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Syllabus

BIOE 4560: Structural Design in Wood

Winter 2021

University of Manitoba | Price Faculty of Engineering

COURSE DETAILS

Course Title & Number:	BIOE4560, Structural Design in Wood
Number of Credit Hours:	3
Class Times & Days of Week:	Video lectures posted weekly, tutorials and mid-term exam as detailed in course schedule
Location for Classes:	Online only, course will utilize a asynchronous delivery for lecture materials (i.e. materials will be posted to review over a given schedule), and some synchronous elements such as live tutorials and mid-term exam during scheduled time slots, timed assessments in line with class time.

Instructor Contact Information

Instructor(s) Name:	**Farhoud Delijani**, Ph.D, P.Eng
Office Location:	Virtual only
Office Hours or Availability:	During scheduled class time, or by appointment
Email:	Farhoud.Delijani@umanitoba.ca
Contact:	Phone: (204) 474 8613 I will be happy to help you with any questions you might have via email, phone, or on WebEx

TA Contact Information

Name and Email Addresses:	**Adam Kriegl,** Graduate Student, Department of Civil Engineering kriegla@myumanitoba.ca
Office Hours or Availability:	By appointment and via Cisco WebEx

Course Description

Design using wood as a structural material in light-frame buildings. Consideration of design constraints associated with sawn lumber as well as based composite materials.

Course Learning Objectives

By the end of the term BIOE 4560 students should be able to:

- Demonstrate an understanding of the Canadian standard for wood design CSA O86 for the design of wood structures
- Explain/demonstrate how a natural engineering material responds to load and how an understanding of the fundamental properties of wood informs design.
- Prepare reports that demonstrate an understanding of wood behaviour from hands-on experience in the lab.
- Complete a set of calculations to evaluate the suitability of a wood component and/or system with regards to loads, serviceability and constructability.
- Read a set of construction plans, determine the load on a structural component and evaluate if the component can carry the applied load and is in compliance with the code.

Why is this course useful?

It has been commented on by many senior engineers that sometime within an engineer's career they will have to design something with wood. From a strictly pragmatic point of view, this course will provide the engineering student with at least the basics of wood design in preparation for this inevitable event. Although uncertain where credit should lie for the following statement —"If wood were discovered today, it would be considered a wonder material" — it essentially sums up an overall philosophy of the developers of this wood design course share.

Within any naturally occurring population there may exist variations on a central theme. Wood, a natural material, is no exception. Although the physical characteristics of a specific wood species may virtually be the same, anomalies exist. These anomalies, within any species group, will have an inherent impact on the material, shaping its structural performance and behaviour. It is the intent of the developers of this course, therefore, to assist students in developing a feel for the use of wood in structural design. Furthermore, the course will extend the understanding of the behaviour of discrete wood-member components to how this individual behaviour may affect a structural system.

As a noted researcher has put it, "Timber is as different from wood as concrete is different from cement"(Madsen, 1992). The developer of this wood-design course feel that it is of fundamental importance that participants gain an appreciation of how the natural structure of wood affects the behaviour of the engineering material we euphemistically call lumber.

Who should take this course?

This is a design elective for students in the Biosystems and Civil Engineering program.
How this course fits into the curriculum. This course is intended for students in their senior year in Biosystems/Civil Engineering. This course will provide the student with the opportunity to gain an understanding of wood as an engineering material. The relationship between how a material reacts with its environment and how we as design engineers, can integrate this knowledge into design. From a pragmatic point of view, we will also get an understanding of CSA O86 Engineering Design in Wood, the national standard for wood design in Canada. For Biosystems students this is one of the courses in the design elective package for Sustainable Buildings Specialization.

Engineering-Related Objectives

By the end of the term, students will have the knowledge to design basic structures using dimensional lumber in compliance with the Canadian national code. It is also an objective of this course that students will gain a 'feel' for how wood behaves within a structure and the implications of design assumptions.

