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, Thu, Fri | 2:30–3:20 | ITB AB102
- Tutorials:
  - T01 | Tue 3:30–5:20 | JHE 326H
  - T02 | Fri 11:30–1:20 | CNH 106
  - T03 | Thurs 11:30–1:20 | ETB 238
- Tutorials to start the week of Sep 11

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:

<table>
<thead>
<tr>
<th>Graduate Attributes</th>
<th>Learning Objectives where it is measured</th>
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<tbody>
<tr>
<td>Knowledge Base for Engineering (Indicator 4)</td>
<td>1,2,3,4</td>
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</table>

Recommended Course Material

- **Course pack**: Custom courseware: Brief notes & example problems (Compiled by Prof. Sivakumaran)

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

<table>
<thead>
<tr>
<th>Topic</th>
<th>Lectures</th>
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<tbody>
<tr>
<td>1 Review of statics: vector representation of a force, resultant of forces, equilibrium of a particle (2-dimensional and 3-dimensional applications)</td>
<td>4</td>
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<tr>
<td>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)</td>
<td>4</td>
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<tr>
<td>3 Analysis of structures (trusses, frames and machines)</td>
<td>3</td>
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<td>4 Internal forces: stress resultant system, shear force and bending moment diagrams</td>
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<td>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</td>
<td>6</td>
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<tr>
<td>6 Shear stress and strain, torsion of solid and hollow circular sections</td>
<td>4</td>
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<tr>
<td>7 Pure bending of beams: properties of sections – second moment of area, deformation of a symmetric beam in pure bending, bending (normal) stress distribution</td>
<td>6</td>
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<tr>
<td>8 Shear stresses in beams, shear stress distribution in thin-walled structural sections</td>
<td>4</td>
</tr>
<tr>
<td>9 Stresses due to combined axial, flexural and torsional loadings</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total number of lectures:</strong></td>
<td><strong>37</strong></td>
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</tbody>
</table>

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

There are no compulsory assignments for this course. 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 20 | 6:30 – 8:30 | MDCL 1009, 1110, 1309
- **Term Test II**: Friday, November 17 | 6:30 – 8:30 | BSB B135, B136, B138

### Grading

- **Term Tests**: 50% (each term test is 25%)
- **Final Examination**: 50%

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
In the event that 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/marking 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.

The instructor and 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. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

Calculators
Only McMaster Standard Calculator (Casio fx-991) 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)
"Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and 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 kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at: http://www.mcmaster.ca/senate/academic/ac_integrity.htm
The following illustrates only two 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. Copying or using unauthorized aids in tests and examinations."