Statics and Mechanics of Materials (CIV ENG 2P04)
Course Outline, Fall 2017

Teaching Staff

Instructor
Taylor C. Steele (steeletc@mcmaster.ca)
Office Hours: By appointment only

Teaching Assistants
Nathan Buccella (buccelnj@mcmaster.ca); Office Hour: TBD
Eric Goforth (goforte@mcmaster.ca); Office Hour: TBD
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Meeting Times

Lectures
Mondays and Wednesdays: 11:30 a.m. – 12:20 p.m. (BSB B135)
Fridays: 1:30 p.m. – 2:20 p.m. (BSB B135)

Tutorials
T01: Tuesdays, 9:30 a.m. – 11:20 a.m. (ABB 163)
T02: Thursdays, 2:30 p.m. – 4:20 p.m. (KTH 109)
T03: Wednesdays, 2:30 p.m. – 4:20 p.m. (KTH 109)

Course Overview

Intended Learning Outcomes
After completing this course successfully, you will be able to:
• Draw and label free-body diagrams of physical problems
• Apply the equations of static equilibrium to calculate resultant and reaction force vectors
• Calculate the internal force distribution in members under axial force, shear, flexure, and torsion
• Define stress, strain, and stress-strain relationships
• Calculate the stresses and strains in members under axial force, shear, flexure, and torsion
• Determine the deformation of simple members under axial force, shear, flexure, and torsion
• Solve simple statically indeterminate problems
• Identify principle stresses and strains on differential stress blocks

Course Topics and Approximate Schedule
As shown in the figure and table on the following page, we will start the course with the principles of vectors, forces, resultants, and static equilibrium of particles and rigid bodies. We will extend this knowledge of statics to perform structural analysis on simple structures such as trusses, beams, and frames.

We will take an aside to explore the development of stress and strain, and the relationship between stress and strain in civil engineering materials; we will extend our structural analyses to calculate stresses, strains, and deformations in the different structural members under axial force, shear, bending, and torsion.

We will finish the course with the identification of the state of stress at a small point in the member, and determination of the maximum principle stresses and strains. A more detailed breakdown of lecture topics, due dates, and tutorials is available on the course website, under “Course Information.”
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1) Statics
   - force vectors
   - force resultants
   - particle equilibrium
   - moment resultants
   - rigid bodies

2) Structural Analysis
   - internal forces
   - axial forces
   - torsional moments
   - shear forces
   - bending moments
   - force diagrams

3) Material Stress & Strain
   - stress and strain
   - stress-strain relationship
   - poisson’s ratio
   - allowable stress

4) Stress & strain analysis
   - cross-section properties
   - normal stress/strain
   - shear stress/strain
   - combined loading
   - stress block elements

5) Deformation Analysis
   - axial elongation
   - bending curvature
   - torsional angle of twist
   - deformation compatibility
   - indeterminate problems

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<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topics (subject to change)</th>
<th>Important Dates (tentative)</th>
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<tbody>
<tr>
<td>Sep 4</td>
<td>Course introduction, force vectors</td>
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<tr>
<td>Sep 11</td>
<td>Particle equilibrium, force resultants</td>
<td>Sep 19: A1 due</td>
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<tr>
<td>Sep 18</td>
<td>Rigid bodies, internal forces in trusses</td>
<td>Sep 26: A2 due</td>
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<tr>
<td>Sep 25</td>
<td>Internal forces in trusses, and beams</td>
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<tr>
<td>Oct 2</td>
<td>Shear force and bending moment diagrams</td>
<td>Oct 2: A3 due</td>
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<tr>
<td>Oct 9</td>
<td><strong>Mid-term recess, no classes</strong></td>
<td>Oct 17: A4 due, <strong>Oct 21: Test 1</strong></td>
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<tr>
<td>Oct 16</td>
<td>Concept of normal stress, shear stress, strain</td>
<td>Oct 24: A5 due</td>
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<tr>
<td>Oct 23</td>
<td>Indeterminate problems, cross-section properties</td>
<td>Oct 31: A6 due</td>
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<td>Oct 30</td>
<td>Normal stress from bending, curvature</td>
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<tr>
<td>Nov 6</td>
<td>Shear stress and shear flow</td>
<td>Nov 7: A7 due</td>
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<tr>
<td>Nov 13</td>
<td>Shear stress from torsion, angle of twist</td>
<td>Nov 14: A8 due</td>
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<td>Nov 20</td>
<td>Indeterminate problems, combined loading</td>
<td>Nov 21: A9 due, <strong>Nov 25: Test 2</strong></td>
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<td>Nov 27</td>
<td>Stress transformation and Mohr’s circle</td>
<td>Nov 28: A10 due</td>
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<tr>
<td>Dec 4</td>
<td>Strain transformation, principle strains</td>
<td>Dec 5: A11 due</td>
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**End of Term**

