

CEE 2202A – Mechanics of Materials –Course Outline 2024/25

This course introduces the fundamental principles used in the study of the engineering behaviour of structures and mechanical members subjected to slowly applied or steady state loading conditions. The general objectives are for the student to develop the ability to:

- Apply the knowledge of statics, properties of materials and basic mathematics to analyse the stress-strain behaviour of structural members subjected to slowly applied or steady state loads.
- Differentiate between various static loading conditions of simple structures and formulate progressive solutions to quantify their stress-strain behaviour.
- Work individually or function in a team to analyze the stress-strain behaviour of simple structural elements under combined loading conditions, to design simple beams to meet specific design needs and effectively communicate the results of this work in coherent and legible design calculations.
- Develop awareness of the applications of the skills and techniques introduced in this course in civil engineering practice.
- Recognize the need for life-long learning to keep abreast of new developments in engineering practice and to improve one's design abilities to solve more complex contemporary engineering problems.

Calendar Copy:

Concept of stress and strain; axially loaded members; second moment of area; elastic torsion of circular shafts; bending and shearing stresses in beams; transformation of stress and strain; stresses in thin-walled pressure vessels; design of beams and introduction to beam deflection. Course Weight: 0.50.

Pre-requisites: Engineering Science 1022A/B/Y, NMM 1412A/B or the former Applied Mathematics 1412A/B.

Anti-requisites: MME 2202A/B.

Corequisites: None

Note: It is the student's responsibility to ensure that all Pre-requisite and Co-requisite 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 Anti-requisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Pre-requisite, Co-requisite or Anti-requisite conditions.

Contact Hours:

- 3 lecture hours/week: Lectures will be delivered in-person. 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 6-8 hours per week.
- 3 tutorial hours: A 3-hour in-person tutorial session will be delivered each week. Student attendance of the lecture and tutorial is mandatory.

Note: In any event that necessitates the course delivery moving away from face-to-face interaction, affected 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.

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>

Instructor:

Dr. Hassan EL-Chabib, P. Eng., SEB 3026A,

helchab2@uwo.ca.

Office hour: Wednesday, 11:30 am – 12:30 pm or by appointment

Textbook and Notes:

- R.C. Hibbeler, Mechanics of Materials, 11th Edition, Pearson Prentice Hall (purchase recommended).
- Course notes will be regularly posted on the OWL course website as needed. It is the student's responsibility to regularly check the course website and print notes if required.

Units:

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

Specific Learning Objectives: At the completion of the course, students should be able to recognize and understand [Graduate Attribute]:

1. Concept of Stress:

- a) Differentiate between normal, shearing and bearing stresses [PA1]
- b) Analyse stresses in simple structures [PA2]
- c) Identify the components of stress under general loading conditions [PA1]

2. Stress and Strain – Axial Loading:

- a) Determine stress-strain relationships under axial loading using Hooke's Law [PA1]
- b) Calculate deformations of axially loaded members [PA2]
- c) Identify and solve simple statically indeterminate problems [PA1]
- d) Analyse the effects of temperature changes in axial loading conditions [PA2]
- e) Assess multi-axial loading cases and use the generalised Hooke's Law [KB4]
- f) Determine the effect of shearing strain [PA1]
- g) Apply the stress and strain distribution (Saint-Venant's Principle) [PA2]

3. Torsion

- a) Define and calculate the polar moment of inertia [PA1]
- b) Compute deformations and stresses in a circular shaft [PA2]
- c) Analyse statically indeterminate shafts [KB4]
- d) Determine torsion stresses in thin-walled hollow shafts [PA2]

4. Pure Bending

- a) Define and calculate centroids and moments of inertia [PA1]
- b) Discuss the basic assumptions of the engineering bending theory [PA1]
- c) Compute deformations and stresses in symmetric members [PA2]
- d) Compute deformations due to transverse loading [PA2]

5. Transverse Loading

- a) Calculate and graphically represent normal stress distributions [PA1]
- b) Analyse problems of shear on a horizontal plane [PA2]
- c) Compute and graphically represent the distribution of shearing stresses in beams [PA2]

6. Transformations of Stress and Strain

- a) Carryout transformation of plane stresses, define principal stresses and maximum shearing stresses and apply Mohr's circle for plane stress [PA2]
- b) Carryout transformation of plane strain, define principal strains and maximum shearing strains and apply Mohr's circle for plane strain [PA2]
- c) Analyse experimentally measured strain, discuss and interpret results [PA2]

7. Design of Beams

- a) Determine bending moments and shear force diagrams for a given span and loading [PA2]
- b) Define relations among load, shear and bending moment [PA2]
- c) Identify and compute principal stresses in beams [KB4]

8. Deflection of Beams (time permitting)

- a) Analyse the deformation of a beam under transverse loading [PA2]
- b) Analyse and design statically indeterminate beams [KB4]
- c) Apply superposition to assess deflections/stresses due to various load combinations [KB4]

General Learning Objectives

E=Evaluate, T=Teach, I=Introduce

Problem Analysis	E	Teamwork	I	Ethics and Equity	
Investigation	T	Communication	I	Economics and Project Management	
Design	I	Professionalism	I	Life-Long Learning	
Engineering Tools	I	Impact on Society			

Accreditation Units:

Engineering Science = 100%.

Evaluation:

The final course mark will be determined as follows:

Quizzes:	45%
Attendance/Participation:	10%
Final examination:	45%

Total:	100%

Note: (a) **Students must pass the final examination to pass this course.** Students who fail the final examination will be assigned the aggregate mark, as determined above, or 48%, whichever is less.

(b) **Students who have failed an Engineering course (i.e. <50%) 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, if applicable, cannot be resubmitted for grading by the student in subsequent years.

1. Quizzes and Examinations

- **Three 75 minutes** quizzes will be held during the tutorial hours. These quizzes are tentatively scheduled for **October 3rd, October 31st, and November 28th**.
- **Final Exam:** 3-hour final examination will be held during the final examination period.

2. Weekly Assignments

Assignments will be given on a weekly basis and consist of two parts. **Part A** will be solved in class during the tutorial period with the support of teaching assistants. **Part B** is assigned as **homework**. they should be solved individually and submitted to OWL prior to the due date. A solution for **both parts A and B** will be posted on the course website. Students are highly encouraged to solve all assignment questions to do well in the course. Assignments will not be marked but their completion might be considered as attendance/participation.

3. Participation:

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

Note: Quizzes and examinations will be closed book and only nonprogrammable calculators are permitted. Students should consult the list of approved calculators posted outside the Civil and Environmental Engineering Department Office.

I. Missed/Late Accommodation Policy:

1. Students missing a test/assignment/lab or examination must 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.
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 are completed prior to the last day of classes.

4. 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 take appropriate action concerning the work done in classes from which they are absent.

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 assistance, 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](#)