

## Course Outline

1. COURSE INFORMATION			
Session Offered	Winter 2022		
Course Name	Statics and Mechanics of Materials		
Course Code	ENG TECH 1ME3		
Date(s) and Time(s) of Virtual Lectures	Monday 8:30AM-10:20AM Wednesday 9:30AM-11:20AM		
Program Name	Automotive and Vehicle Technology		
Calendar Description	Statics of particles and rigid bodies; force vectors; equilibrium; trusses, frames and machines; internal forces; centroids; moments of inertia; friction; axial loads, torsion, bending and shear; stress and strain.		
Instructor(s)	Dr. Reza Ushaksaraei, Ph.D., P.Eng.	E-mail: <a href="mailto:ushakr@mcmaster.ca">ushakr@mcmaster.ca</a>	
2. COURSE SPECIFICS			
Course Description	This introductory course in mechanics provides the knowledge required to solve practical problems that occur in engineering applications.		
Instruction Type	<b>Code</b>	<b>Type</b>	<b>Hours per term</b>
	C	Virtual Classroom instruction	52
	L	Laboratory, workshop or fieldwork	
	T	Tutorial	
	DE	Distance education	
	<b>Total Hours</b>		52
Resources	<b>ISBN</b>	<b>Textbook Title &amp; Edition</b>	<b>Author &amp; Publisher</b>
	ISBN:9781119286974	Engineering Mechanics: Statics, <b>8th Edition (SI Canadian Version)</b>	J. L. Meriam, L. G. Kraige, J. N. Bolton; Wiley
Prerequisite(s)	ENG TECH 1PH3 and registration in Automotive and Vehicle Technology		
Corequisite(s)	n/a		
Antirequisite(s)	n/a		
Course Specific Policies	<p>Students are expected to attend all lecture sessions, and to complete and submit reports on all requested exercises.</p> <p>Assignments will be submitted as instructed (either electronic format, or hard copy). A submission after the deadline will NOT be considered for grading or review.</p> <p>Due dates for course work will be posted on course website or communicated in class.</p>		
Departmental Policies	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>Announcements made in class or placed on Avenue are considered to have been</p>		

	communicated to all students including those individuals that are not in class. Instructor has the right to submit work to software to identify plagiarism.
<b>3. SUB TOPIC(S)</b>	
Week 1	Introduction to statics: scalars, vectors, units, Newton's Laws, Law of Gravitation
Week 2	Two-dimensional force systems: rectangular components, moments and couples, resultants
Week 3	Three-dimensional force systems: rectangular components, moments and couples, resultants
Week 4	Equilibrium in two- and three-dimensions, free-body diagrams
Week 5	Structures: plane trusses, method of joints and method of sections, frames and machines
Week 6	<b>Test #1</b> Distributed forces, centres of mass, centroids of lines, areas and volumes, composite bodies
Mid-term Recess: Monday, February 21 to Sunday, February 27, 2022	
Week 7	Distributed forces, beams
Week 8	Friction: dry friction, belt friction
Week 9	Area moments of inertia: definitions, composite areas, second moments of inertia
Week 10	<b>Test #2</b> Stress and strain
Week 11	Torsion: torsional deformation of a circular shaft, torsion formula, power transmission, Hooke's law, angle of twist, stress concentrations
Week 12	Bending: shear and moment diagrams, bending deformation of a straight member, stress concentrations, residual stress
Week 13	Review
Classes end: Tuesday, April 12 <sup>th</sup> 2022 Final examination period: Thursday, April 14 to Friday, April 29, 2022 All examinations <b>MUST</b> be written during the scheduled examination period.	
<p>Note that this structure represents a plan and is subject to adjustment term by term.              The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.</p>	
<b>4. ASSESSMENT OF LEARNING *including dates*</b>	
<b>Assignments (4 x 5%)</b> - No late assignments will be accepted (Dates TBA)	<b>20</b>
<b>Term tests (2 x 22.5%)</b> (Dates TBA)	<b>45</b>
<b>Final examination</b> (tests cumulative knowledge)	<b>35</b>
<b>TOTAL</b>	<b>100%</b>
Percentage grades will be converted to letter grades and grade points per the University calendar.	
<b>5. LEARNING OUTCOMES</b>	
1. Define the basic concepts used in mechanics: space, time, mass, force, particle, rigid body, scalars, vectors	

2. Study the effect of forces, moments and couples which act on engineering structures and mechanisms, and perform two- and three-dimensional analyses to study their effects on various types of vehicle components
3. Apply the knowledge of the properties of forces, moments and couples to solve problems involving rigid bodies in equilibrium; lay the foundation for a deeper analysis in statics and dynamics
4. Apply the principles of equilibrium to simple trusses, as well as to frames and machines
5. Analyse the friction that occurs in various machine components; develop models that include the types of dry friction which are encountered in practice
6. Determine the resultant of distributed forces and the location of the resultant, and apply the analysis for various types of forces distributed throughout volumes, over areas and along lines
7. Determine the moment of inertia of areas and apply the parallel axis theorem to problems involving the moment of inertia of composite bodies
8. Study the relationship between external forces acting on elastic bodies and the internal stresses and strains generated by these forces; apply the analyses to machine and structural elements that have applications in various fields of engineering technology
9. Analyse machine components subjected either to a twisting action that produce torsion or to concentrated or distributed loads that cause bending

## **6. COURSE OUTLINE – APPROVED ADVISORY STATEMENTS**

### **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.

[http://www.mcmaster.ca/policy/General/HR/Discrimination\\_Harassment\\_Sexual\\_Harassment-Prevention&Response.pdf](http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf)

### **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: 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](http://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.

### **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.

### **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](mailto: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".

#### **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. <http://www.mcmaster.ca/policy/Students-AcademicStudies/Studentcode.pdf>

#### **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.