

Northwestern University

Department of Civil and Environmental Engineering

Civ_Env 323 – Structural Steel Design

Mo., We., Fr. 1-1.50pm Annenberg Hall G32, Tu 2-3.20 pm (Tech L150)

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

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Required text: 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-requisite: Civ_Env 221 and 216, 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

Academic Integrity: Engineers are required to adhere to the highest professional responsibility and ethics. Hence, Academic Integrity is strictly enforced in this course. A grade of F may be assigned to the course if Academic Integrity is breached. Refer to the University and McCormick School policy of Academic Integrity, <http://www.mccormick.northwestern.edu/students/undergraduate/academic-integrity.html> and *Clarification of Academic Integrity* handout.

Student Support Resources: Any student with a disability requesting accommodations is required to register with AccessibleNU Center (accessiblenu@northwestern.edu; 847-467-5530) preferably within the first two weeks of class. All discussions will remain confidential. Any student who wishes to seek assistance beyond the content of this course may want to meet with a staff member at CAPS (Student Affairs <http://www.northwestern.edu/counseling/>)

Course Outline:

Week	Lecture Topics	Comments
1 (1/6)	Course overview; design process (brief) & intro. to steel, design loads	Chapters 1-3
2 (1/13)	Tension system design- member	Chapter 4
3 (1/20)	Compression member design - short column	Chapter 5.1-5.8, no class 1/20, class on 1/21
4 (1/27)	Compression member design - slender column	AISC App. 7
5 (2/3)	Flexure member design - compact and non-compact section	Chapter 6.1-6.7-- Test 1 (2/7)
6 (2/10)	Flexure member design - compact and non-compact section	
7 (2/17)	Tension system design- bolt connections	Chapter 10.1-10.7
8 (2/24)	Tension system design- connections	
9 (3/2)	Tension system design- weld connections	Chapter 10.8 – 10.10-- Test 2 (3/4)
10 (3/9)	Flexure member design - lateral stability, review	

Final exam is Monday 3/16: 9-11 am

Course Grades

Course grade is composed of: homework and class preparation (team of two) (20%), quiz (unannounced) and tests (40%), final exam (35%), and instructor assessment (5%).

Grade Assignment

If you have a numerical grade of

≥95		A	90-95	Your grade will	A-		
87-90	your grade will	B+	83-87	be	B	80-83	Your grade will be
77-80	be	C+	73-77		C	70-73	B-
60-70		D					C-