

CE 123N Design of Reinforced Concrete Structures

3 units, 3 hours of lecture per week

Course Instructor: A. Kren

Textbook and/or Other Required Material

Design of Concrete Structures, 15th Ed. by A. Nilson, D. Darwin, C. Dolan, 2015, McGraw-Hill.

ACI Committee 318-2014, *Building Code Requirements for Reinforced Concrete and Commentary*, 2014, American Concrete Institute, Detroit.

Catalog Description

Introduction to materials and methods of reinforced concrete construction; behavior and design of reinforced concrete beams and one-way slabs considering deflections, flexure, shear and anchorage; behavior and design of columns including slenderness effects; design of spread footings; design of lateral load resisting frames and walls for earthquake effects. Laboratory includes experiments and design sessions leading to development of a structural design project in reinforced concrete.

Prerequisites

CE 120, Structural Engineering

Design Elective Course

Specific Outcomes of Instruction

	None	Some	Moderate	Extensive
1. Apply mathematics, science, and engineering				X
2. Design in presence of constraints				X
3. Function in multi-disciplinary team			X	
4. Engineering problem solving				X
5. Understand professional, ethical responsibilities			X	
6. Communicate effectively			X	
7. Understand broad impact of engineering solutions			X	
8. Understand importance of life-long learning			X	
9. Knowledge of contemporary issues				X
10. Use modern engineering tools			X	
11. Think critically				X

Topics Covered

1. Review of limit states and strength design concepts and applications
2. Reinforced concrete materials
3. Design of beams and one-way (slab-beam-girder and joist) floor systems in flexure

4. Design of beams and one-way slabs for shear
5. Design of beams and one-way slabs for bond and anchorage; location of bar cut-off points
6. Design of members subjected to axial load, flexure, and shear; methods to account for slenderness effects (depending on schedule)
7. Design of reinforced concrete foundations
8. Design of cantilever retaining walls
9. Lateral-force-resisting systems; wind and seismic loading, layout of load-resisting elements; special proportioning and detailing requirements; structural walls and frames
10. Serviceability considerations for beams and one-way slabs; cracking and deflections

Course Objectives

The objective of CE123N is to introduce the theory and application of analysis and design of reinforced concrete structures. The course focuses on understanding the behavior of reinforced concrete components and systems subjected to gravity as well as lateral loads.

Course Outcomes

1. Recognize the design philosophy of reinforced concrete structures.
2. Understand the difference between the structural behavior of different reinforced concrete structural elements through demonstration experiments and data analysis.
3. Be able to analyze reinforced concrete structural systems under gravity and lateral loads.
4. Be able to design different elements of reinforced concrete structural systems subjected to gravity and lateral loads.
5. Be able to analyze and design a complete structural system through a comprehensive design project.
6. Be able to produce a complete project document and present in a concise and complete manner to include structural drawings and structural calculations.