

**Western University
Faculty of Engineering
Mechatronic Systems Engineering Program**

MSE 2212A – Mechanics of Materials

Course Outline Fall 2025

COURSE DESCRIPTION: Stress and strain, Mohr's stress circle, behavior of structures, axial loading of columns and struts, torsion of shafts, bending of beams, buckling of columns and combined loading of components.

ACADEMIC CALENDAR:

https://www.westerncalendar.uwo.ca/Courses.cfm?CourseAcadCalendarID=MAIN_027024_1&SelectedCalendar=Live&ArchiveID=

PRE OR COREQUISITES: ES 1022a/b/y, NMM1412A/B or the former Applied Mathematics 1412A/B. Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record.

ANTIREQUISITES: CEE2202A/B, MME2202A/B

CEAB ACADEMIC UNITS: Engineering Science 100%

CONTACT HOURS:

Lectures occur weekly. Tutorials occur weekly. There are three laboratory sessions

LECTURE:	3 hours/week
LAB:	3hrs/3 times during the term
TUTORIAL:	2 hours/week

RECOMMENDED TEXT: Mechanics of Materials, R.C. Hibbeler. 11th edition. Prentice Hall, ISBN 978-0-13-760552-1. <https://www.pearson.com/en-ca/subject-catalog/p/mechanics-of-materials/P200000003409/9780137605385>

RECOMMENDED/ REQUIRED SOFTWARE: None

RECOMMENDED RESOURCES/REFERENCES:

Mechanics of Materials: An integrated Learning System, T. A. Philpot, 2nd edition, John Wiley & Sons;

Mechanics of Materials R. R. Craig, JR, 3rd edition, John Wiley & Sons;

Lecture notes.

GENERAL LEARNING OBJECTIVES (CEAB GRADUATE ATTRIBUTES)

Knowledge Base	D	Engineering Tools		Impact on Society	
Problem Analysis	D	Individual & Teamwork		Ethics and Equity	
Investigation	D	Communication		Economics and Project Mgmt.	
Design		Professionalism		Life-Long Learning	

Notation: x represents the content level code as defined by the CEAB. blank = not applicable; I = introduced (introductory); D = developed (intermediate) and A = applied (advanced).

Rating: I – The instructor will introduce the topic at the level required. It is not necessary for the student to have seen the material before. D – There may be a reminder or review, but the student is expected to have seen and been tested on the material before taking the course. A – It is expected that the student can apply the knowledge without prompting (e. g. no review).

COURSE MATERIALS: Weekly content and guides for the laboratories will be available on the course OWL site. The material for this course will be taught in both lectures and labs; therefore, it is imperative that you attend each lecture and lab.

UNITS: SI

COURSE TOPICS AND SPECIFIC LEARNING OUTCOMES: This course will focus on calculating stresses, strains and deformations in structures and their components under different loading conditions. Students will develop knowledge and skills for the design of engineering structures and solve practical engineering problems based on the fundamentals of this course.

The following table summarizes the course learning outcomes along with CEAB GAIs where the GAIs in bold indicate ones to be measured and reported annually.

COURSE TOPICS AND SPECIFIC LEARNING OUTCOMES	(CEAB) Graduate Attribute
1. Review of statics At the end of this section, students will be able to: a. Understand fundamental concepts of statics, including external loads, internal loads, stress, strain, material properties and stress-strain relation. b. Draw free body diagram, use method of sections, write equilibrium equations, determine support reactions and internal loads and calculate stresses.	KB3, PA2, PA3

2. Axially loaded mechanical member At the end of this section, students will be able to: a. Calculate normal stress developed and elastic deformation of axially loaded members. b. Solve the problem for the statically indeterminate axially loaded members using superposition principle and force method.	KB3, PA2, PA3
3. Torsional shaft At the end of this section, students will be able to: a. Calculate shear stress developed and twist angle of torsional shafts. b. Solve the problem for the statically indeterminate torsional shafts using compatibility condition.	KB3, PA2, PA3
4. Bending beam At the end of this section, students will be able to: a. Draw shear and bending moment diagrams, calculate bending stress and shear stress developed and deflection of bending beams. b. Solve the problem for the statically indeterminate bending beams using different methods.	KB3, PA2, PA3, IN3
5. Mechanical members subjected to combined loading At the end of this section, students will be able to: a. Determine state of stress for material point using superposition principle. b. Calculate the stresses developed for pressured vessels.	KB3, PA2, PA3
6. Stress transformation At the end of this section, students will be able to: a. Understand the concepts of state of stress, stress element, principal stresses and planes, stress transformation. b. Plot stress element, perform stress transformation to determine the stress components acting on oriented plane, the principal stresses, and maximum shear stress.	KB3, PA2, PA3

