

## MECH ENG 2P04: STATICS & MECHANICS OF MATERIALS

### COURSE OUTLINE

#### Instructor

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*(I am usually available through the day for consultation: you are welcome to drop by my office. Please email me if you would like to see me at a specific time.)*

#### Schedule

- ❖ Lectures: Tue, Wed, Fri | 12:30–1:20 | ITB AB102
- ❖ Tutorials:
  - T01 | Wed 3:30 – 5:20 | ABB 163
  - T02 | Mon 2:30 – 4:20 | BSB 108
  - T03 | Mon 9:30 – 11:20 | ABB 164
  - Tutorials to start the week of Sep 10

#### Learning Outcomes

Upon successful completion of the course, the student will have demonstrated the ability to:

1. Identify load effects and boundary effects in simple structures
2. Analyze simple determinate and indeterminate structures
3. Calculate stresses and strains in members due to internal forces and moments
4. Calculate normal and shear deformations in structural members

#### Graduate Attributes

This course provides students with the opportunity to develop the following measures of graduate attributes:

<i>Graduate Attributes</i>	<i>Learning Objectives where it is measured</i>
Knowledge Base for Engineering (Indicator 4)	1,2,3,4

#### Recommended Course Material

- ❖ **Course pack: MECHANICAL ENGINEERING 2P04: BRIEF NOTES & EXAMPLE PROBLEMS**  
(Compiled by Prof. Sivakumaran)
- ❖ **Text book:** Beer, Johnston, DeWolf, Mazurek, "**STATICS and MECHANICS of MATERIALS,**"  
Second Edition, McGraw-Hill, 2017, ISBN: 978-0-07-339816-7

The textbook listed above is recommended (but not mandatory) for the course. Reference texts related to "Mechanics of Materials" are available in sections TA350 and TA450 of the Thode Library of Science and Engineering.

## Lecture Content

	Topic	Lectures
1	Review of statics: vector representation of a force, resultant of forces, equilibrium of a particle (2-dimensional and 3-dimensional applications)	4
2	Review of statics: vector representation of a moment, equivalent force system (distributed loads), external reactions, concept of a free body diagram, equilibrium of a rigid body (2-dimensional and 3-dimensional applications)	4
3	Analysis of structures (trusses, frames and machines)	3
4	Internal forces: stress resultant system, shear force and bending moment diagrams	4
5	Axial loading: deformation of a member under axial load, statically indeterminate problems, problems involving temperature changes, multi-axial loading and generalized Hooke's Law	6
6	Shear stress and strain, torsion of solid and hollow circular sections	4
7	Pure bending of beams: properties of sections – second moment of area, deformation of a symmetric beam in pure bending, bending (normal) stress distribution	6
8	Shear stresses in beams, shear stress distribution in thin-walled structural sections	4
9	Stresses due to combined axial, flexural and torsional loadings	2
	Total number of lectures:	37

The above is a tentative list of topics anticipated to be covered during the lecture periods shown; however, depending on the progress with the course, additional topics may be covered, or some topics may have to be left out.

### Practice Problems

Practice problem sets will be distributed weekly. Please see the course website for problems and solutions. Students are strongly encouraged to solve the problems in the practice problem sets prior to the tutorial, during which time, some of the problems in the sets will be discussed. This course is problem-oriented, which means that concepts and applications are better learned by solving as many problems as possible. Though the course includes weekly practice problem sets, students are strongly encouraged to solve additional problems available in books related to topics discussed in this course.

### Term Tests

There will be **two** term tests. Books and notes are not permitted during the term tests, as well as during the final examination.

Term Test I: Friday, October 19 | 7:00 – 9:00 | MDCL 1008, 1009, 1102

Term Test II: Friday, November 16 | 7:00 – 9:00 | BSB 106, 119, 136, 137

### Grading

Term Tests: 50% (each term test is 25%)

Final Examination: 40%

Assignments (about 4): 10%

The percentage marks will be converted to a final letter grade using the standard conversion scale shown in the McMaster Undergraduate Calendar.

### **Procedure for Remarking Term Test Answer Books**

If a student has an issue with the way in which a term test has been evaluated, he/she may lodge their objections within a week of returning the marked papers. Term tests written in pencil will not be considered for re-marking.

*Please follow the steps below while submitting material for remarking:*

Compare your solutions to that posted on the course website. Write your complaint in a separate piece of paper indicating: (i) Problem number(s) you have a complaint about, (ii) Detailed nature of the complaint, and (iii) The marks you think you should have received, in reference to the solution/marketing scheme posted on the course website. Please submit this along with your answer book personally to the instructor. The student will receive a written response from the TA that marked the paper; if the student does not agree with the response, the student may submit the whole documentation to the instructor for arbitration.

### **Policy Reminders**

Students are reminded of the following Policies, which could be relevant to activities in this course.

Calculators Only McMaster Standard Calculator (Casio FX-991 MS or MS Plus ONLY) may be used during term tests and the final examination.

Adverse Discrimination "The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible."

Academic Integrity (Ethics and Dishonesty) "You are expected to exhibit honesty and use ethical behavior in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. 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 behavior 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. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity). 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."

Online Element "In this course we will be using Avenue to Learn. Students should be aware that, when they access the electronic components of this course, 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 this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor."

Requests for relief for missed academic term 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".

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 requiring a RISO accommodation 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."

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, labor disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email."