

Western University
Faculty of Engineering
Department of Civil and Environmental Engineering

CEE 9548 – Advanced Design and Behavior of Steel

COURSE OUTLINE 2023-2024

DESCRIPTION

Topics covered in this course include; analysis and behaviour of steel structures and industrial buildings, design of steel structures, understand the concepts of structure stability and lateral torsional buckling of steel beams, design of crane-supporting steel structures, plate girders, and steel connections.

The general objectives of this course are for student to become able to:

- Understand the three-dimensional modeling aspects and techniques of steel industrial buildings
- Understand and quantify the concept of structure stability and buckling of columns
- Understand the stability concepts of beam-columns
- Understand the lateral torsional buckling of steel beams
- Design steel plate girders with the provisions of CSA Standard CAN/CSA-S16-14
- Design crane-supporting steel structure with the provisions of CSA Standard CAN/CSA-S16-14
- Understand the behaviour of Steel Connections.

ENROLLMENT RESTRICTIONS

Enrollment in this course is restricted to graduate students in the Department of Civil and Environmental Engineering.

Note: It is the student's responsibility to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the student's responsibility to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

INSTRUCTOR CONTACT INFORMATION

Course instructor: Ahmed Hamada

Email address: ahamada2@uwo.ca

Office: SEB 3109

Office hours: Weekly Office hours are held via Zoom (By Appointment)

COURSE FORMAT

face-to-face (in-person)

“In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online at the discretion of the course instructor”

TOPICS

Topic #	Description	Learning Activities	Tentative Timeline
1	Lateral Load resisting systems for industrial steel buildings	Six (6) hours Lecture	(Week 1 and 2)
2	Concept of Structure Stability	Six (6) hours Lecture	Week (3 and 4)
3	Stability Concepts of Steel Beam-Columns	Six (6) hours Lecture + Quiz 1	(Week 5 and 6)
4	Lateral Torsional Buckling of Steel Beams	Three (3) hours Lecture	(Week 7)
	Reading Week (No Class)		(Week 8)
5	Design of Steel Plate Girders	Three (3) hours Lecture	(Week 9)
6	Design Crane-Supporting Steel Structures	Six (6) hours Lecture + Quiz 2	Week (10 and 11)
7	Introduction to Steel Connections Behaviour and Design	Three (3) hours Lecture	(Week 12)

SPECIFIC LEARNING OUTCOMES

Degree Level Expectation	Weight	Assessment Tools	Outcomes
Depth and breadth of knowledge	20%	<ul style="list-style-type: none"> • Assignments • Final Project • Oral Examinations 	<ul style="list-style-type: none"> • Understanding of advanced concepts and theories • Awareness of important current problems in the field of study • Understanding of computational and/or empirical methodologies to solve related problems
Research & scholarship	15%	<ul style="list-style-type: none"> • Final Project 	<ul style="list-style-type: none"> • Ability to conduct literature review for current advancements in the field of specialization • Ability to conduct coherent and thorough analyses of complex problems using established techniques/principles and judgment
Application of knowledge	35%	<ul style="list-style-type: none"> • Assignments • Final Project • Examinations 	<ul style="list-style-type: none"> • Ability to apply knowledge in a rational way to analyze a particular problem • Ability to use coherent approach to design a particular engineering system using existing design tools
Professional capacity / autonomy	5%	<ul style="list-style-type: none"> • Final Project 	<ul style="list-style-type: none"> • Awareness of academic integrity • Ability to implement established procedures and practices in the coursework • Defends own ideas and conclusions • Integrates reflection into his/her learning process
Communication skills	15%	<ul style="list-style-type: none"> • Final Project 	<ul style="list-style-type: none"> • Ability to communicate (oral and/or written) ideas, issues, results and conclusions clearly and effectively
Awareness of limits of knowledge	10%	<ul style="list-style-type: none"> • Final Project 	<ul style="list-style-type: none"> • Awareness of the need of assumptions in complex scientific analyses and their consequences • Understanding of the difference between theoretical and empirical approaches

			<ul style="list-style-type: none"> • Ability to acknowledge analytical limitation due to complexity of practical problems
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COURSE MATERIAL

Prepared class notes will be made available through the course website on OWL at <http://owl.uwo.ca/>, along with other useful reference material and data for assignments.

Lecture notes and any posted demonstration videos are copyrighted to the instructor and legally protected. Do not post these videos and lecture notes on any other website or online forums. The recording of the live/synchronous lectures of the course without the permission from the course instructor is prohibited. The illegal posting and sharing of the copyrighted course content could be subjected to legal actions.

UNITS

SI units will be used in lectures and examinations

ASSESSMENTS

Assessment Type	Material Covered	Tentative Due Date	Weight
Take Home Assignments	All Topics		20%
Three (3) Quizzes (Open Book)	Topics 1-3 (Quiz 1) and topics 4-6 (Quiz 2) and All Topics (Quiz 3)	Thursday, Oct 19, 2023 and Thursday, Nov 23, 2023 and Thursday, December 07, 2023	45%
Final Project Building Analyses and Design (Group – Max. 4 Students/group)	Building Analyses and Design for whole course materials	Dec 14 and 15, 2023	35%

Note: Students who have failed this course previously must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.