**TBD: Final Exam**
Modifications
This outline may be adjusted by the university or the instructor during the term. If this happens, the class will be given reasonable notice, an explanation, and an opportunity to comment. It is your responsibility to stay informed of changes by attending lectures and by checking the course website.

Course website
All course materials will be posted to the course website, and announcements will be made periodically to remind students of Avenue2Learn (https://avenue.cllmcmaster.ca/d2l/home). It is the students responsibility to check the course website regularly.

Textbook
This text will compliment the material covered in lecture, but it is not mandatory for this course; any assigned problems taken from the text will be made available on the assignment handouts.

Assessment
Components
Your total possible percentage grade for this course will comprise the following components:

- **Final Exam (Date: TBD)**
  Two-sided hand-written information sheet, no worked-out examples; Casio fx-991 MS/MS Plus only. 35%

- **Midterm Test 2 (Saturday, November 25, 12:30 – 2:30 p.m. in LRW B1007)**
  One-sided hand-written information sheet, no worked-out examples; Casio fx-991 MS/MS Plus only. 25%

- **Midterm Test 1 (Saturday, October 21, 12:30 – 2:30 p.m. in MDCL 1102 & MDCL 1105)**
  One-sided hand-written information sheet, no worked-out examples; Casio fx-991 MS/MS Plus only. 25%

- **Weekly Assignments**
  One third of this grade is based on completeness and presentation of all problems, and two thirds is based on the correctness of randomly selected problems. 15%

The final percentage grade will be converted to a letter grade using the scale specified in the McMaster Undergraduate Calendar (http://academiccalendars.romcmaster.ca/index.php).

Assignment Grading and Submission
Assignments for this course will be marked using a grading rubric, which can be found on the course website under “Course Information.” Familiarise yourself with this rubric so that you can maximise the grade you receive for your effort. Assignments **must be completed on engineering paper**, which is available as a print-out on the course website. Assignments not completed on engineering paper will receive a 10% penalty. Assignments **must also include the standard cover page** for this course, which is also available as a print-out on the course website “Course Information.” Assignments that do not include the standard cover page will receive a 10% penalty.

Assignments are to be submitted via the physical drop box assigned to the course, just outside of the Department of Civil Engineering office. The assignment grade will be based on the best 10 assignments, provided that all have submitted all of the assignments. Late assignments will be accepted **up to one week** after the specified due date; however, these late assignments will receive a 50% penalty. Assignments submitted past the late date will not be marked, and will be assigned a grade of zero.
McMaster University Policies

Accommodation for Students with Disabilities
Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140, ext. 2865 or e-mail sas@mcmaster.ca. For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.

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.

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 dishonest”), 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 McMaster University’s policy for Academic Integrity.

