Analysis and Design in Steel

CES 4605

Class Periods: MWF / Period 3 / 9:35AM – 10:25AM

Location: Weimer Hall (WEIM) Room 1084

Academic Term: Fall 2025

Instructor:

Taylor Rawlinson, Ph.D., P.E.

taylor.rawlinson@essie.ufl.edu

Weil Hall Room 128

Office Hours:

MWF 9:00AM - 9:30AM;

MWF 10:30AM - 11:15AM

By Appointment

Course Description

Elastic and plastic theories of design; design of members subjected to tension, compression, flexure, and torsion; design of connections and rigid frames.

Course Pre-Requisites

CES 3102, CGN 3501C, and engineering major.

Course Objectives

This course introduces structural steel design focusing on load and resistance factor design (LRFD) philosophy.

This course will enable students to:

1. Understand and apply the theoretical background and experimental behavior of structural steel members, connections, and frames
2. Design and analyze structural steel members, connections, and frames using standardized building codes and design specifications
3. Use structural analysis computer programs as design aids

Professional Component (ABET):

CES 4605 is an advanced elective course in the BS Civil Engineering Curriculum. It satisfies the additional Design Elective requirement and therefore meets the requirement in the Civil Engineering Program Criteria that students design in more than one civil engineering context.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
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	High
3. An ability to communicate effectively with a range of audiences	Medium

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 societal contexts	Low
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	High
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbook

- Title: Steel Construction Manual, 16th Ed. (Print)
  Author: American Institute of Steel Construction
  Publication date and edition: 2023
  ISBN number: 978-1-56424-116-0

This manual is necessary to complete homework assignments, in-class exercises, the design project, and the exams. To purchase the manual at a reduced cost, follow the instructions posted on Canvas. **Additionally, tabs are recommended for quick reference during assignments/tests.**

Recommended Materials

- Title: Unified Design of Steel Structures
  Authors: Louis F. Geschwindner, Judy Liu, and Charles J. Carter
  Publication date and edition: 2023, 4th Edition
  ISBN number: 979-8351317908

- Title: Steel Design
  Authors: William T. Segui and Sayed Soleimani
  Publication date and edition: 2025, 7th Edition
  ISBN number: 979-8214012315

Course Schedule (Subject to Change)

Week 1: Introduction to structural steel
Week 2: Introduction to structural steel design
Week 3: Calculation of service and factored loads on structural members
Week 4: Behavior and design of tension members
Week 5: Behavior and design of tension members
Week 6: Behavior and design of tension members
Week 7: Behavior and design of compression members
Week 8: Behavior and design of compression members
Week 9: Behavior and design of flexural members
Week 10: Behavior and design of flexural members
Week 11: Behavior and design of flexural members
Week 12: Behavior and design of beam-column members

Week 13: Behavior and design of beam-column members
Week 14: Behavior and design of welded and bolted connections

Attendance Policy, Class Expectations, and Make-Up Policy

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: (https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/).

Calculation Packages

Calculation Packages (homework) will consist of design and analysis problems of a smaller scope than the design project. Assignments are typically due at least one week after assigned and must be uploaded to Canvas by 11:59PM on the due date. Calculation packages will have a 24-hour grace period for submission. No late assignments will be accepted after the grace period. You are encouraged to work in groups but must summit assignments individually. If you consult with a classmate to complete the calculation package, you should write their name in the header of each page in which they assisted. Copying is not permitted.

In-class Assignments

There will be periodic in-class exercises during the semester. The instructor will be available to answer questions and provide guidance. You are encouraged to work with your classmates during these exercises. They will be due at the end of the class period.

Design Project

The design project mimics a realistic structure that must be designed to meet criteria established by the owner in accordance with standardized building code and design specifications. The project is divided into four submittals, each of which builds upon the work of the previous submittal. Because these submittals will be somewhat lengthy, organization, and presentation is critical. You will be divided into groups of 3 to 4 members. Submittals (one per group) must be uploaded to Canvas by 11:59PM on the due date. You may ask for advice from outside your group, but all calculations and designs should be done with your group alone. Copying is not permitted. The same late policy for calculation packages applies to design project submittals (except final submittal).

Exams

There are three exams spaced throughout the semester. Make-up exams will not be given unless prior coordination is made with the instructor or in extreme situations that are consistent with university policies found in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and with appropriate documentation.

Expectations for Written Work (Calculation Packages and Design Project)

In this course, you are expected to demonstrate a high level of professionalism in all submitted work. As in professional engineering practice, your work should be clear, precise, and independently verifiable. Engineers must communicate effectively with clients, subcontractors, colleagues, and supervisors. Your written work should reflect this standard.

The following guidelines apply to all submissions. Failure to follow them will result in significant point deductions:

1. No sloppy work. Even if your solution is correct, unclear or disorganized work is unprofessional and can lead to misinterpretation.

2. Use of MathCAD is strongly encouraged. MathCAD (available via UFApps) is recommended for calculation packages and design project work due to its clarity and professional formatting, mimicking industry practices. Hand calculations should be done on engineering paper.
3. Include a proper header. Each submission must include your name, date, assignment title, and names of any classmates you consulted.
4. Show your work. Calculations must be presented in a clear, logical, step-by-step format.
5. Justify your decisions. Clearly explain any assumptions, design choices, or simplifications.
6. Include technical drawings. Use detailed sketches or diagrams where they help clarify your design or analysis.
7. State the problem. Begin each section or problem with a brief summary of the problem statement or design objective.
8. Reference applicable codes. Cite relevant sections of design codes or standards used in your work.
9. Highlight final answers. Box, underline, or otherwise emphasize final results. Include a brief concluding statement if appropriate.
10. Submit clean, professional files. Canvas submissions must be compiled into a single high-quality PDF (8.5" x 11" or 11" x 8.5"). **MathCAD submissions should include both the .mcdx and .pdf files.**

Evaluation of Grades

Assignment	Percentage of Final Grade
Calculation Packages & In-Class Assignments	35%
Design Project Submissions	20%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Total	100%

Grading Policy

Percent	Grade	Grade Points
100% to 92.0%	A	4.00
< 92.0% to 89.5%	A-	3.67
< 89.5% to 87.0%	B+	3.33
< 87.0% to 82.0%	B	3.00
< 82.0% to 79.5%	B-	2.67
< 79.5% to 77.0%	C+	2.33
< 77.0% to 72.0%	C	2.00
< 72.0% to 69.5%	C-	1.67
< 69.5% to 67.0%	D+	1.33
< 67.0% to 62.0%	D	1.00
< 62.0% to 59.5%	D-	0.67
< 59.5% to 0%	F	0.00

More information on UF grading policy may be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Academic Policies and Resources:
https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/