

WESTERN UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 9548 – Advanced Design and Behavior of Steel

Course Outline 2021-2022

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.

Prerequisites:

Bachelor's degree in Civil 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.

Topics

Topic #	Description	Learning Activities	Tentative Timeline
1	Lateral Load resisting systems for industrial steel buildings	Nine (9) hours In Person	September 17, 24, and October 01, 2021 (Week 1, 2 and 3)
2	Concept of Structure Stability	Six (6) hours In Person	October 08 and 15, 2021 Week (4 and 5)
3	Stability Concepts of Steel Beam-Columns	Three (3) hours In Person	October 22, 2021 (Week 6)
4	Lateral Torsional Buckling of Steel Beams	Three (3) hours In Person + In Person Quiz 1	October 29, 2021 (Week 7)
5	Design of Steel Plate Girders	Three (3) hours In Person	November 05, 2021 (Week 8)
6	Design Crane-Supporting Steel Structures	Three (3) hours In Person	November 12, 2021 (Week 9)
7	Introduction to Steel Connections Behaviour and Design	Six (6) hours In Person + In Person Quiz 2	November 19 and 26, 2021 (Week 10 and 11)

Specific Learning Outcomes:

Degree Level Expectation	Weight	Assessment Tools	Outcomes
Depth and breadth of knowledge	20%	<ul style="list-style-type: none"> • Assignments • Final Projects I and II • 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"> • Project I Report and Presentation 	<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 Projects I and II • 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 Projects I and II 	<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"> • Project I Report and Presentation 	<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 Projects I and II 	<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 • Ability to acknowledge analytical limitation due to complexity of practical problems

Assessments

Assessment Type	Material Covered	Tentative Due Date	Weight
Take Home Assignments	All Topics		20%

In Person Quizzes (two) (Open Book)	Topics 1-4 and topics 5-7	Friday October 29 and Friday November 26, 2021	30%
Final Project I Report and Presentation (Group – Max. 4 Students/group)	Report and Presentation of State-of-the-Art Steel Structures and Connections	Friday December 03, 2021	20%
Final Project II Building Analyses and Design (Group – Max. 4 Students/group)	Building Analyses and Design for whole course materials	Friday, December 10, 2021	30%

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.

Project I Breakdown

- Presentation and Oral Discussion 60%
- Report 40%

Project II Breakdown

Final Project Portfolio:

- Cover Letter 05%
- Design Brief 10%
- Calculations 25%
- Drawings 20%
- Oral discussion & Defence of design 40%

Project I - Max. 4 Students/group

Presentation

Each group will give a 15 minutes presentation on their project followed by an oral discussion and defence of the report topic. Each student is required to be fully aware of all aspects of the report and **participate equally in presenting**. Some of the questions shall be asked individually to any of the group members, and others to the whole group.

Report

The length of the Project I report shall not exceed 20 typed pages (font size 12, double spaced, including all figures, references, title page, etc.). The evaluation of the final report shall be based on the format, layout, completeness, technical content and use of English.

Project II - Max. 4 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:

Two One-hour quizzes will be held on Friday Morning (Same day of the lecture). These quizzes are tentatively scheduled for 9:00 am on Friday, October 29 and November 26, 2021.

The Two One-hour quizzes will be conducted in Person.

Assignments:

Each student must turn in the solution of the assignment at 9:00 am 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:

- Project I
- Project II

Activities in Which Collaboration is Permitted:

- Assignments
- Quizzes

Contact Hours:

Dr. Ahmed (Mahdy) Hamada, *P.Eng.*
email: ahamada2@uwo.ca

Contact policy:

- Contact instructor via email (above)
- Weekly Office hours are held in person or via Zoom

Administrative Assistant: Eduard Sviridenko (esviride@uwo.ca)

3 lecture hours per week
Friday: 1:30-4:30 pm (In-Person)

Textbook:

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

Optional Course Readings:

List of books

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

Course Content:

The lecture notes and online lecture 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 sessions of the course without the permission from the instructor is prohibited. The illegal posting and sharing of the copyrighted course content could be subjected to legal actions.

Units:

Both SI and FPS unit systems may be used in lectures, tutorials and examinations.

Computing:

Final project and assignments involve computer modelling using the commercial program ETABS, S-Frame, S-PAD, spread sheets, and writing report. The full versions of software are available at the PC labs in the engineering building or through online access as per the Faculty of Engineering-IT procedures (please consult with Faculty of Engineering IT for granting access to these software).

Use of English:

In accordance with Senate and Faculty Policy, students may be penalised up to 10% of the marks on all assignments, tests, and examinations for the improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

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 under “Assessments” 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 (see Western's scholastic discipline regulations for graduate students).

Attendance:

Any student who, in the opinion of the instructor, has not engaged sufficiently in class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Conduct:

Students are expected to follow proper etiquette during synchronous and asynchronous activities to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in the synchronous and asynchronous learning activities and/or is not following the rules and responsibilities associated with the online learning 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:

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 (remotely accessible) 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. Campus mental health resources may be found at

http://www.health.uwo.ca/mental_health/resources.html
<https://www.uwo.ca/health/psych/index.html>

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.

Accessibility:

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at 661-2111 x 82147 or

http://academicsupport.uwo.ca/accessible_education/index.html, for any specific question regarding an accommodation.

Accommodation:

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: [Academic Accommodation for Students with Disabilities](#).

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the term, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For Western University policy on Consideration for Student Absence, see

[Policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs](#)

and for the Student Medical Certificate (SMC), see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the [Western Multicultural Calendar](#).

Use of Recordings:

All of the remote learning sessions for this course will be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals under special circumstances. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Notice:

Students are responsible for regularly checking their email, course website (<https://owl.uwo.ca>) and notices posted outside the Civil and Environmental Engineering Department Office.