Final Project Breakdown

Final Project Portfolio:

- Cover Letter 05%
- Design Brief 10%

- Calculations 25%
- Drawings 20%
- Oral discussion & Defence of design 40%

Final Project - Max. 3 Students/group

Oral discussion and Defence of design

Each group will give a 5 to 10 minutes presentation on their project followed by an oral discussion and defence of the design. Each student is required to be fully aware of all aspects of the final project, such as analyses, design, and drawings. Some of the questions shall be asked individually to any of the group members, and others to the whole group. Each individual member of the group might receive different mark based on the oral discussion.

Final Project Portfolio

Cover letter and Design Brief

The length of the cover letter is one page and follow the common layout of cover letters directed to the Department of Civil and Environmental Engineering at Western University. The length of the final design brief shall not exceed 10 typed pages (font size 12, double spaced). Design Brief Contents are: Cover Letter, Executive Summary; Introduction, Design Criteria and Codes of Analyses, particulars of design/analysis, lateral deflections results, and Recommendations (or Conclusions). The Design Criteria would include the design standards and technical references used; the particular design criteria adopted also must be indicated succinctly. The particulars of design/analysis would summarize the rationale behind the various design decisions. The evaluation of the final design brief shall be based on the format, layout, completeness, technical content and use of English.

Calculations

Calculations must be well organized, clear, complete, and done on calculation paper. Each calculation page shall be dated, and shall indicate the name or initials of the person who performed the calculations. A final calculation set, which must be current, checked and indexed, shall be submitted with the final design brief. The evaluation of calculations will be based on their clarity, completeness, technical content, originality, and accuracy.

Drawings

Each student is required to prepare a set of drawings. Each drawing shall be dated and shall indicate the name or initials of the person who did the drawing. The drawings shall be developed using AutoCAD or similar drafting software. ETABS drafting tool is not allowed to be used. The evaluation of drawings will be based on their technical content, clarity, completeness, and quality of drafting.

Quizzes and Examination:

Three One-hour quizzes will be held during lecture hours. These quizzes are tentatively scheduled for 4:30 pm on Thursday, Oct 19, 2023 and Thursday, Nov 23, 2023 and Thursday, December 07, 2023.

Assignments:

Each student must turn in the solution of the assignment at 5:00 pm Monday Morning electronically on OWL. Hardcopy submissions are not accepted unless permission is granted by the instructor. Late assignment will be accepted till 5:00 pm on the Tuesday following the submission date and have to be submitted directly to the instructor. Late assignments will be assessed a penalty of 10% per day, to a maximum of 4 days, after which they will receive a mark of zero. Extensions are to be negotiated with the course instructor, not the teaching assistants. All required papers, assignments, and projects may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Activities in which collaboration is permitted:

- Final Project

Activities in which students must work alone (collaboration is not permitted):

- Assignments
- Quizzes

REQUIRED TEXTBOOK

Prepared class notes should be uploaded to OWL and brought to all lectures and tutorial sessions.

OPTIONAL COURSE READINGS

- Handbook of Steel Construction 2016, Canadian Institute of Steel Construction, 11th Edition, Second revised printing, Canada
- G. L. Kulak, and G. Y. Grondin 2016, Limit States Design in Structural Steel, Canadian Institute of Steel Construction, 10th Edition, First printing, Canada

CHEATING, PLAGIARISM/ACADEMIC OFFENCES

Academic integrity is an essential component of learning activities. Students must have a clear understanding of the course activities in which they are expected to work alone (and what working alone implies) and the activities in which they can collaborate or seek help; see information above and ask instructor for clarification if needed. Any unauthorized forms of help-seeking or collaboration will be considered an academic offense. University policy states that cheating is an academic offence. If you are caught cheating, there will be no second warning. Students must write their essays and assignments in their own words. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence. Academic offences are taken seriously and attended by academic penalties which may include expulsion from the program. Students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence at the following website: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

CONDUCT

Students are expected to follow proper etiquette to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in course activities and/or is not following the rules and responsibilities associated with the course activities, will be reported to the Associate Dean (Graduate) (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean (Graduate), the student could be debarred from completing the assessment activities in the course as appropriate.

HEALTH/WELLNESS SERVICES

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several health and wellness related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Faculty of Engineering has a Student Wellness Counsellor. Information on how to schedule an appointment with the counsellor is available at: <https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/Student-Wellness-Counselling.html>

Students who are in emotional/mental distress should refer to Mental Health@Western: <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

SICKNESS

Students should immediately consult with the Instructor (for a particular course) or Associate Chair (Graduate) (for a range of courses) if they have problems that could affect their performance. The student should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or the Associate Chair (Graduate) immediately (or as soon as possible thereafter) will have a negative effect on any appeal. Obtaining appropriate documentation (e.g., a note from the doctor) is valuable when asking for accommodation due to illness.

Students who are not able to meet certain academic responsibilities due to medical, compassionate or other legitimate reason(s), could request for academic consideration. The Graduate Academic Accommodation Policy and Procedure details are available at:

<https://www.eng.uwo.ca/graduate/current-students/academic-support-and-accommodations/index.html>

ACCESSIBLE EDUCATION WESTERN (AEW)

Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program. Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education Western (AEW): http://academicsupport.uwo.ca/accessible_education/index.html

AEW is a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AEW and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.