

WESTERN UNIVERSITY - FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 4438B – Introduction to Wood Design – Course Outline 2023-24

This course is intended to extend the Civil Engineering Program in the area of structural engineering to include the design and analysis of wood structures. Recent advances have led to an increase in the prevalence of engineered wood structures, notably multistory buildings. As wood is a green building material, it is expected that its use will continue to grow as efforts to address climate change expand. Students completing this course will be well positioned to lead the emergence of wood as a structural material and participate in the design and construction of wood structures. The general objectives are for students to be able to:

- Understand the physical and mechanical properties of wood and structural wood products.
- Understand the design procedures for wood structures and fire safety
- Design different wood elements in accordance with provisions of CSA standards CAN/CSA O86-14,
 - Axially Loaded Members
 - Flexural Members
 - Combined Axial and Flexural Members
- Design wood shear walls and diaphragms under lateral loads in accordance with the provisions of CSA standards CAN/CSA O86-14.
- Design wood connections
- Understand different wood structural systems

Calendar Copy:

Topics covered in this course include: physical and mechanical properties of wood and structural wood products, design of axially loaded members, flexural members, and combined axial and flexural wood members, design of light-framed wood diaphragms and shear walls, design of wood connection and introduction of different wood systems and structural assemblies.

Prerequisites:

None

Antirequisites:

None

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.

Contact Hours:

Course delivery with respect to the COVID-19 pandemic

Although the intent is for this course to be delivered in-person, the changing COVID-19 landscape may necessitate some or all of the course to be delivered 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 assessments affected will be conducted online as determined by the course instructor.

When deemed necessary, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>.

3 lecture hours per week

Lectures will be delivered in-class during lecture time slots and recorded. Recorded lectures will be posted afterwards to the course OWL site.

2 hours/week Tutorial and office hours

Office Hours Via Zoom or In-Person

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

Instructor:

Dr. Ahmed (Mahdy) Hamada, *P.Eng.*, SEB 3117

email: ahamada2@uwo.ca

Office hours: By Appointment – TBA

Teaching Assistant:

TBA

Textbook:

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

Other references:

Wood Design Manual 2017 – Canadian Wood Council CWC 2017 and Canadian Standards Association, Mississauga, ON, Canada

Introduction to Wood Design 2018 – Canadian Wood Council CWC 2018 and Canadian Standards Association, Mississauga, ON, Canada

The above references will be on hold in Taylor library, and will be available for one-day borrowing.

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 S-Timber, 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).

Specific Learning Objectives:

1. Introduction
 - a. Wood as a green building material
 - b. History of wood structures
2. Physical and Mechanical Properties of wood
 - a. Physical and mechanical properties
3. Structural Wood Products and Structural Forms
 - a. Sawn lumber, visually graded, MSR, and engineered wood
 - b. Specified Strengths and Modification factors
 - c. Shrinkage
4. Design Process and Code Consideration
 - a. Limit State Design Procedures
 - b. Ultimate and Serviceability Limit State for Wood Structures

5. Design of Axially Loaded Members
 - a. Compression Members
 - b. Tension Members and Trusses
6. Design of Flexural Members
 - a. Sheathing and Flooring
 - b. Floor joists
 - c. Beams and Girders
7. Design of Combined Axial and Flexural Members
 - a. Design of Columns under wind loads
 - b. Design of Frame Girders
8. Light-Framed Diaphragms and Shear Walls
 - a. Distribution of forces to lateral load resisting system
 - b. Design of Light-Framed wood diaphragms
 - c. Design of Light-Framed wood walls
9. Fire Safety
 - a. Mechanics of wood in fire
 - b. Code procedures and encapsulation
10. Design of Connections
 - a. Nails, bolts, and lag screws
 - b. Failure Modes
11. Introduction to Wood Structural Systems
 - a. Light-Framed and Heavy Timber standard systems
 - b. Different Types of Systems Commonly Used
 - c. Introduction to Heavy Timber Buildings