7. Buckling column At the end of this section, students will be able to: a. Calculate the critical buckling load for columns with various end supports. b. Determine possible failure modes of compressive columns.	KB3, PA2, PA3
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EVALUATION:

Name	% Worth	Assigned	Due Date	CEAB GAs ASSESSED
Assignments (Total = 6)	5%	Two weeks before the due date	Sept. 19, Oct. 3, Oct. 17, Oct. 31, Nov 21, Dec 5.	
Labs (Total = 3)	10% (Lab 1 and 3: 2.5%; Lab 2: 5%)	Oct. 20-24, Nov. 10-14, Nov. 24-28.	Lab reports are due one week after each lab session.	IN3
Quizzes (Total = 3)	15% (Quiz 1 and Quiz 2: 5.5%, Quiz 3: 4%)	Sept. 26, Oct. 24, Nov. 21. During tutorials.	Same day as the assigned date.	
Mid-Term Examination	20%	6:30pm-8:30pm on Oct. 30.	Same day as the assigned date.	KB3
Final Examination	50%	3 hours. It will take place during the regular examination period.	Same day as the assigned date.	PA2, PA3

Note that the dates listed above are **tentative** and may be adjusted if needed. Marks will be assigned on the basis of method of analysis and presentation, correctness of solution, clarity and neatness.

COURSE POLICIES:

All work submitted must be of professional quality in the requested format. Material that is handed in dirty, illegible, disorganized, or in an unapproved format will be returned to the student for resubmission and the late submission penalty will take effect. An additional penalty of 10% may be deducted for poor grammar, incoherence, or lack of flow in the written reports.

The following course-specific policies will be enforced throughout the course:

Assignments:

- Assignments are due by 5 pm on due days;
- Late submissions of assignments will receive a grade no higher than 50% for that assignment;
- Missing of an assignment without academic consideration will translate into a zero mark for that assignment;
- Missing of an assignment with academic consideration will only account for the completed assignments for the assignment weighted mark.

Laboratory sessions:

- Reports are due by 5 pm on due days (will be posted on OWL);
- Late submissions of lab reports will receive a grade no higher than 50% for that lab session;
- Late shows up in the lab after 15 minutes will get no higher than 50% for that lab session;
- Missing of a laboratory session without academic consideration will result in a zero mark for that laboratory session;
- Students who miss a lab with academic consideration are required to reschedule the lab by contacting the course instructor no later than 2 days after that lab. Failure to do so will result in a zero mark for that lab.

Quizzes:

- No make-up quiz option will be offered regardless of the circumstances for which the quiz was missed;
- Missing of a quiz without academic consideration will translate into a zero mark for that quiz;
- Missing a quiz with academic consideration will automatically re-weigh the missing quiz(es) to the final exam.

Mid-term examination:

- No make-up midterm option will be offered regardless of the circumstances for which the midterm was missed;
- Missing the midterm with academic consideration will determine automatic reweighting to the final exam;
- Missing the midterm without academic consideration will result in a grade of zero for the midterm.
- This assessment is considered to be central to the learning objectives for this course. Accordingly, students seeking academic consideration for this assessment will be required to provide formal supporting documentation.

Final examination:

- To obtain a passing grade in the course, a mark of 60% or more must be achieved on the final examination. A final examination mark < 60% will result in a final course grade of 48% or less.

If the above conditions are not met, your final grade cannot be greater than 48%. Students who have failed this course (i.e., final average < 50%) must repeat all components of the course.

LATE SUBMISSION POLICY:

Advise the instructor if you are having problems completing the assignment on time prior to the due date of the assignment and be prepared to submit an Academic Consideration Request and provide documentation if requested by the instructor at:

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

If you are granted an extension, establish a due date with the instructor. The approval of the Chair of your Department is not required if assignments are completed prior to the last day of classes. 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.

ATTENDANCE: All classes, laboratories, and tutorials are mandatory unless otherwise stated. Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the program, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

ABSENCE FROM MANDATORY COURSE COMMITMENTS: Students must familiarize themselves with the policies of the Faculty of Engineering