The following illustrates only three forms of academic dishonesty:

- Plagiarism
- Improper collaboration in group work
- Copying or using unauthorized aids in tests and examinations

Missed Term Work
The University’s policy on missed term work is available in the McMaster Undergraduate Calendar (http://academiccalendars.romcmaster.ca/index.php), under the section General Academic Regulations. If you are unable to complete your term work for any reason, please contact the course instructor to discuss your situation as soon as possible. The McMaster Student Absence Form (MSAF) will only be accepted if you email the course instructor within one week after the due date of the assignment. When accommodations are made, they will be confirmed by email from the course instructor; any grades that are missing on the course website will be counted as zero when calculating your final grade unless you have re-ceived email confirmation otherwise. As the midterm exam is worth 25% of the final grade, students who miss the midterm must report to the Faculty Office; an MSAF is not sufficient. The weight of any missed term work will normally be deferred to the final exam.

CIV ENG 2P04 Course Policies

Professional Class Conduct
As the instructor for this course, I hope to provide a learning environment that is conducive to learning and professional development. To do this, I expect you to act professionally in a similar way that you would during a meeting with your supervisor and colleagues during your career. This includes the following:

- **Be punctual.** Arrive for lecture and tutorial on time, and take part in correspondence in a timely manner. Plan for the possibility of transportation delays. If you are late for lecture or tutorial, minimize the disruption you cause by finding the closest seat quickly and quietly.

- **Be quiet during lecture.** Refrain from discussing anything with those sitting next to you, unless you have been asked to do so. If you have any questions or misconceptions regarding the lecture material,
please raise your hand and ask the instructor; it is likely that other students in the lecture hall will have a similar question.

- **Do not use electronics for leisure.** Do not text, reply to e-mails, browse the internet, or listen to music during lecture. If you must use your device to take notes, I will check that this is what you’re using for. If you wish to use a device to take notes, please sit to the side of the lecture hall to avoid distracting others behind you. Use of devices will be permitted when students are asked to provide class feedback during lecture through the “Socrative” app.

If you are bothered by the actions of others around you, please let me know so that I may justly address your concerns as soon as possible.

A “rules free zone” will exist in the **back five rows of the lecture hall**; I will be less strict with class conduct expectations, as long as there is no disorderly behaviour that disrupts the class or your peers.

**E-mail Correspondence**

The initiation of e-mail correspondence to teaching staff from students must include a subject line, salutation, and sign off. Subject lines must start with the course number followed by a colon, and include a relevant description of the content in the e-mail (e.g. “CIV ENG 2P04: Assignment 1 Question”). Appropriate salutations must respectfully address the individual receiving the e-mail (e.g. “Dear Nathan,” “Hi Eric,” or “Hey Mehdi”). The sign-off is left to the student to decide, but this also must be respectful.

When e-mails follow this policy, students may expect a response from the TAs within one business day, or from the instructor in three business days. E-mails that do not follow this policy may not receive a response.

**Discussion of Feedback**

You are encouraged to discuss graded assignments with the grading TA, and graded midterms with the course instructor to improve your understanding of the topics explored on the assignment or midterm. To contest the grade that you received on an assignment, you must return that assignment to the grading TA, along with a written explanation of why you believe the grade to be incorrect; all such submissions must be made within one week, but no earlier than 24 hours, of receiving the graded assignment.

Periodically, you will be asked to provide feedback of your own regarding your experience during this course, including your opinions on the effectiveness of the lectures, tutorials, and assignments in contributing to your learning. This feedback will be solicited to help improve your experience, so it is in your best interest to make this feedback as informative, constructive, and respectful as possible.

**In-class Participation**

During this course, you will be asked to answer some multiple choice questions during lecture, and often to submit an “exit ticket” at the end of lectures. This will probably all be done using the application “Socrative,” which is free to download and use from the Apple App Store, Google Play Store, and Microsoft Store. Your participation in this process is not mandatory (i.e. you will not lose marks for choosing not to participate), but it is very important for providing the course instructor feedback on your learning. To motivate students to participate in this process, 1 to 2 bonus points will be awarded based on the level of participation.

Questions posed during lectures will be both quantitative (requiring simple calculation) and qualitative (requiring an extra bit of thinking). You are expected to have the required tools with you during lecture such that you may answer these questions in a timely manner.