University of Connecticut
Department of Civil & Environmental Engineering

CE 3630: Design of Steel Structures

Spring 2018

Instructor	Kevin McMullen, EIT		Bronwell Building (BRON), Room 310
Teaching Mentor	Arash E. Zaghi, PhD, PE, SE		Castleman Building (CAST), Room 328
Time and Location			
Lecture:	Tu-Th	11:00-12:15	LH 302
Lab:	Fr	10:00-11:00	LH 301 (dates will be announced in advance)
Office Hours:	We	10:30-12:00	BRON 310
	Or feel free to make an appointment		
Email	Email: kevin.mcmullen@uconn.edu. Please include **CE3630** in the subject line for all course related emails.		
Lab Instructor	Angela Lanning (angela.lanning@uconn.edu)	Mo 1:00-2:30	BRON 310

Text Book

Text Book: "*Build with Steel: A Companion to the AISC Manual*" by Paul W. Richards, 2012 (It can be purchased online from Amazon)

Optional Text Book: "*Unified Design of Steel Structures*," by Louis F. Geschwindner, Second Edition, John Wiley & Sons, 2011

Design Manual (Required): Steel Construction Manual, **15th Edition**, American Institute of Steel Construction, 2017. You need to use the code provided to you to order your manual with the student discount. The code is located on The AISC form which was handed out in the first class. You need the manual throughout the course and in future for your PE exam.

Prerequisites

CE 3110 Mechanics of Materials and CE 3610 Structural Analysis (concepts such as cross-section properties, stress and strain, and moment and shear diagrams will be frequently used in this course.)

Attendance

Students are expected to attend all lectures and class activities. There will be no makeup quiz or exams. Late submissions are not accepted. Only works missed by absence resulting from co–curricular activities performed in the interest of the university and/or those that support the scholarly development of the student or documented medical emergency will be accommodated. Students involved in such activities should inform me in writing prior to the anticipated absence and take the initiative to make up missed work in a timely fashion.

Goals

The purpose of this course is to provide you with a solid background in the fundamentals of steel structure design. In this course design concepts, the basics of structural loading, load combination, design of steel structural members, and the use of current design specifications will be discussed. This course will also make you familiar with steel design aids/tools that are commonly used by practicing structural engineers.

Outcomes

Upon successful completion of this course, you are expected to know how to use the current steel design specification, size or control simple steel members under given loadings, utilize related design aids and software, and present your design calculations in a professional format.

Tentative Final Grade Break Down (This may be adjusted later. You will be informed of any changes)

Homeworks	15%
Announced Quiz	10%
Lab Assignments	20%
Midterm Exam	20%
Final Exam	35%

Quizzes One announced quiz will be given during either the lecture time.

Midterm Exam There will be one midterm exam during the class time. The date and the content of the exam will be announced in advance.

Final Exam 2-hour final exam that covers the entire content of the course. (The date will be announced.)

Final Grade Requests for any bonus grades to put you in the next bracket will not be accepted. Any requests for passing the course if your grade is less than 62.99 will not be accepted.

Grade (out of 100)	Letter Grade
93-100	A
90-92.99	A-
87-89.99	B+
83-86.99	B
80-82.99	B-
77-79.99	C+
73-76.99	C
70-72.99	C-
67-69.99	D+
63-66.99	D
<62.99	F

Homework Homeworks are due a week after their assignment date at the beginning of class. Late submission will not be accepted. Solutions will be posted on HuskyCT. Presentation, format and neatness are counted towards your homework grade.

Cell Phones **Cell phones are not permitted to be used in class from start to finish**. Laptops can ONLY be used to take notes or during lab activities. Please be advised that texting and using laptops for other reasons will distract me and the other students; therefore, if you do not pay attention to my notice, I will ask you to leave the classroom.

Course Content

1- Introduction
2- Steel Material and Mechanical Properties of Steel
3- Structural Shapes and Calculation of Section Properties
4- Design Philosophies and Limit States in Steel Structure Design (ASD and LRFD Methods)
5- Design of Members Subjected to Tensile Forces
    a. Yielding Limit State
    b. Effective Net Area and Rupture Limit State
    c. Block Shear Failure
6- Design of Members Subjected to Compressive Forces (Column Elements)
    a. Buckling and Euler Theory
    b. Slenderness Ratio and Design for Stability
    c. Axial Compressive Capacity
    d. Local Buckling
7- Design of Members Subjected to Bending (Beam Elements)
    a. Plastic Section Modulus and Plastic Moment
    b. Lateral Torsional Buckling (LTB)
    c. Beams with Non-Compact Sections
8- Design of Members Subjected to Combined Effects of Axial Forces and Bending Moments (Beam-Column Elements)
    a. Interaction of Bending and Axial Forces
    b. Interaction Relationship
    c. Design for Stability and Moment Magnification Factors
9- Connections (time permitting)
    a. Basics of Bolted Connections
    b. Bolts Subjected to Tension
    c. Bolts Subjected to Shear and Tension

Suggestion: Become a student member of American Institute of Steel Construction (AISC) and the American Society of Civil Engineers. It is free for students! On their website you can find useful technical information, design guides, design examples, etc. (https://www.aisc.org/aisc-membership/member-types/student/ & https://www.asce.org/membership/student/)

Lab Activities The goal of the lab portion of this course is to familiarize students with an engineering analysis and design software called SAP2000. Students will learn how to build a model of an office building using this software including assigning loads to the structure, analyzing the structure, and controlling the capacity of members. Students have to complete a series of hand calculations on a number of members in order to check the calculations done by SAP 2000.

