WESTERN UNIVERSITY - FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CEE 4438B – Introduction to Wood Design – Course Outline 2024-25

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 lead 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:

3 lecture hours per week

Lectures are organized into weekly learning modules, including both in-person/online lectures and in-person discussion. Students should review the online lectures in the week they are posted and be prepared to discuss and apply the concepts presented during the weekly lecture sessions. Review of lecture material and attendance at lecture sessions should take approximately 6 hours per week.

2 tutorial hours per week

A 2-hour tutorial session will be delivered each week during the scheduled tutorial hours. A graded team

Instructor:

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

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		

Accreditation Units:

Engineering Science = 25 %, Engineering Design = 75 %

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. 3 Students/group)	20%
Project II - Building Analyses and Design (Group – Max. 3 Students/group)	30%
Total	100%

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 20%
- Drawings 15%
- Oral discussion & Defence of design 50%

Project I - Max. 3 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. 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:

Two One-hour quizzes will be held during tutorial hours. These quizzes are tentatively scheduled for Tuesday, February 11 and Tuesday, March 18, 2025 at the same time and location of tutorials.

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).

Participation:

Participation will be assessed based on class attendance, participation in lectures and tutorials and completion of short in-class assessments.

I. Missed/Late Accommodation Policy:

1. Students missing a test/assignment/lab or examination you will report the absence by submitting Academic Consideration Request form through STUDENT ABSENCE PORTAL.
2. Documentation must be provided as soon as possible.

II. Exam Accommodation:

1. If you are unable to write a final examination, report your absence using the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department and the Associate Dean and in order to apply you must submit an the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
   PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

III. Late Assignments:

1. Students must advise the course instructor if they are having difficulty completing an assignment on time (prior to the due date of the assignment).
2. Students should be prepared to submit the Academic Consideration Request Form and provide documentation if requested to do so by the course instructor (see reverse side for information on documentation).
3. If granted an extension, a revised due date should be established with the course instructor. The approval of the Chair of your Department (or the Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. This course has 10 assignments with only 8/10 assignments counted towards your final grade. Academic consideration will not be granted for missed assignments. If students miss 2/10 assignments, the remaining 8 assignments will be used in the calculation of the final grade. If students miss more than 2 assignments, they will receive a grade of zero on each missed assignment.
5. This course employs flexible deadlines for assignments. The assignment deadlines can be found above in the course outline. For each assignment, students are expected to submit the assignment by the deadline listed. Should illness or extenuating circumstances arise, students are permitted to submit their assignment up to 72 hours past the deadline without academic penalty. Should students submit their assessment beyond 72 hours past the deadline, a late penalty of XX% per day will be subtracted from the assessed grade. As flexible deadlines are used in this course, requests for academic consideration will not be granted. If you have a long-term academic consideration or an accommodation for disability that allows greater flexibility than provided here, please reach out to your instructor at least one week prior to the posted deadline.
6. Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

IV. Medical Accommodation:

1. Requests for Academic Consideration Request Form through STUDENT ABSENCE PORTAL.

2. Requests for academic consideration must include the following components:
    a. Self-attestation signed by the student (*This is only accepted for the first/one absence*)
    b. Medical note
    c. Indication of the course(s) and assessment(s) affected by the request
    d. Supporting documentation as relevant
3. Requests without supporting documentation are limited to one per term per course.
4. **Students must request academic consideration as soon as possible and no later than 48 hours after the missed assessment.**
5. Once the request and supporting documents have been received and reviewed, appropriate academic consideration, if granted, shall be determined by the instructor in consultation with the academic advisor, in a manner consistent with the course outline. Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements. Some forms of academic consideration, such as arranging Special Examinations, assigning a grade of Incomplete, or granting late withdrawals without academic penalty, may only be granted by the Academic Advising office of the Faculty of Engineering.

V. Religious Accommodation:

When scheduling unavoidably conflicts with religious holidays, which (a) require an absence from the University or (b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate Department Chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning the work done in classes from which they are absent and to take appropriate action.

VI. Academic Integrity:

In the Faculty of Engineering, we encourage students to create a culture of honesty, trust, fairness, respect, responsibility, and courage, befitting the professional degree you are pursuing.

Please visit Academic Integrity Western Engineering for more information

VII. Academic Offences:

Plagiarism means using another's work without giving credit. The university has rules against plagiarism and other scholastic offences. Western Engineering has a zero-tolerance policy on plagiarism. The minimum penalty is zero on the course work and a repeat offence will earn you zero on the course. A third offence may lead to expulsion from the university.
Scholastic Discipline for Undergraduate Students & Cheating, Plagiarism and Unauthorized Collaboration: What Students Need to Know

Students must write their reports, essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on 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). Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

VIII. Faculty of Engineering AI Policy:

The use of generative Artificial intelligence (GenAI) tools won't be discouraged in the Faculty of Engineering. As we pride ourselves on building the future we can't hide from the use of GenAI tools to contribute to the understanding of the course materials. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed, as a resource.
GenAI tools use won't be permitted in any type of examination or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

IX. Use of English Policy:

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally, poorly written work except for 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.

X. Accessibility:

Western is committed to achieving barrier free accessibility for persons with disabilities studying, visiting and working at Western. As part of this commitment, there are a variety of services, groups and committees on campus devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. To help provide the best experience to all members of the campus community, please visit the Accessibility Western University for information on accessibility-related resources available at Western.

Students with disabilities may arrange for academic accommodation at Western. For a more detailed explanation, please visit Academic Support & Engagement -Academic Accommodation.

XI. Inclusivity, Diversity, and Respect:

The Faculty of Engineering at Western University is committed to creating equitable and inclusive learning environments that value diverse perspectives and experiences. We recognize that university courses often marginalize students based on social identity characteristics such as, but not limited to, Indigeneity, race, ethnicity, nationality, ability, gender identity, gender expression, sexuality, age, language, religion, and socioeconomic status. Understanding this, we strive to facilitate equitable experiences and inclusion within the classroom by respecting and integrating multiple ways of knowing, being, and doing. Please visit the Office of Equity, Diversity and Inclusion.

XII. Health and Well-Being:

- Health & Wellness Services – Students - Offers appointment-based medical clinic for all registered part-time and full-time students.

- Mental Health Support - Provides professional and confidential services, free of charge, to students needing assistance to meet their personal, social and academic goals. Services include consultation, referral, groups and workshops, as well as brief, change-oriented psychotherapy.
- Crisis Support - For immediate assistant, please visit Thames Hall Room 2170 or call 519-661-3030. The crisis clinic operates between 11:00 am - 4:30 pm. For after-hours crisis support, click here.
- Gender-Based Violence and Survivor Support - Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, here. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Important Contacts:

Engineering Undergraduate Services	SEB 2097	519-661-2130	engugrad@uwo.ca
Civil & Environmental Engineering	SEB 3005	519-661-2139	civil@uwo.ca
Office of the Registrar/Student Central	WSSB 1120	519-661-2100	

Important Links:

- WESTERN ACADEMIC CALENDAR
- ACADEMIC RIGHTS AND RESPONSIBILITIES