Northwestern University

Department of Civil and Environmental Engineering

Civ_Env 323 – Structural Steel Design – Spring 2023

Mo., We., Fr. 10-10.50 am (MG28), We. 1-2.20 pm (Annenberg Hall G32)

Instructor: Arancha Alarcon, Ph.D., P.E., A220

email:arancha.alarconfleming@northwestern.edu

Office hours: Mo. 12-2 pm and We. 2.30- 4.30 pm and by appointment

Required textbook: 1. AISC Steel Construction Manual 15th Edition, purchase directly from AISC at student rate.

2. *Unified Design of Steel Structures*, 3rd ed., L.F. Geschwindner, J. Liu, C.J. Carter, purchase at Barnes and Noble.com for $50.

Catalog description: Rational basis of structural design. Design approach for structural-steel components of a building system.

Pre-requisites: Civ_Env 221 (Theory of Structures), or equivalent.

Course description: This course will discuss the selection of member sizes for flexural, compression, and tensile member, design of bolted and weld connections for shear and axial forces; use of AISC Steel Construction Manual is required and LRFD concept is used.

Course Objectives: By the end of the course, students should be able to:

1. Describe the requirements of a properly designed structural steel structure
2. Describe the methodologies that govern strength design
3. Complete design of a tensile system (member sizing and weld or fastener connection design).
4. Complete design of a flexural member (bending, shear, lateral torsion buckling, etc.)
5. Complete design of a compression member (column)
6. Present design calculations in professional manner

Course Goals: To design fundamental components of structural steel structures in compliance with AISC Specification for Structural Steel Building (AISC 360), July 2016.

Student Learning outcomes: This course addresses the following ABET student learning outcomes & civil engineering program requirements:

Course Objectives	ABET Outcomes	Criteria met via	Assessment Outcome	Proposed Actions/ Comments
2	3.1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics			
3 – 5	3.2: an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors			
6	3.3: an ability to communicate effectively with a range of audience (through homework and design presentations)			
1	3.4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and social contexts (discussion)			no direct assessment
1,6	3.7: an ability to acquire and apply new knowledge as needed, using appropriate learning strategies (discussion)			no direct assessment

This course meets the following civil engineering program requirements:

- Apply knowledge of four technical areas appropriate to civil engineering
- Design a system, component, or process in more than one civil engineering context
- Explain basic concepts in management, business, public policy, and leadership

CIV_ENV 323: Course Outline

Week	Lecture Topics & Labs	Readings- Geschwindner, Liu and Carter
1 3/28, 3/29 & 3/31	Course overview; design process (brief) & intro. to steel, design loads	Ch. 1-2
2 4/3, 4/5 & 4/7	Tension system design- member	Ch. 4
3 4/10, 4/12 & 4/14	Compression member design - short column	Ch. 5.1-5.8
4 4/17, 4/19 & 4/21	Compression member design - slender column	AISC App. 7
5 4/24, **4/26** & 4/28	Flexure member design - compact and non-compact section	Ch. 6.1-6.7 **Midterm 1 (4/26)**
6 5/1, 5/3 & 5/5	Flexure member design - compact and non-compact section	
7 5/8, 5/10 & 5/12	Tension system design- bolt connections	Ch. 10.1-10.7
8 5/15, 5/17 & 5/19	Tension system design- connections	
9 5/22, **5/24** & 5/26	Tension system design- weld connections	Ch. 10.8 – 10.10 **Midterm 2 (5/24)**
10 **5/29**, 5/31 & 6/2	Flexure member design - lateral stability, review	**No class 5/29**

Final exam: Tuesday June 6, 3-5 pm

When there is no test, at least 50 min of Wednesday's meeting is used for discussion/review unless communicated otherwise.

Course Grades

- **Homework 20%**

Weekly homework due on Canvas. Solutions will be posted after due date. No late homework will be accepted. (Guidelines provided)

- **Midterm 1 20%**

Exam on Wednesday April 26, 1.00 - 2.20 pm at Annenberg G32

- **Midterm 2 20%**

Exam on Wednesday May 24, 1.00 - 2.20 pm at Annenberg G32

- **Final exam 35%**

Two-hour final exam scheduled for Tuesday June 6, 3-5 pm

- **Participation and teamwork 5%**