Steel Structures (CIV ENG 4N04)
Course Outline, Fall 2019

Teaching Staff
Lecturer: Paul Steneker (stenekpr@mcmaster.ca)
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TBA
Office Hours: TBA

Communication
Lectures: Mondays, Wednesdays, and Thursdays 13:30-14:20 in TSH B105
Tutorials: Thursdays 8:30-10:20 in JHE A101, BSB B155 or BSB154
Website: On Avenue to Learn (http://avenue.mcmaster.ca). Please sign up immediately because important information and course documents will be posted there. It is your responsibility to check the course website regularly as this will be the main source of updated information.
Email: You can expect a response from TAs within 1 business day, or from the instructor within 3 business days. We will only answer emails from your official @mcmaster.ca address. No guarantee is provided for answers to personal addresses.

Academic Accommodation of Students with Disabilities
Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University’s Academic Accommodation of Students with Disabilities policy.

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.

Course Overview
Learning Outcomes
When you have successfully completed this course, you will be able to:

• identify key elements of steel structures, such as braces, columns, and beams [CEAB Indicator 1.4]
• calculate the forces in these members using fundamental principles of engineering statics, including strategies for solving trusses and for drawing shear force and bending moment diagrams [CEAB Indicator 1.3]
• describe the limit states of these elements and their connections using words, sketches, and calculations [CEAB Indicators 1.4 and 7.1]
• navigate the CISC Handbook of Steel Construction [CEAB Indicator 1.4]
• apply this fundamental and specialized engineering knowledge to solve unfamiliar problems in steel design [CEAB Indicator 3.2]
• design steel elements using the current Canadian steel specification, S16-14, to resist the loading conditions specified by the current National Building Code of Canada, NBC 2015 [CEAB Indicators 1.4 and 2.3]
• identify the assumptions that are required to design these elements and the limitations of the equations that are used for analysis and design [CEAB Indicators 2.1 and 2.3]
• integrate the design of individual structural elements into a larger project, and communicate the design, including its context and limitations, using writing and drawings [CEAB Indicators 2.3 and 7.1]

If you achieve these objectives, you will be able to contribute meaningfully to the work that structural engineers do, whether in a design office or in academia.

Graduate Attributes and CEAB Indicators
Through this course, you will develop in the following graduate attributes and indicators:
1. A knowledge base for engineering (Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.)
   1.3 Competence in Engineering Fundamentals
   1.4 Competence in Specialized Engineering knowledge
2. Problem analysis (An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.)
   2.1 Demonstrates an ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed.
   2.3 Obtains substantiated conclusions as a result of a problem solution including recognizing the limitations of the solutions.
3. Investigation (An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.)
   3.2 Selects appropriate model and methods and identifies assumptions and constraints.
7. Communication Skills (An ability to communicate complex engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.)
   7.1 Demonstrates an ability to respond to technical and non-technical instructions and questions.

Course Outline and Approximate Schedule
The figure and table on the following page summarize the structure of the course. The first 2-3 weeks will focus on aspects of structural design that are common to all materials: how structures carry loads, how to calculate those loads using the National Building Code of Canada (NBC 2015), and the principles of Limit States Design.