The lab activities will be performed during the lab class. All students must attend computer lab activities. Work missed during lab sessions cannot be made up. Students who miss lab sessions will not receive credit for the lab activity they have missed. Lab activities are integral parts of the course. In the computer lab sessions, a powerful, professional analysis and design software will be utilized to complement theories and hand calculations. There will be two short experimental demonstrations during the course.

You will install the student version of SAP2000 on your own laptop. You must bring your laptop to class on days designated for computer lab activities.

Lab Log Sheets At the end of each lab, students need to complete and sign a log sheet. ONLY the forms that are submitted at the end of the lab sessions will be accepted.

Lab Final Report A final report describing the process of modeling and design, selected outputs and hand calculations should be submitted. The written report is due before the week of final exams. Each student must submit an individual report. The required content of the report will be discussed later.

Lab Content

1- Typical Building Structural Systems
2- Introduction to the Design Project
3- Loads and Load Factors
4- Modeling the Geometry and Assigning Member Sections
5- Assigning Loads and Load Cases
6- Performing Analysis and Obtaining Analysis Results
7- Generating Design Sheets for Selected Elements
8- Hand Calculations to Check the Results

The lab activities will be synchronized with the lectures. The time for each lab module will be announced in advance. Please make sure you bring your laptop to class on these days.

Tentative Grading Distribution

Tutorial Model	15%
Log Sheets	25%
Final Report	35%
Completeness and Correctness of Structure Model	25%

Policy Against Discrimination, Harassment and Inappropriate Romantic Relationships

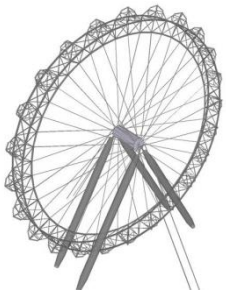
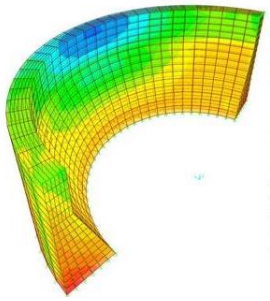
The University is committed to maintaining an environment free of discrimination or discriminatory harassment directed toward any person or group within its community – students, employees, or visitors. Academic and professional excellence can flourish only when each member of our community is assured an atmosphere of mutual respect. All members of the University community are responsible for the maintenance of an academic and work environment in which people are free to learn and work without fear of discrimination or discriminatory harassment. In addition, inappropriate Romantic relationships can undermine the University's mission when those in positions of authority abuse or appear to abuse their authority. To that end, and in accordance with federal and state law, the University prohibits discrimination and discriminatory harassment, as well as inappropriate Romantic relationships, and such behavior will be met with appropriate disciplinary action, up to and including dismissal from the University. More information is available at http://policy.uconn.edu/?p=2884.

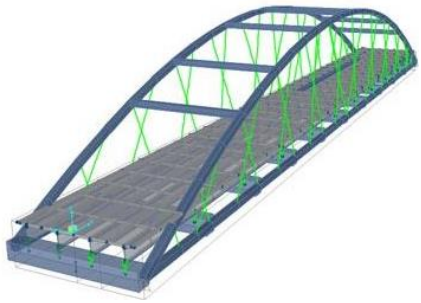
Sexual Assault Reporting Policy

To protect the campus community, all non-confidential University employees (including faculty) are required to report assaults they witness or are told about to the Office of Diversity & Equity under the Sexual Assault Response Policy. The University takes all reports with the utmost seriousness. Please be aware that while the information you provide will remain private, it will not be confidential and will be shared with University officials who can help. More information is available at http://sexualviolence.uconn.edu/.

Introduction for Download and Installation of SAP 2000

SAP2000 is a multi-purpose software that is ideal for the analysis and design of different types of structural system. Basic and complex structural systems may be modeled, analyzed, designed, and optimized using a practical and intuitive object-based modeling environment. This software simplifies and streamlines the engineering design process.



SAP2000 is one of the products of Computers and Structures Inc. (CSi). It is widely used by civil engineers to design and analyze different types of structures.

In this course, you will use the free student version of SAP2000 to complement theories that will be presented in the lectures. The Evaluation version is fully functional and the same as the original version with a few limitations, mostly related to the size of the structural model.

A link will be provided to you to download the student version of SAP2000.

ftp://csidemos:U790lzh4Dgdy@ftp.csiamerica.com/

Choose: **SAP2000V20**

The student version has the following limitations:

- Models with more than 100 point objects cannot be saved,
- Models with more than 100 analysis joints cannot be analyzed (linear.)
- Models with more than 30 analysis joints cannot be analyzed (nonlinear.)
- 64-bit analysis is not available.

References:

https://wiki.csiamerica.com/display/sap2000/Home
http://www.csiamerica.com/products/sap2000/features