McMaster University | Civil Engineering

2021-22 COURSE OUTLINE

COURSE INFORMATION

Course Name: Statics & Mechanics of Materials **Course Code:** CIVENG 2P04

Session Offered: Fall Term, 2021 – 2022

Calendar Description: Principles of statics as applied to rigid bodies. Internal forces, shear and bending moment diagrams, Stress and strain, elastic behaviour of simple members under axial force, torsion, bending and traverse shear, Principal stresses.

Instructor: Mehdi Shafikhani **Phone:** (647) 501-8114

Email: shafikham@mcmaster.ca **Office Hours/Contact:** By appointment only

Teaching Assistants: Yara Soliman Email: solimy1@mcmaster.ca

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Class Schedule Days:	**Lectures:** Tue., Wed., Fri.	Time: 12:30 AM – 1:20 PM	Location: Virtual
	Tutorial: T01: Fri.	Time: 2:30 PM – 4:20 PM	Location: ABB 270
	T02: Wed.	Time: 9:30 AM – 11:20 AM	Location: ABB 162
	T03: Tue.	Time: 2:30 PM – 4:20 PM	Location: ABB 162

1. COURSE OBJECTIVES

This is the first course in structural mechanics (statics). The focus of this course is on developing your understanding of basic skills in mechanics of materials (also referred to as strength of materials). This course mainly deals with concepts of forces vectors, particle/rigid body equilibrium, analysis of simple structures subjected to different loading conditions, and stress and strain due to these loading conditions.

2. COURSE SPECIFIC POLICIES

All lectures and tutorials are mandatory.
CIVENG 2P04 student are to attend Registrar's office assigned tutorial sections.
All email exchanges are to be via McMaster University email accounts. Emails from non-McMaster accounts will not receive a reply and we will not be checking for emails via avenue.

3. SCHEDULE

WEEK 1	Introduction; Force vectors; Equilibrium of a particle	
WEEK 2	3D force system; Vector representation of moments; External reactions; Resultant forces	A1 due: Sep 18,2021
WEEK 3	Analysis of trusses, Two force members; Zero force members; Analysis of frames and machines	A2 due: Sep 25, 2021

WEEK 4	Internal forces; Members end forces; Members internal forces; Shear force and bending moment diagrams	A3 due: Oct 2, 2021
WEEK 5	Concept of stress: Normal stress, shearing stress and bearing stress in connections; Strain	A4 due: Oct 18, 2021 Term Test 1: Oct 5, 2021, 6:00-8:00
WEEK 6	Reading Week	
WEEK 7	Analysis of members subjected to axial loading: Deformation of a member under axial load; Analysis of members subjected to torsion: Shear stress and strain; Torsion of solid and hollow circular sections; Polar moment of area; Torsional stress and angle of twist in axisymmetric members	A5 due: OCT 23, 2021
WEEK 8	Analysis of members subjected to pure bending: Properties of sections; Deformation of a symmetric beam in pure bending	A6 due: Oct 30, 2021
WEEK 9	Analysis of members subjected to pure bending cont'd; Bending normal stress distribution; Eccentric axial loading	A7 due: Nov 6, 2021 Term Test 2: Nov 5, 2021, 6:00-8:00
WEEK 10	Analysis of a member subjected to transverse shear: Stress due to transverse loads; Shear stresses in common beams; Longitudinal shear on a beam element	A8 due: Nov 13, 2021
WEEK 11	Shear stress distribution in thin-walled structural section; Critical shear stress	A9 due: 20 Nov 2021
WEEK 12	Transformation of stress and strain: Stresses due to combined axial, flexural and torsional loadings; Introduction to transformation of stresses, principal stresses and Mohr's circle representation	A10 due: Nov 27, 2021 Term Test 3: Nov 30, 2021, 6:00-8:00
FINAL EXAMINATION	Scheduled during the regular University Final Examination period established by the Registrar's Office	
NOTE	Depending on the progress of the course either additional topics may be covered, or some topics may not be covered.	

4. ASSESSMENT OF LEARNING	WEIGHT %
Individual components will be weighted as follows:	
Assignments	15%
Term Tests	60% (20% for each term test)
Final Exam	25%
Bonus	3% (Class attendance)
Students that have written and received a grade equal or larger than 60% on all three term tests, and whose cumulative average is equal or greater than 75% have the option to be exempt from writing the final exam. If you meet the requirements and choose not to write the final exam, you need to inform the instructor by email no later than December 7, 2021. For those that receive an exemption, the individual component for the final grade will be weighted as follows:	
Assignments	15%
Term Tests	85% (28.3% for each term test)
Bonus	3% (Class attendance)

5. LEARNING OUTCOMES
1) Identify the load effects and the boundary effects on a simple structure
2) Draw and label free body diagrams of physical problems
3) Apply the equations of static equilibrium to calculate resultant and reaction force vectors
4) Calculate the internal force distribution in members under axial force, shear, flexure, and torsion
5) Define stress, strain, and stress-strain relationships
6) Calculate the stresses and strains in members due to internal forces
7) Calculate axial, torsional, and flexural displacements in simple structures/members
8) Solve simple statistically indeterminate problems
9) Obtain principal stresses and orientation at a point

6. LABORATORY SAFETY

The Faculty of Engineering is committed to McMaster University's Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs and policies". It is your responsibility to understand McMaster University's Risk Management system, which is supported by a collection of Risk Management Manuals (RMMs) that contain programs and policies in support of the Risk Management System. The RMMs are available from https://hr.mcmaster.ca/employees/health_safety_well-being/our-safety/risk-management-manuals-rmms/.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for specific experiments (see course lab manuals) and the laboratory equipment https://www.eng.mcmaster.ca/sites/default/files/civil_lab_health_and_safety_manual.pdf

Additionally, McMaster University's workplace health and safety guidance related to COVID-19 must always be followed (available from https://hr.mcmaster.ca/resources/covid19/workplace-health-and-safety-guidance-during-covid-19/).

7. COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their "@mcmaster.ca" alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

8. POLICIES

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:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- 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

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.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

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.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): 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".

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period. You may submit a maximum of 1 Academic Work Missed requests per term. It is **your** responsibility to follow up with your Instructor immediately regarding the nature of the accommodation. If you are absent more than 5 days or exceed 1 request per term you **must** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation. This form should be filled out immediately when you are about to return to class after your absence.

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.

PROTECTION OF PRIVACY ACT (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades, and all other personal information at all times. For example, the submission and return of assignments and the posting of grades must be done in a manner that ensures confidentiality – see http://www.mcmaster.ca/univsec/fippa/fippa.cfm.

ANTI-DISCRIMINATION

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer, or the Human Rights Consultant, as soon as possible.
https://www.mcmaster.ca/policy/General/HR/Discrimination_and_Harassment.pdf

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.

9. MCMASTER GRADING SCALE

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49