

CIV 312 – Steel and Reinforced Concrete Design

Current Catalog Description: Strength limit states, behavior, and proportioning of steel and reinforced concrete members. Design principles also address serviceability and constructability limit states. Steel tension member and connection design including gross and net yielding and block shear. Steel and reinforced concrete flexural members and columns. Shear capacity design for reinforced concrete beams. Reinforced concrete T-beams, doubly reinforced beams, and one-way slabs. Introduction to combined loading for both steel and concrete members.

Prerequisite: CIV 310 and CIV 340

Corequisite: None

Textbooks and/or Required Texts:

Other Required Material: American Institute of Steel Construction (AISC), *Steel Construction Manual*, 15th Edition. (2017)

American Concrete Institute (ACI), *Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary*. (2014)

This course is: Required

- Topics Covered:**
1. LRFD Approach and Background
 2. Steel Design and Construction
 - a. Tension Members
 - b. Tension Connections
 - c. Compression Members
 - d. Beams
 - e. Beam-Columns and Frames
 3. Reinforced Concrete Design and Construction
 - a. Flexure
 - b. Serviceability
 - c. Shear
 - d. Development Length
 - e. Columns
 4. Engineering Software and Design Code Discussion

Course Learning Outcomes/ Expected Performance Criteria:

Course Learning Objectives	ABET Student Outcomes
Identify and calculate the critical load combinations required for member design	1
Determine the capacity of and design a steel tension member	1, 2, 7
Determine the capacity of and design a steel flexural member	1, 2, 7
Determine the capacity of and design a steel column	1, 2, 7
Design a frame consisting of steel beams and columns	1, 2, 7
Determine the capacity of and design a singly reinforced concrete beam for flexure	1, 2, 7
Determine the capacity of a doubly reinforced concrete beam for flexure	1, 2, 7
Determine the capacity of and design a reinforced concrete beam for shear	1, 2, 7
Determine the capacity of and design a reinforced concrete column	1, 2, 7
Understand how research informs the design codes and discuss specific research that led to a change in the design code.	3, 7
Understand how modern engineering software is programmed and how the engineer is still responsible for answers they get from the software.	1, 2, 7

Prepared by: Georgios Moutsanidis (2021)