

CE 802 – Advanced Reinforced Concrete Design (Fall 2015)

Instructor:

Prof. Tommy Cousins (210 Lowry & cousin5@clemson.edu)

Required Texts:

Reinforced Concrete - Mechanics and Design (7th edition) by MacGregor & Wight and ACI Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (See ACI Store web site and search 31814stu to become student member and order ACI 318-14 (\$99 plus shipping))

Course Overview:

CE 802 is graduate reinforced concrete analysis and design course which is intended to accomplish two broad goals: Introduce the student to key advanced reinforced concrete concepts and topics as well as further develop the student's critical thinking skills. This class will be one of many on campus designated as a Critical Thinking (CT2) Initiative Course. There are many definitions of critical thinking presented in academia. For the sake of this class it is defined as the combination of interpretation, analysis, and evaluation of a given set of parameters that leads to a structural design solution. Good critical thinking skills are an important part of an engineers approach to the structural design of buildings and bridges

Course Outline:

1. Introduction (Chapter 1) – 1 class
2. Material Properties (Chapter 3) – 1/2 class
3. Concrete Failure Models/Effect of Confinement (11.2 & notes) - 3 classes
4. Moment/Curvature (4.2 & notes) - 1 class
5. Moment/Curvature with Confinement (notes) – 3 classes
6. Plastic Hinging & Collapse Mechanisms (notes) - 2 classes
7. Moment Redistribution (10.6) - 1 class
8. Development of Reinforcement (Chapter 8) - 3 classes
9. Slender Columns (Chapter 12) - 3 classes
10. Two-Way Slabs – Direct Design Method (DDM) (Chapter 13) - 3 classes
11. Shear and Moment Transfer (Chapter 7) - 3 classes
12. Torsion and Shear (Chapters 6 & 7) - 3 classes

Objectives:

Describe basic properties of reinforced concrete constituents
Interpret and apply concrete failure models and effects of confinement models
Interpret and apply moment curvature, plastic behavior, and moment redistribution principles
Identify key concepts in development of reinforcement in reinforced concrete members
Articulate slender reinforced concrete column design principles
Apply the DDM (Direct Design Method) method to two-way reinforced concrete slab systems
Analyze reinforced concrete members to resist shear and torsion

Student Evaluation:

- Advanced design of reinforced concrete structures is a combination of previously learned engineering principles (statics, material models, and structural analysis), new concepts (more sophisticated material properties and applications), and critical thinking skills. We will define critical thinking as the combination of interpretation, analysis, and evaluation of a given set of parameters that leads to a structural design solution. Critical thinking skills may be the most important part of structural design. During this class your critical thinking skills will be measured indirectly using homeworks, tests, and a technical presentation and directly using the CCTST. In addition, your previously learned knowledge of statics, material models, and structural analysis, as well as the new material presented in this course will be evaluated using tests and homeworks.
- 2 tests (25% each) and a final exam (35% and no exemptions) will be given. The dates for the tests are 9/23 & 10/28. The tests may be given from 7 pm to 9 pm on the assigned day.
- Homework assignments will be made frequently and count 10% of final grade. The homework grade will include critical thinking training exercises, which may be a combination of group and individual work.
- Students will make PowerPoint presentations about a RC topic. The presentation will focus on the relevance of the research topic to the ACI Specification and propose alternatives to present ACI Code criteria. The presentation will count 5% of the final grade. Sample presentations will be provided as artifacts (examples) of a critical thinking exercise to Clemson Thinks2 (CT2).
- California Critical Thinking Skills Test (CCTST) – As part of the effort to measure and improve student critical thinking skills, each student will take the CCTST during the first and last weeks of class. Scores on this test are not part of the grading scale for this course but will be used to evaluate critical thinking skills and teaching methods.

Attendance:

Not mandatory but will be recorded. Everyone is responsible for material covered in class. In event of a canceled class meeting due to unforeseen circumstances (instructor illness, inclement weather, etc.) I will email the class with instructions regarding changes in the syllabus and assignment and test due dates.

Office Hours:

9:00 am to 9:45 am MW, and, otherwise, anytime I am in the office.

Prerequisites:

CE 402 Reinforced Concrete Design or equivalent.

Students with Disabilities:

Students with disabilities requesting accommodations should make an appointment with Dr. Margaret Camp (656-6848), Director of Disability Services, to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors (first week of class for me). Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Title IX Statement:

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at <http://www.clemson.edu/campus-life/campus-services/access/title-ix/>. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864.656.3181 (voice) or 864.565.0899 (TDD).

Academic Integrity

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating or stealing in any form. Discussions on homework assignments are encouraged; however, the solutions submitted for grading are to be the individual efforts of each student.