Required Textbook, Readings, and Course Materials

- **Wood Design Manual – 2017, Canadian Wood Council (Available at the Bookstore)**

Reference Materials: (partial list):

- National Building Code of Canada (latest edition), National Research Council of Canada, Ottawa
- Engineering Design in Wood (Limit States Design), CAN-CSA O86-09 Canadian Standards Association
- Wood Reference Handbook, Canadian Wood Council
- Wood Building Technology (latest edition) Canadian Wood Council
- Reliability-Based Design of Wood Structures. 1989, Foschi, Folz, Yao. Structural Research Series, Report No.34. Dept. of Civil Engineering, Univ. British Columbia

Course Technology

This course relies on an online learning environment, so the expectation is that each student is able to access the internet in a reliable manner, be able to download and view video lectures and also be able to participate as needed in video conferences. Trials of all of these components will be provided for students to see if their connection is capable of handling these tasks.

Students are also expected, for the term project, assignments and quizzes, to have access to either a good quality phone camera, or a computer drawing software, and a word processing software to prepare their reports and relevant diagrams.

Course Expectations and Policies

Attendance and Time Input:
In the asynchronous portions of this course (video lectures), students are strongly recommended to keep pace and watch the lectures at the prescribed schedule. The instructor for the course has put in significant effort to ensure that the pace is not more than a student would be used to in a regular term. Approximately 2.5 hours of lecture content and about an equivalent amount of time spent on homework per week is expected for the course. It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade.

Class Communication:
You are required to obtain and use your University of Manitoba email account for all communication between yourself and the University. Please note that all communication must comply with 'the electronic communication with student' policy.

Expectations for Synchronous (Live) Remote Learning Activities:

- Please mute your microphone
- Please do not conduct side conversations, direct messaging, texting, or email with other students during the lecture
- Use the chat window to ask short questions or use the "raise your hand" icon for longer question that are best asked out loud
- Tutorial may be recorded and posted on UM Learn after the class at the discretion of the instructor.

Academic Integrity:

Each student in this course is expected to abide by the University of Manitoba Academic Integrity principles. Always remember to reference the work of others that you have used. Also be advised that you are required to complete your assignments independently unless otherwise specified. If you are encouraged to work in a team, ensure that your project complies with the academic integrity regulations. You must do your own work during exams. Inappropriate collaborative behavior and violation of other Academic Integrity principles, will lead to the serious disciplinary action. Visit the Academic Calendar, Student Advocacy, and Academic Integrity web pages for more information and support.

Distributing Teaching Content:

No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission. Course materials (in any format) are for the participant's private study and research. This also means that any provided pre-recorded content/notes/assignments are not to be distributed or shared as the instructors hold copyright over these materials.

Posting quiz, exam, or assignment problems online for the purpose of seeking the solutions from the so-called tutoring websites, is not allowed and is considered a serious form of plagiarism.

Student Accessibility Services:

The University of Manitoba is committed to providing an accessible academic community. Students Accessibility Services (SAS) offers academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

Student Accessibility Services
520 University Centre
Phone: (204) 474-7423
Email: Student_accessibility@umanitoba.ca

Using Copyrighted Material:

All students are required to respect copyright as per Canada's *Copyright Act*. We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the Copyright Act applies or written permission has been

confirmed. For more information, see the University's Copyright Office website at http://umanitoba.ca/copyright/ or contact um_copyright@umanitoba.ca.

Course Evaluation Methods

Due to the nature of the course and its focus on developing skills, there will be a variety of evaluation methods to ensure that your progress throughout the course is noted and reflected in evaluations.

TITLE	VALUE
Assignments	15%
Lab Reports	15%
Mid-term exam	30%
Final Examination	40%
Total	**100%**

- **Assignments**
  - There will be two assignments in this course.
  - To see the assignment's start and due dates, see the course schedule file on UMLearn (under Content/Course Outline & Schedule).
  - Assignments must be completed individually: you are required to only consult with the TAs or course instructor if you need help. All sources of information used in the assignments must be referenced.
  - A **term declaration form** (on UMLearn under Content/Forms) must be signed and submitted as a part of your practice quiz at the beginning of the term (you will receive an instructional email on this task). Your assignments and lab report will not be marked if you fail to submit the signed form.
  - Late assignments will be accepted up to 3 days following their due date. Late assignments will receive a mark deduction of 50, 60 and 70% **no exceptions**.

- **Mid-Term Exam**
  - Midterm exam is a 120 minute exam and will take place on **March 14th from 5:00-7:00PM** (+15 minutes grace period for scanning and uploading your answers).
  - Midterm exam will cover material taught in lectures and included in lecture notes since the start of the term.
  - Midterm exam cannot be made up, **no exceptions**. Missing the exam for excused documented medical, compassionate or travel reasons will entail adding the weight of the exam to the weight of the final exam.
  - Travel request should be pre-approved by the Dean's office or the instructor prior to any test.

