MECH ENG 3A03
Engineering Mechanics
Undergraduate Studies
Winter 2026
Course Outline

CALENDAR/COURSE DESCRIPTION

Calendar Description: Singularity functions, generalized Hooke's law; shear stress, shear flow in beams; shear centre. Biaxial and unsymmetrical bending, analysis of indeterminate beams and frames using energy methods, impact loads. Buckling of compression members. Introduction to yield criteria.

Course Description: This course deals with analyzing of structure under combined loading (axial, bending, shear and torsion) and designing or selecting the appropriate prismatic beams. The design criteria of the structure can be based on ductile or brittle failure. The selection of the loaded structure can be a function of deflection, stresses or instability (Buckling). Identify the operating limits of the fundamental mechanics of structure analysis.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): ENGINEER 2P04 or MECHENG 2P04 and registration in any Mechanical Engineering program.
Antirequisite(s): CIVENG 2C04

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Duncan Cree
creed1@mcmaster.ca

Office Hours:
By appointment

TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION

T.A.s (Last, First Name)	T.A. Email	Allocated Students Last Name	Office Hours:
McCafferty-Leroux, Alex	mccaffea@mcmaster.ca	Abdelmouti to Chiu	By appointment
Mirhakimi, Anooshe Sadat (Anooshe)	mirhakia@mcmaster.ca	Chung to Geul	By appointment
Alkadi, Ahmed Osama	alkadia@mcmaster.ca	Gilani to Khawar	By appointment
Ibrahim, Almigdad	ibraha71@mcmaster.ca	Kim to Mostofa	By appointment
Shiguemoto, Eduardo Akira Sr. (Akira)	shigueme@mcmaster.ca	Muczynski to Sankar	By appointment
Sanjeevi, Bairavi	sanjeevb@mcmaster.ca	Sanli to Tabassum	By appointment
Gentile, Stavros (Stavro)	gentis3@mcmaster.ca	Tabbal to Zhou	By appointment

COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

Course notes, lecture recordings, assignments, solutions, general course information, and announcements will be posted on Avenue to Learn (A2L), the course website. Students are responsible for keeping up to date with the information on Avenue to Learn via the following link: http://avenue.mcmaster.ca/. The course will be delivered in-person; all the lectures, tutorials and exams will be in-person. Lectures (Monday/Wednesday/Thursday, BSB 147) and tutorial (Wednesday, JHE 376) will be delivered in person and recorded.

COURSE INTENDED LEARNING OUTCOMES

By the end of this course, students should be able to:

1. Analyze structures under combined loading and designing the appropriate prismatic beams.
2. Calculate principal stresses from normal and shear stresses in three-dimensional configurations.
3. Design and specify structures which are made of either ductile or brittle materials.
4. Design of beams based on either structure deflection, stresses or buckling.
5. Evaluate strain measurement in specific directions into principal strain.
6. Identify the operating limits of the fundamental mechanics of structure analysis.

MATERIALS AND FEES

Required Texts: None
Recommended Additional Texts: "Mechanics of Materials, 6th Ed.", by Beer, Johnston, Dewolf and Mazurek, McGraw Hill Education, 2012. ISBN 10-9780073380285.
Calculator: Only the McMaster Standard Calculator will be permitted in tests and examinations. This is available at the Campus Store.
Other Materials: None

COURSE FORMAT AND EXPECTATIONS

The course is organized as follows:

- 3 classroom-based lectures per week
- 1 classroom-based tutorial per week
- 8 assignments
- 2 in-person term tests (Closed Book).
    - Term test 1, February 3, 2026, from 6:30-9:00 pm, Location TBD.
    - Term test 2, March 3, 2026, from 6:30-9:00 pm, Location TBD.
- 1 in-person final exam (Closed Book)