General Learning Objectives:

E = Evaluate, T = Teach, I = Introduce

Knowledge Base	T	Individual Work	I	Ethics and Equity	-
Problem Analysis	T	Team Work	I	Economics and Project Management	-
Investigation	-	Communication	I	Life-Long Learning	I
Design	T	Professionalism	I		
Engineering Tools	T/I	Impact on Society	I		

Evaluation:

The final mark will be determined as follows:

Assignments	20%
2 Quizzes (Open Book - written quizzes)	30%
Project I - Report and Presentation (Group – Max. 2 Students/group)	20%
Project II - Building Analyses and Design (Group – Max. 2 Students/group)	30%

Total	100%
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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

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|------------------------------------|-----|
| ○ Presentation and Oral Discussion | 60% |
| ○ Report | 40% |

Project II Breakdown

Final Project Portfolio:

- | | |
|---------------------------------------|-----|
| ○ Cover Letter | 05% |
| ○ Design Brief | 10% |
| ○ Calculations | 20% |
| ○ Drawings | 15% |
| ○ Oral discussion & Defence of design | 50% |

Project I - Max. 2 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. 2 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 during tutorial hours. These quizzes are tentatively scheduled for Friday, February 17 and Friday, March 24, 2023.

In-Person written quizzes will be held during these tentative dates shown above.

Assignments:

Each student must turn in the solution of the assignment at 5:00 pm Monday afternoon 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, 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>).

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:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

For more information on scholastic offenses, please see:

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

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.

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

Sickness and Other Problems

Students should immediately consult with the instructor if they have any problems that could affect their performance in the course. The student should seek advice from the instructor regarding how best to deal with the problem. Failure to notify the instructor (or as soon as

possible thereafter) will have a negative effect on any appeal. Please visit for information on how to submit a request for Academic Consideration:

<https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html>

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.

Conduct:

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Please turn off your cell phone before coming to a class, tutorial, quiz or exam. On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: <http://www.uwo.ca/univsec/board/code.pdf>

Some components of this course will involve online interactions. To ensure the best experience for both you and your classmates, please honour the following rules of etiquette:

- please “arrive” to class on time
- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly mute your microphone for the entire class until you are invited to speak, unless directed otherwise
- [suggested for classes larger than 30 students] In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- [suggested for cases where video is used] please be prepared to turn your video camera off at the instructor’s request if the internet connection becomes unstable
- unless invited by your instructor, do **not** share your screen in the meeting

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:

- if you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question
- remember to unmute your microphone and turn on your video camera before speaking
- self-identify when speaking.
- remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:

- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

Contingency plan for an in-person class pivoting to 100% online learning:

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 as determined by the course instructor.

Online Proctoring Notice:

Tests and examinations in this course will be conducted using Zoom. You will be required to keep your camera on for the entire session, hold up your student card for identification purposes, and share your screen with the invigilator if asked to do so at any time during the exam. The exam session will not be recorded.*

More information about the use of Zoom for exam invigilation is available in the Online Proctoring Guidelines at the following link:

<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf>.

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link:

<https://support.zoom.us/hc/en-us>.

* Please note that Zoom servers are located outside Canada. If you would prefer to use only your first name or a nickname to login to Zoom, please discuss this with your instructor in advance of the test or examination.

Sickness and Other Problems:

Students should immediately consult with the Instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the Instructor or Department Chair regarding how best to deal with the problem. Failure to notify the Instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

Students that 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

For more information concerning medical accommodations, please see:

http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf

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

Consultation:

Students are encouraged to discuss problems with their teaching assistant and/or the Instructor in tutorial sessions. Office hours will be arranged for the students to meet with the Instructor and teaching assistants. Other individual consultation can be arranged by appointment with the instructor.

Course Breakdown:

Engineering Science = 25 %, Engineering Design = 75 %

The document “INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED” is part of this course outline.