The majority of the course will be spent on the behaviour and design of individual steel members according to the Canadian steel specification S16-14. We will start by discussing the behaviour and design of steel members in tension, including bolted and welded connections for such members. Next, we will consider the behaviour of steel members in compression. Bending members, which carry loads through a combination of tension and compression, will be our next topic. Finally, we will study situations with combined flexural and axial loading. As time permits, we will also discuss P-Delta effects and current research in earthquake engineering.
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topics (subject to change without notice)</th>
<th>Due Dates (subject to change without notice)</th>
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<tbody>
<tr>
<td>Sep 4</td>
<td>Structural Design</td>
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<td>Sep 11</td>
<td>Load Paths, Gravity Loads</td>
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<td>Sep 18</td>
<td>Lateral Loads, Limit States Design</td>
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<td>Sep 25</td>
<td>Tension Members: Failure Surfaces</td>
<td>Sep 26: Assignment 1</td>
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<td>Oct 2</td>
<td>Tension Members: Bolted Connections</td>
<td>Oct 3: Assignment 2</td>
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<td>Oct 9</td>
<td>Bolts in Tension and Shear</td>
<td>Oct 10: Assignment 3</td>
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<td><strong>Oct 16</strong></td>
<td><strong>Midterm Recess, No Lectures or Tutorials</strong></td>
<td><strong>Oct 24: Midterm Exam</strong></td>
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<td>Oct 23</td>
<td>Introduction to Welding</td>
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<td>Oct 30</td>
<td>Fillet Welds and Shear Lag in Welded Connections</td>
<td>Oct 31: Assignment 4</td>
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<td>Nov 6</td>
<td>Compression Members</td>
<td>Nov 7: Assignment 5</td>
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<td>Nov 13</td>
<td>Flexural Members</td>
<td>Nov 14: Assignment 6</td>
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<td>Nov 20</td>
<td>Shear and Deflections in Beams</td>
<td>Nov 21: Assignment 7</td>
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<td>Nov 27</td>
<td>Combined Axial and Flexural Loading</td>
<td>Nov 28: Assignment 8</td>
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<tr>
<td>Dec 4</td>
<td>Course Wrap-Up</td>
<td>Dec 5: Project</td>
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Extreme Circumstances and Other Modifications

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.

In addition, the instructor may adjust the lecture and assessment schedule during the term. If this happens, the class will be given reasonable notice, an explanation, and an opportunity to comment, although the instructor will not necessarily make changes in response to comments received. It is your responsibility to stay informed of changes by attending all lectures and by checking the course website regularly.

Required Background: Structural Analysis (3G03 or 3G04), Civil Engineering Materials & Design (3P04)

Books

Required: Handbook of Steel Construction, 11th Edition, 3rd Revised Printing. Canadian Institute of Steel Construction, Markham ON. If you use an earlier printing, you are responsible for the changes published by the CISC.


Both of the above books are available from the CISC’s Amazon storefront. The discount codes that are available on the course website expire on October 15, 2018.


Assessment Components

Final Exam (Date TBA) 50%
  - Limited Open Book: CISC handbook and specified documents only
  - McMaster Standard Calculator (Casio fx-991 MS or MS Plus) only

Midterm Exam (October 24 during Tutorial Time) 25%
  - Limited Open Book: CISC handbook and specified NBCC documents only
  - McMaster Standard Calculator (Casio fx-991 MS or MS Plus) only

Design Project & Assignments 25%

There will be approximately 8 assignments throughout the term, worth a total of 20% of your final grade. These assignments will include both individual (80% of each assignment) and group work (20% of each assignment) components. Most assignments will involve phases of the design project, which encompasses the design of a low-rise steel structure. One question requiring the interpretation of in-situ scenarios will be included for discussion among the group. All group members will receive the same grade for the group work portion only. The final group project report will be worth 5% of your final grade. It will include structural drawings and a discussion of the selected design solutions.

The final percentage grade will be converted to a letter grade using the scale specified in the McMaster calendar (http://academiccalendars.romcmaster.ca/index.php under General Academic Regulations).

Late Submissions

If an assignment will be accepted after the regular deadline, the deadline for late submissions will be listed on the assignment. A deduction of 20% will apply (e.g. a student who scores 80% on the assignment will receive 60% if it is submitted late).

1 For each student, a non-zero midterm exam grade will be replaced with the final exam grade if it is to that student’s benefit.
Discussions of Feedback
You are encouraged to discuss the feedback that you receive on any assessment with your TAs or the course instructor. If you believe that you have received an incorrect grade on any piece of assessment, you must return it to the person who marked it, together with a written explanation of why you believe the grade was incorrect, within one week of the day that the assessment was returned. This may result in the grade increasing, decreasing, or remaining the same.

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.” In accordance with university policy, 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 received 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.

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 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/

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.