COURSE SCHEDULE

Week	Date	Topic
Wk01	Jan 5 to Jan 9	Introduction, Centric Buckling, Extended Euler Formula, Elastic Curve Theory
Wk02	Jan 12 to Jan 16	Examples on Centric Buckling and Elastic Curve
Wk03	Jan 19 to Jan 23	Eccentric Buckling
Wk04	Jan 26 to Jan 30	2D Mohr Circle
Wk05	Feb 2 to Feb 6	3D Mohr Circle, **Term Test 1 (Feb 3)**
Wk06	Feb 9 to Feb 13	Normal Stresses under Combined Loading
	Feb 16 to Feb 20	Mid-Term Break
Wk07	Feb 23 to Feb 27	Mohr Circle and Normal Stress Examples
Wk08	Mar 2-Mar 6	Centric/Eccentric, Symmetrical/Unsymmetrical Bending **Term Test 2 (Mar 3)**
Wk09	Mar 9-Mar 13	Shearing Stress for Non-Thin Wall Structures
Wk10	Mar 16-Mar 20	Shearing Stress for Composite Material and Thin Wall
Wk11	Mar 23-Mar 27	Longitudinal Shearing Stress
Wk12	Mar 30-Apr 3	Combined Loading Analysis and Yield Criteria
Wk13	Apr 6-Apr 7	Review Examples

Note: *The above-listed topics are only provisional. As such, they are subject to change based on time and the instructor's judgment.* Exams will cover only what is covered in class up to the time of each exam.

ASSESSMENT

Component	Due Date	Weight
Term Test 1	February 3, 2026	25%
Term Test 2	March 3, 2026	25%
Final Exam	Scheduled by Registrar	50%
Total		100%

Assignments: Assignments will be given approximately every two weeks, which will depend on how fast or slow the topics are covered in class. Assignments will not be graded and solutions will be provided. It is strongly recommended to work out the assignment questions.

Term Test (two in total): Students obtaining 25 to 49/100 for the term tests are required to do a correction test. The highest grade for the correction term test is 50/100. If the grade is less than 24.9/100, no correction test will be allowed. Missed Term Tests will have a grade of zero. It is recommended not to use an MSAF for the Term Tests. Do all your Term Tests, as the final will be more difficult. A missed Term Test with an MSAF will be redistributed to the final exam, where the final exam will be worth 75%.

Final Exam: Students must write both term tests and the final exam to pass the course.

ACCREDITATION LEARNING OUTCOMES

The Learning Outcomes defined in this section are measured for Accreditation purposes only and will not be directly taken into consideration in determining a student's grade in the course.

Outcomes	Indicators
1.Knowledge Base for Engineering	1.4. Competence in Specialized Engineering Knowledge
2. Problem Analysis	2.1 Demonstrates an ability to identify reasonable assumptions that could/should be made before a solution path is defined. 2.2 Demonstrate an ability to identify a range of suitable engineering fundamentals that are potentially useful for analyzing a technical problem.

For more information on Accreditation, please visit: https://www.engineerscanada.ca

EQUITY, DIVERSITY, AND INCLUSION

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your Instructor to be respectful of this diversity in all aspects of the course, and the same is expected of you.

The Department of Mechanical Engineering is committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexual orientations, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our Department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Undergraduate Chair, Academic Advisor or to contact the Equity and Inclusion Office.

MENTAL HEALTH & WELLNESS

For a list of McMaster University's resources, please refer to the Student Wellness Centre.
Talkspot is a non-crisis mental health resource specifically for students in the Faculty of Engineering.

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy*, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty:
1. plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. improper collaboration in group work.
3. copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

McMaster is committed to an inclusive and respectful community. These principles and expectations extend to online activities including electronic chat groups, video calls and other learning platforms.

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

1. It is the students' responsibility to regularly check the course webpage (ex. Avenue to Learn) for updates and announcements.
2. The weight of any missed work that has been properly reported and approved using MSAF will be automatically added to the weight of the final examination. No other accommodation will be provided for missed work.

SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

1. **Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:**

    - Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.
    - Students may submit requests for relief using the MSAF once per term.
    - An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
    - The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
    - The MSAF cannot be used for academic work that has already been completed attempted.
    - An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
    - The MSAF cannot be used to apply for relief for any final examination or its equivalent. See *Petitions for Special Consideration* above.

2. **For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:**

- Students must report to their Faculty Office to discuss their situation and will be required to provide appropriate **supporting documentation**.
- If warranted, the Faculty Office will approve the absence, and the instructor will determine appropriate relief.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.