CVEN 444 - 502 STRUCTURAL CONCRETE DESIGN

Description: Behavior, design, and detailing of reinforced concrete structural members according to the ACI Building Code Requirements. Design for ultimate limit states (flexure, shear, and axial loads) and serviceability requirements (cracking and deflection). Applications include continuous beams and moment frames.

Prerequisites: CVEN 342 and CVEN 345


Building Code Requirements for Structural Concrete (ACI 318-08) and Commentary (ACI 318-R-08), American Concrete Institute.


Class Hours: T,Th: 11:10 AM -12:25 PM, 419 CVLB Bldg

Office Hours: T,Th: 1:00 - 2:00 PM or by appointment through email

Grading: Attendance mandatory, Homework/Quizzes 20 pts, 2 Mid-term Exams 50 pts; and Final Exam 30 pts. NOTE: Attendance will be taken at the beginning of class (late = absent). Each student is allowed one (1) unauthorized absence (see regulations on authorized absence), then each additional unauthorized absence results in a one (1) pt. deduction from your final grade.

Total: >90 A; >80 B; >70 C; >60 D; <60 F

Course Objectives:
Prepare students to analyze, design, and detail reinforced concrete structural elements and frames according to the ACI Building Code Requirements.

Course Contents (Note Reading Materials):
1. Fundamentals: (a) Introduction; (b) RC Systems; (c) Design Process; and (d) Loadings. (Chaps 1,2)
2. Material Strength: Stress-strain behavior and properties of concrete and rebar. (Chap 3)
3. Flexural Strength: (a) Bending moment cracked, yield, and ultimate capacity; (b) Cracked section properties; and (c) T-beams and doubly reinforced sections. (Chaps 4,5)
4. Continuous Beams/Frames: (a) ACI moment coefficients and (b) Moment redistribution. (Chap 10)
5. Detailing Reinforcement: (a) Cover spacing requirements; (b) Development length of bars and hooks in tension/compression; (c) Bar cutoffs and strength envelopes; (d) Development of bars at supports and points of inflection; (e) Development and splice length of bars in columns. (Chap 8)(Exam #1)
6. Shear: (a) Shear behavior and design and (b) Introduction to Strut-and-Tie Modeling. (Chap 6)
7. Deflections: (a) Effective member stiffness of cracked/uncracked sections; (b) ACI computations; and (c) Cracking. (Chap 9)
8. Slabs: (a) Review of one-way slabs and general behavior of slabs; and (b) Direct Design Method for two-way slabs. (Chap 13)
9. Columns: (a) Short columns; (b) Introduction to slender columns; and (c) Introduction to biaxial loading on short columns. (Chap 11) (Exam #2)
10. Introduction to Footing Design (Chap 16)
**ABET Professional Content:**
Preparation for engineering practice;
Design experience;
Engineering design incorporating of engineering standards;
Engineering design incorporating realistic constraints that included economic, environmental, health, and safety.

**ABET Outcomes Addressed:**
Ability to apply knowledge of basic mathematics, science, and engineering;
Ability to design a civil/ocean engineering system to meet desired needs;
Ability to formulate and solve civil/ocean engineering problems;
Understanding of professional and ethical responsibility;
Ability to communicate effectively (written);
Recognition of the need to engage in life-long learning;
Ability to use techniques, skills, and modern tools necessary for civil/ocean engineering practice;
Ability to use computers to solve civil/ocean engineering problems

**Amplifications:**
To help expand these recommendations, the following extracts from student rules are provided. The first have to do with the statement “No statements contrary to University rules regarding attendance, approved absences, etc.” and include extracts from Student Rules 1 & 7 (additional information on student rules are found at the TAMU student rule website).

The following is an extract from Section 1 of Student Rules (<http://student-rules.tamu.edu/>) is related to changing class meeting times, including night exams:

“1.14 Class Schedules
"All classes will meet according to schedules prepared by the registrar. Modification in these schedules, including common night exams, may be made only when authorized by the registrar and approved by the dean of the college in which the course is offered.”

The following are extracts from Section 7 of Student Rules (<http://student-rules.tamu.edu/>) related to excused absences:

”The university views class attendance as an individual student responsibility. Students are expected to attend class and to complete all assignments. Instructors are expected to give adequate notice of the dates on which major tests will be given and assignments will be due. This information should be provided on the course syllabus, which should be distributed at the first class meeting. Graduate students are expected to attend all examinations required by departments or advisory committees as scheduled formally.”

**Excused Absences**

“7.1 The student is responsible for providing satisfactory evidence to the instructor to substantiate the reason for absence. Among the reasons absences are considered excused by the university are the following: (1 Muster)

“7.1.1 Participation in an activity appearing on the university authorized activity list. (see List of Authorized and Sponsored Activities)

“7.1.2 Death or major illness in a student’s immediate family. Immediate family may include: mother, father, sister, brother, grandparents, spouse, child, spouse’s child, spouse’s parents, spouse’s grandparents, stepmother, step-father, step-sister, step-brother, step-grandparents, grandchild, step-grandchild, legal guardian, and others as deemed appropriate by faculty member or student’s academic dean.

