Civil Engineering 2P04  
Statics & Mechanics of Materials - Fall Term, 2019-2020

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Lectures: Monday, Wednesday, Thursday (13:30-14:20) BSB B135  
Tutorial: Mon (9:30-11:20) ITB 139; Mon (16:30-18:20) T13 125; Wed (16:30-18:20) JHE A101

Course Objectives and Learning Outcomes:  
At the end of this course student should be able to: 1) identify the load effects and the boundary effects on a simple structure, 2) analyze simple determinate and indeterminate structures, 3) calculate the stresses and strains in members due to internal forces, 4) calculate axial, torsional and flexural deformations in simple structures/members, and 5) obtain principal stresses and orientation at a given point in a structural member.

Course Content

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<tr>
<th>Topic</th>
<th>Content</th>
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| 1 | Review of Statics: EQUILIBRIUM OF A PARTICLE  
Vector representation of a force, Resultant of forces, Equilibrium of a particle (2-Dimensional applications) | 3 |
| 2 | Review of Statics: EQUILIBRIUM OF A RIGID BODY  
Vector representation of moments, Resultant of forces and moments, Equivalent force system (distributed loads), External reactions, Concept of a free body diagram, Equilibrium of a rigid body (2-Dimensional applications) | 3 |
| 3 | ANALYSIS OF STRUCTURES: Analysis of Trusses, Two Force Members, Zero Force Members, Analysis of Frames and Machines (2-Dimensional) | 4 |
| 4 | INTERNAL FORCES: Member end forces, Member internal forces, Shear force and bending moment diagrams, Relations between load, shear force and bending moment.  
CONCEPT OF STRESS: Normal Stress, Shearing Stress, Bearing Stress in connections | 5 |
| 5 | ANALYSIS OF MEMBERS SUBJECTED TO AXIAL LOADING:  
Deformation of a member under axial load, Statically indeterminate problems, Problems involving temperature changes, Multi-axial loading and generalized Hooke's Law. | 5 |
| 6 | ANALYSIS OF MEMBERS SUBJECTED TO TORSION: Shear stress and strain, Torsion of solid and hollow circular sections, Polar Moment of Area, Torsional Stresses in Axii-Symmetric Members, Angle of Twist in Axii-symmetric Shafts. | 3 |

1st Midterm - October 04, 2019 (7:00-10:00pm) T13-123, T13-125
2nd Midterm - November 01, 2019 (7:00-10:00pm) T13-123, T13-125

ANALYSIS OF MEMBERS SUBJECTED TO PURE BENDING:
- Properties of sections – First Moment of Area, Centroid, Second moment of areas, Parallel axis-theorem, Deformation of a symmetric beam in pure bending, Bending (normal) stress distribution, Eccentric axial loading.

ANALYSIS OF MEMBERS SUBJECTED TO TRANSVERSE SHEAR:
- Stresses due to transverse loads, Shear stresses in common beams, Longitudinal Shear on a beam element, Shear stress distribution in thin-walled structural sections, Critical shear stress.

TRANSFORMATION OF STRESS AND STRAIN:
- Stresses due to combined axial, flexural and torsional loadings. Introduction to transformation of stresses, Principal stresses, Mohr’s circle representation.

3rd Midterm – November 22, 2019 (7:00-10:00pm) LRW B1007
Depending on the progress of the course, either additional topics may be covered or some topics may not be covered.

Recommended Reference Material
A number of reference texts related to Statics and Mechanics of Materials are available at Thode Library.

Avenue
http://avenue.mcmaster.ca/
Lecture notes; Additional notes and sample problems will be posted on Avenue. Students are expected to frequently check and read all the material posted on Avenue.

Assignments
At the end of each week, a problem set is posted on Avenue. You are required to solve and submit the solutions individually for the assessment of your comprehension of the material and preparation for the upcoming tutorial session. The assignment is due 30 minutes before your tutorial session, electronically through McMaster’s Avenue to Learn. Failure to submit the individual assignment results in losing the group assignment mark.
Assignments are checked for plagiarism and your understanding of the course material.

Tutorials
Students are required to work as groups of 3-5 members on the problems assigned from the problem set and submit a paper group assignment at the end of tutorial.
Each group chooses a Speaker and a Rep, and starts working on the assigned problem. The TA(s) will be helping the groups with their questions. The Rep is responsible for writing the final solution to hand in as group assignment. For the students who received a grade below 65% on the term test, a detail review of the electronically submitted assignments will be carried out by the TA and discussed with the student.
Groups are chosen randomly to discuss the problem they are working on. The Speaker describes the problem to the whole class, explains the challenges and questions the members might have, and waits for other groups to try to answer those questions, and finally explains the solution strategy and procedure.
At the end of the tutorial, Reps hand in the group assignment, including the name and student number of all members and indicating the Rep and the Speaker. The group assignments will be graded, marked and handed back on the next tutorial.

**Important Notes:**
- Group members do not change during the term. Group list is due on your first tutorial session after the add/drop deadline.
- Rep and Speaker roles must change every week to give everyone a chance to develop their skills and to determine the Bonus mark.
- It is important that you arrive on time.
- If a student fails to submit the individual assignment more than three times, they will receive a failing grade for the group assignment portion of the course.
- For this model to work, every student is expected to come prepared to the tutorials by practicing on the problem sets on their own.

**Midterms**
There will be three 2-hour long midterms. The dates and test rooms are confirmed. If the date and time of the midterms conflict with your regular academic schedule, you need to inform the instructor no later than September 10 by email.

**Grading Procedure**
Final grades will be converted to the twelve-point letter grade system using the standard conversion scale. Individual components will be weighted as follows:

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<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Group assignment</td>
<td>12%</td>
</tr>
<tr>
<td>Midterms</td>
<td>60% (20% for each midterm)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>28%</td>
</tr>
<tr>
<td>Bonus</td>
<td>3% (Class attendance &amp; group work)</td>
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In order to pass the course, students must complete and pass the assignments, term tests and exam portion of the course. If a student misses a midterm, they need to contact the Associate Dean of Engineering in order to obtain permission for relief (Refer to the McMaster Undergraduate Calendar for the relevant policy). If a relief is granted, there will be no makeup test and the missed midterm grade portion will be re-allocated to the final examination.

**Final exam opt-out option has been removed.**

Bonus marks will be granted to groups whose members endorse peer teaching. This will be evaluated by examining the trend of the coefficient of variance of the group members’ grades received on the midterms and activities during the tutorial.

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

"The instructor and university reserve the right to modify elements of the course during the term. The university and instructor 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 the 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."

1. All lectures and tutorials are mandatory.
2. CE 2P04 students are to attend Registrar’s office assigned tutorial section.
3. Emails from non-McMaster accounts will not receive a reply and we will not be checking for emails via avenue.
4. Students are expected to work in groups during tutorial. If there are any problems, communication/delivery or others, among group members, they are expected to first resolve it among themselves. If the problem is not resolved within one week, the group is expected to contact the TA for assistance.

POLICY REMINDERS

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

Calculators
McMaster Standard Calculator (Casio FX-991 MS or MS Plus) may be used during assignment/tutorials, term tests, and final examination.

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](http://www.mcmaster.ca/senate/academic/ac_integrity.htm)
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.

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 involved, individuals are reminded that they should contact their Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible.

Health and Safety
The Faculty of Engineering is committed to McMaster's University 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".
It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services Occupational Safety Risk Management Manual at:
It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment.