<https://resolutioncenter.colostate.edu/conduct-code/>).

As stated by the Catalog ***“Academic integrity is conceptualized as doing and taking credit for one's own work.”*** Promoting academic integrity is particularly important to me as your professor because I want to be fair to all students, because I believe that all students in this class are capable of success on their own, and because you are training to be civil engineers – a profession that has deep responsibility for public safety. I believe that to be ethical engineers in the future you must practice being ethical students now.

Below I have described in general terms how academic integrity applies to each graded component of the class. This description is not all-inclusive, please contact me if you have questions about behaviors not specifically described here. Instances of cheating will be reported to the Student Resolution Center, and will result in a grade penalty on the assignment. Repeated instances will result in a grade penalty for the overall course.

Exams may include the following honor pledge for you to sign:

I have not given, received or used any unauthorized assistance on this exam.

Homework Assignments – Students are encouraged to work in groups and learn from each other. The final submitted assignment must reflect the individual effort and understanding of the student submitting the assignment. Direct copying is not acceptable and in this case all students with the same work will be given a zero.

Semester Design Project – Individual assignments should follow the same guidelines as the homework. On group assignments I expect all group members to make equitable contributions to the final assignment.

Canvas Quizzes - Quizzes should be completed individually without aid from other students.

Exams – The midterm and final exams should be completed individually without aid from other students. Students are allowed to use only their own copy of ACI 318 and a one page, two sided formula sheet. Exams must be taken with FE approved calculators.

Creating an Inclusive Climate:

I am committed to helping build an inclusive culture in this classroom, in the Department of Civil and Environmental Engineering, in the College of Engineering, and at CSU. Each individual brings diversity to our class in the identities they hold, the ways they think, their interests and skills, their background and past experiences. To me, inclusion means not only accepting these differences, but embracing them and understanding that we can leverage these differences to be better engineers.

My goal for this class is to create an environment where we do not discriminate against individuals because of their identities (for example race, ethnicity, sex, gender identity, sexual orientation, religion, nationality, age, levels of ability). It is also important to understand that even when we hold egalitarian beliefs, we can hold implicit or unconscious biases that can also influence the way we treat others. It is my expectation that students in this class will:

- 1) treat others with respect
- 2) work in teams in ways that recognize the contributions of all team members and provide all team members the opportunity to learn
- 3) examine their own behaviors and refrain from acting in biased ways
- 4) speak with the professor when biased behaviors may occur from other students, their TAs and even the professor
- 5) be sensitive to context and acknowledge that hurtful comments can sometimes be inadvertent

Grievances:

Any issues regarding the grading of homework or exams should be addressed in person, within one week of receiving the graded assignments.

Other Needs:

If you have any other particular concerns about this class, please come visit me during office hours so that we can discuss how I can help you be successful in this course.