

CEE 151C STRUCTURAL DESIGN II
(Required for CE)

- Catalog Data:** **CEE 151C: Structural Design II (Credit Units: 4) F.** Ultimate strength design. Design of reinforced concrete beam sections. Design for shear and deflection. Design of columns. Design of isolated and combined footings. Laboratory sessions. Prerequisites: CEE130; CEE151B. (Design units: 3)
- Textbook:** Nilson, A.H., Darwin, D., and Dolan, C.W. *Design of Concrete Structures*, 13th Edition, McGraw-Hill, 2004.
- References:** Building Code Requirements for Structural Concrete, ACI 318-05 and Commentary ACI 318R-05. American Concrete Institute.
- Coordinator:** Tara C. Hutchinson
- Course Objectives:** This course provides an introduction to the use of structural concrete as used in structures and foundations.
- Course Outcomes:** Students will:
Analyze and design singly and doubly reinforced concrete beams under flexure, including regular (rectangular shaped) and T-beams.
Analyze and design structural concrete beams subjected to shear loading.
Conduct a service load analysis to control deflection and cracking of beams.
Analyze and design reinforced concrete columns and develop moment-axial load interaction curves.
Determine bond length, lap splice and detailing requirements for reinforced concrete members.
Analyze and design isolated and combined footings.
- Prerequisites By Topic:** Mechanics of Materials
Analysis of beams and framed structures
Buckling of columns
Design loads
Bearing capacity
- Lecture Topics:** Week 1: Introduction and concrete as a building material
Weeks 2 and 3: Flexural design (singly, doubly reinforced, and T-sections)
Weeks 4 and 5: Shear and diagonal tension in beams
Week 6: Deflection and crack control
Weeks 7 and 8: Design of columns, interaction diagrams
Week 9: Bond development, lap splices, and detailing
Week 10: Design of isolated and combined footings
- Class Schedule:** Meets for 4 hours of lecture and 2 hours of lab each week for 10 weeks.
- Computer Usage:** Commercial mix design and RC structural design software such as PCA concrete software programs are used for the lab projects.

Laboratory Projects: A physical laboratory project encompasses three of the weekly discussion/laboratory sessions during the quarter. During these labs, students perform concrete mixing and placing, testing of standard concrete cylinders, and flexural testing of simply supported beams. Laboratory reports summarizing their findings and comparison with theoretical calculations are required.

Professional Component: Contributes to the design experience and Engineering Topics courses of Civil Engineering major.

Relationship to Program Outcomes: CE - The course relates to Program Outcomes a, c, d, e and k as stated at:

<http://undergraduate.eng.uci.edu/degreeprograms/civil/mission>

Design Content Description

Approach: Design is an overarching theme in this class. Students focus on design of concrete components under axial, bending, and shear loading. Emphasis on ultimate, allowable, and service design theories is provided. An overall view of component design is taken, by incorporating practical considerations, such as reinforcement placement and member sizing. All homework assignments contain member design problems. Of these, approximately half require students to first determine system load distributions using static analysis procedures. A significant portion of the lectures is designed to guide students as needed to complete design related homework problems and present theoretical background related to member design concepts. A field trip is organized during one lecture period to visit the site nearby to observe concrete construction. In a portion of the weekly discussion/laboratory sessions, component design is discussed (as complemented by lectures) and specifically related to homework design problem sets.

Lectures: 67%

Laboratory Portion: 33%

Grading Criteria:

Homework:	20%
Laboratory Report:	10%
Midterm:	40%
Final Exam:	<u>30%</u>
	100%

Estimated ABET Category Content:

Mathematics and Basic Science: ___ credit units or ___%

Engineering Science: 1 credit units or 25 %

Engineering Design: 3 credit units or 75 %

Prepared by: Ayman Mosallam **Date:** July 2007

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