In this course, most assignments will have slightly different numerical questions for each group member. Discussing your solution technique with your group members is encouraged, but copying some or all of the solution from another student who has the same numerical problem as you is considered an example of academic dishonesty.

Diversity and Inclusion
Under the Ontario Human Rights Code and McMaster policy, you have a right to an environment that is free of discrimination and harassment. If you have any concerns, please do not hesitate to contact me or a human rights officer (equity.mcmaster.ca). Like many people, I am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone, including me) that made you feel uncomfortable, please talk to me about it. Anonymous feedback is always an option.

Laboratory Safety
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 Policy, which is available at http://www.workingatmcmaster.ca/med/document/Lab-Safety-Handbook-1-36.pdf. It is also
your responsibility to follow any specific Standard Operating Procedures that may be provided for some of the ex-
periments and the laboratory equipment. The safety requirements for all Civil Engineering laboratories are listed be-
low. Students who do not comply with health and safety requirements will not be allowed to participate in the lab.
- Glasses or safety glasses/goggles must be worn in the lab at all times
- Contact lenses are not to be worn in the lab.
- No short (i.e., above the knee) pants or skirts are permitted in the lab – lab coats must be worn over top of
your clothing in these instances.
- Closed-toe shoes must be worn at all times.
- No loose clothing allowed.
- Long hair must be tied back.
- Gloves must be worn when working with hazardous chemicals (as indicated by the laboratory instructor).

In addition, the following instructions have been provided specifically for this course by the Applied Dynamics Labo-
ratory manager, Kent Wheeler:
- **PPE Required:** During the lab, students are required to wear Green Patch safety boots, hard hats, and safety
eye-glasses at all times. Students supply their own safety boots. Hard hats and safety-glasses are available in the
lab. Prescription eye-glasses are only considered as safety glasses if they have side shields.
- Maintain a safe distance from the universal tester while the sample is being loaded.
- No one will create a situation that could compromise or jeopardize the safety of themselves or anyone else in
the lab. Obey all instructions given to you by the Teaching Assistant and/or lab technical staff.
- These safety requirements are emphasized (1) through a pre-lab form which each student must sign, (2)
through lab work instruction sheets, and (3) instructor/TA/technicians check each student to ensure they are
wearing the above items.
- Prior to each lab, students are verbally reminded that they should wear the above safety equipment at all
times, and in addition lab specific safety instructions are given to students by the instructor/TA/technicians.
- Failure to comply with safety rules, will result in the individual student being denied access to the lab and
given a “did not complete” grade for the lab session.
Copyright Notice
All slides, presentations, handouts, lecture notes, and other course materials in this course are the intellectual property of the instructor unless otherwise noted, and are protected by law under Canada’s Copyright Act. Unless a user’s right in the Copyright Act covers the particular use, students must not publish, post on a public internet site, sell, rent, or otherwise distribute any course materials without the instructor’s express permission.

Professional Class Conduct
My goal in every class is to provide the best possible environment for everyone in the class to become competent structural engineering professionals. In order to do this, I expect you to treat meetings of this class as you would treat meetings that with your supervisor in an engineering design office. This includes the following expectations:

- **Arrive on time.** Plan for the possibility of transport delays. But if you are late, minimize the disruption you cause by quickly and quietly finding a seat near the aisle.
- **Come prepared to work.** Expect to participate actively in every class, check the course website before coming, and bring a calculator with you.
- **Be quiet during class.** If you have a question, please raise your hand so that I can answer it for everyone.
- **Turn off all electronic devices during class, unless you are taking notes on it.** I will check.
- **Avoid eating during class.** If you must eat, choose something that you can eat quietly and that is not smelly.
- **Avoid leaving the room during class.** If you must leave, minimize your disruption by doing so quickly and quietly.

**If you are disrupting the class,** after a warning, I may have to ask you to leave the class and possibly to meet with the Chair of the Department if the behaviour persists.

**If you are bothered by the behaviour of other students,** please let me know so that I can address your concerns quickly.