- **Lab Reports**
  - There will be 6 individual lab reports to write and submit in this course.

- To see the lab's start and due dates, see the course schedule file on UMLearn (under Content/Course Outline & Schedule).
- Physical tests associated with each lab will be conducted by the instructor and the lab technician at the fabrication shop of Biosystems Engineering. The experiment and the resultant data will be recorded and the files will be available to you for review and as material to write your report.
- The lab report format can be found on UMLearn (under Content/Lab Manuals).

- **Final Examination**

  - The final exam is a **3:00-hour** long exam scheduled by the registrar's office.
  - **Please note: You must pass the final exam in order to pass the course.**

General requirements for assignments, quizzes, term project and the final exam:

All students must upload a copy of their handwritten/typed work on the designated dropbox on UMLearn. Please note that ***the only acceptable format is pdf***. Other file formats (such as Word files), low quality and hard-to-read submissions won't be marked and a zero will be recorded for the associated homework. Make sure you have a pdf maker app installed on your phone. Contact us at the beginning of the term, if you do not own a smart phone or don't know how to use a pdf maker app (the one I personally use is called Genius Scan – PDF scanner and it works really well).

Timed Assessment Policy

During any timed assessments (quizzes, exams), the course instructor will be available via WebEx, and a phone number will be provided to call if there are any questions or issues. If a submission (due to a technical issue) cannot be made, a student will be asked to either provide an oral or email submission of their work. All students are expected to keep a hard copy of their work during and after an assessment until the marks are released. A student can be assigned a grade of zero if the assessment submission is illegible.

On any timed assessments (quizzes, exams) a grace period of 15 minutes is provided to upload (i.e. a timed test of 120 minutes will accept submissions up to 15 minutes after the 120-minute window). These assessments will be marked LATE on UMLEARN at the time of submission, but this will be adjusted after.

Any timed assessments (quizzes, exams) submitted late is subject to a late submission penalty of 1% per minute over the due date plus the grace period. As an example, on a 120-minute test, if a submission is submitted at 136 minutes (120+15+1), after the start time there will be a 1% reduction applied to it for the one minute late submission. No timed assignment will be accepted after 10 minute late mark.

Grade Breakdowns

The typical grade breakdown for this course is shown below, although this is subject to modification at the discretion of the instructor or the board of examiners.

LETTER GRADE	PERCENTAGE BRACKET
A+	95-100
A	86-94.99
B+	80-85.99
B	73-79.99
C+	65-72.99
C	60-64.99
D	50-59.99
F	Less than 49.99

Voluntary Withdrawal

Students who did not drop the course by the deadline set by the registrar's office will still be assigned a final grade. Withdrawal courses will be recorded on your official transcript, please refer to the Registrar's Office web page for more information.

Assignment Extension and Late Submission Policy

All items submitted for evaluation are due at the times specified on the items themselves, unless otherwise explicitly told. It is understandable that sometimes situations arise that cause you to be unable to hand in an assignment on time. Late submissions will be accepted but unless an affordance is made (on a case by case basis), any late design project or assignment will be evaluated at a full letter grade lower per day per assignment. Extensions may be granted only if arranged in advance, and it is advisable to submit 'quality' work even if late. It is not the intention of the course to evaluate students on unfinished work.

Supplemental Course Information

All engineering courses are expected to contribute, in some way, to the development of one or more of the 12 graduate attributes that have been identified by the Canadian Engineering Accreditation Board. The 12 graduate attributes have been defined below for your information.

Graduate Attributes

1. **A Knowledge Base for Engineering:** Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. **Problem Analysis:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.
3. **Investigation:** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.

4. **Design:** An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. **Use of Engineering Tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. **Individual and Team Work:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. **Communication Skills:** An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. **Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. **Impact of Engineering on Society and the Environment:** An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
10. **Ethics and Equity:** An ability to apply professional ethics, accountability, and equity.
11. **Economics and Project Management:** An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
12. **Life-long Learning:** An ability to identify and address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Expected Competency Level in this Course:

These are the graduate attributes measured in this course based on the course goals and content and the Canadian Engineering Accreditation Attributes (CEAB) graduate attributes (D=Developing; A= Advance).

Attribute											
A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**
D	D	D	A	D	D	A					