“7.1.3 Illness of a dependent family member.

“7.1.4 Participation in legal proceedings or administrative procedures that require a student’s presence.

“7.1.5 Religious holy day. (See Appendix IV.)

“7.1.6 Injury or Illness that is too severe or contagious for the student to attend class.

“7.1.6.1 Injury or illness of three or more days. For injury or illness that requires a student to be absent from classes for three or more business days (to include classes on Saturday), the student should obtain a medical confirmation note from his or her medical provider. The Student Health Center or an off-campus medical
professional can provide a medical confirmation note only if medical professionals are involved in the medical care of the student. The medical confirmation note must contain the date and time of the illness and medical professional’s confirmation of needed absence.

### 7.1.6.2 Injury or illness less than three days

Faculty members may require confirmation of student injury or illness that is serious enough for a student to be absent from class for a period less than three business days (to include classes on Saturday). At the discretion of the faculty member and/or academic department standard, as outlined in the course syllabus, illness confirmation may be obtained by one or both of the following methods:

2. Confirmation of visit to a health care professional affirming date and time of visit.

### 7.1.6.3 An absence for a non acute medical service does not constitute an excused absence.

### 7.1.7 Required participation in military duties.

### 7.1.8 Mandatory admission interviews for professional or graduate school which cannot be rescheduled.

### 7.2 The associate dean for undergraduate programs, or the dean's designee, of the student's college may provide a letter for the student to take to the instructor stating that the dean has verified the student’s absence as excused.

### 7.3 Students may be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Section 7.1, or other reason deemed appropriate by the student's instructor. To be excused the student must notify his or her instructor in writing (acknowledged e-mail message is acceptable) prior to the date of absence if such notification is feasible. In cases where advance notification is not feasible (e.g. accident, or emergency) the student must provide notification by the end of the second working day after the absence. This notification should include an explanation of why notice could not be sent prior to the class.

If needed, the student must provide additional documentation substantiating the reason for the absence, that is satisfactory to the instructor, within one week of the last date of the absence.

If the absence is excused, the instructor must either provide the student an opportunity to make up any quiz, exam or other graded activities or provide a satisfactory alternative to be completed within 30 calendar days from the last day of the absence.

### 7.4 The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence.

The following are extracts from Section 10 of Student Rules > [http://student-rules.tamu.edu/](http://student-rules.tamu.edu/) related to information that must be provided to students at the first class meeting:

10.1 The course instructor shall provide in writing the following information to the class during the first class meeting:

- A statement of the nature, scope and content of the subject matter to be covered in the course.
- All course prerequisites as listed in the catalog.
- All required course text and material.
- The grading rule, including weights as applicable for tests, laboratory assignments, field student work, projects, papers, homework, class attendance and participation and other graded activities in the calculation of the course grade. No such rule should be in contradiction to other provisions of the University Student Rules.

10.4 Passing grades for graduate students are A, B, C and S.”

### The following is the required ADA statement.

**Americans with Disabilities Act (ADA) Policy Statement**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Cain Hall or call 845-1637.

### The Academic Integrity Statement Must Include the Following:

**AGGIE HONOR CODE**

“An Aggie does not lie, cheat, or steal or tolerate those who do.” Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their
commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information please visit: http://www.tamu.edu/aggiehonor/

It is recommended that the following be included on all course work, assignments, or examinations at Texas A&M University, the following Honor Pledge shall be pre-printed and signed by the student:

“On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.”

Students are expected to understand and abide by the Aggie Honor Code presented on the web at: http://www.tamu.edu/aggiehonor  No form of scholastic misconduct will be tolerated. Academic misconduct includes cheating, fabrication, falsification, multiple submissions, plagiarism, complicity, etc. These are more fully defined in the above web site. Violations will be handled in accordance with the Aggie Honor System Process described on the web site.

Other academic integrity statements that can be included on the syllabus are:

The handouts used in this course are copyrighted. By “handouts,” I mean all materials generated for this class, which include but at not limited to syllabi, notes, quizzes, exams, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts unless I expressly grant permission.

Cheating on quizzes and exams will not be tolerated. Cheating will be reported and handled in accordance with the Aggie Honor System Process. Some or all examinations will be closed book; “looking at another student's examination or using external aids (for example, books, notes, calculators, conversation with others, or electronic devices)” during these examinations is a violation of Texas A&M Aggie Honor Code, Cheating, unless specifically allowed in advance by the instructor.

Unless specifically allowed in advance by the instructor, all assignments and homework in this class are expected to be completed based on individual effort. Copying the work of others, including homework, is a violation of Texas A&M Aggie Honor Code, Cheating.