McMaster University | ENGINEERING

# COURSE OUTLINE

## COURSE INFORMATION

**Course Name:** Design of Low-Rise Buildings **Course Code:** CIV ENG 4W04

**Session Offered:** Winter 2026

**Calendar Description:** Structural systems and load distribution, design of masonry, wood, and cold-formed steel. Introduction to building envelope design.

**Pre-Requisites:** CIVENG 3J04, CIVENG 3G04 and credit or registration in CIVENG 4N04

**Website:** Avenue to Learn (http://avenue.mcmaster.ca).

**Instructor:** Dr. Cancan Yang, yangc106@mcmaster.ca, 905.525.9140 x 27054, JHE 339

**Teaching Assistants:** Gaohong Ye (yeg8@mcmaster.ca)
Yaathaven Sathananthan (sathanay@mcmaster.ca)

**Lecture Schedule Day(s):** Tuesdays 12:30 PM-2:20 PM; Thursdays 12:30PM-1:20PM

**Lecture Location:** BSB 108

**Tutorial Schedule Day(s):** Fridays 12:30 PM - 2:20 PM

**Tutorial Location:** HSC 1A4

**TA Office Hours:** Fridays 2:30 PM – 3:30 PM; JHE 329A

**Instructor Office Hours:** Wednesdays 1:00 PM – 2:00 PM; JHE 339

**Code and Design references:** National Building Code of Canada. Available at: https://nrc-publications.canada.ca

CSA S304 Design of Masonry Structures. Canadian Standards Association (CSA). Available at: https://library.mcmaster.ca/databases/csa-standards-csa-ondemand

CSA O86 Engineering Design in Wood. Canadian Standards Association (CSA). Available at: https://library.mcmaster.ca/databases/csa-standards-csa-ondemand

**Lecture Handouts and Notes:** Lecture References and Examples
(PDFs available on Avenue to Learn)
Lecture Notes
(PDFs available on Avenue to Learn)

**Recommended Textbooks: (Not required)** Bennett, B. and Drysdale, R. "Masonry Structures: Behaviour and Design." (2nd Canadian Edition), Canada Masonry Design Centre. Available at: https://www.canadamasonrydesigncentre.com/resources/textbook/

"Introduction to Wood Design", Canadian Wood Council. Available at: https://webstore.cwc.ca/student-promotion/

## 1. COURSE OBJECTIVES

This course covers the analysis and design of low-rise buildings with materials including masonry and wood. The structural loading and load paths pertinent to low-rise buildings and the response and design of masonry and wood structures to these loads will be studied. Topics includes properties of materials used in the construction of reinforced masonry and wood buildings, design principles and requirements of building components under a variety of loading scenarios.

## 2. COURSE SPECIFIC POLICIES

**Course Materials:** Lecture-related documents (e.g., relevant code provisions, class examples) will be distributed via Avenue to Learn. These materials will be organized by teaching topics for easy reference. Students are expected to check Avenue to Learn daily to stay updated.

**Assignments:** Assignments must be submitted as a single electronic file to Avenue to Learn under Assessment > Assignment by the due date. Late submissions will incur penalties as follows: 1) From 0–48 hours late: 1% penalty per hour. 2) No submissions will be accepted after 48 hours.

Each assignment must include a cover page with the following information: Course title (e.g., CIV ENG 4W04 – Design of Low-Rise Buildings), Assignment number (e.g., Assignment #3), Submission date, and Student name.

MSAF assignments will be extended for 48 hrs following their original due dates.

**Exams:** The midterm exam will be 100 minutes long and is scheduled for Friday, February 27th, from 12:30 PM to 2:10 PM. The final exam will be 2.5 hours long and will take place during the designated final examination period. If a student misses the midterm exam and submits an MSAF, their midterm grade will be replaced by their final exam grade.

## 3. TENTATIVE SCHEDULE

| WEEK | Topics | Assessment Tools |
|---|---|---|
| WEEK 1 | Limit States Design<br>Seismic Design of Building Structures<br>Lateral Load Distribution | Assignment 1;<br>Assignment 2;<br>Midterm exam;<br>Final exam. |
| WEEK 2 | | |
| WEEK 3 | | |
| WEEK 4 | Materials Used in Masonry Construction;<br>Design of Masonry Beams | Assignment 3;<br>Midterm exam;<br>Final exam. |
| WEEK 5 | | |
| WEEK 6 | | |
| WEEK 7 | Midterm Recess | No Lectures or Tutorial |
| WEEK 8 | Design of Masonry Shear Walls | Assignment 4;<br>Final exam. |
| WEEK 9 | Design of Masonry Out-of-Plane Walls | Assignment 5;<br>Final exam. |
| WEEK 10 | | |
| WEEK 11 | Wood Properties, Products, and Systems | Assignment 6;<br>Final exam.. |
| WEEK 12 | Design of Axially Loaded Wood Members | |
| WEEK 13 | Design of Bending Wood Members | Assignment 7;<br>Final exam. |

| | |
|---|---|
| FINAL EXAMINATION | Scheduled during the regular University Final Examination period established by the Registrar's Office. |

| 4. ASSESSMENT OF LEARNING | WEIGHT % |
|---|---|
| Assignments | 30% |
| Midterm Exam<br>(12:30 PM-2:10 PM, February 27th, Friday) | 30% |
| Final Exam | 40% |
| **Note:** MASFed Midterm Exam will be replaced with the final exam grade. | |

## 5. LEARNING OUTCOMES

1. Develop technical competence in determining structural loading and load paths pertinent to low-rise buildings, and lateral load distributions.
   • CEAB attribute 1.4 "Competence in specialized engineering knowledge."
2. Develop significant insight into the structural behaviour of low-rise buildings under design loads.
   • CEAB attribute 1.4 "Competence in specialized engineering knowledge."
3. Understand the properties and material specifications associated with each basic component of masonry (units, mortar, grout, accessory materials).
   • CEAB attribute 2.1 "Ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed."
4. Design masonry beams, shear walls, and out-of-plane walls for ultimate strength limit states using the design provisions of the National Building Code of Canada and CSA S304 Design of Masonry Structures.
   • CEAB attribute 2.2 "Ability to identify a range of suitable engineering fundamentals (including mathematical techniques) that would be potentially useful for analyzing a technical problem."
   • CEAB attribute 4.6 "Determines and employs applicable standards and codes of practice."
5. Understand the properties of wood and its grading process.
   • CEAB attribute 2.1 "Ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed."
6. Design individual wood structural members under a variety of loading conditions: members under axial tension and compression, under flexure, under combined axial load and bending using the design provisions of National Building Code of Canada and CSA O86 Engineering Design in Wood.
   • CEAB attribute 2.2 "Ability to identify a range of suitable engineering fundamentals (including mathematical techniques) that would be potentially useful for analyzing a technical problem."
   • CEAB attribute 4.6 "Determines and employs applicable standards and codes of practice."

## 6. LABORATORY SAFETY

The Faculty of Engineering is committed to McMaster University's 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 and policies". It is your responsibility to understand McMaster University's Risk Management system, which is supported by a collection of Risk Management Manuals (RMMs) that contain programs and policies in support of the Risk Management System. The RMMs are available from https://hr.mcmaster.ca/employees/health_safety_well-being/our-safety/risk-management-manuals-rmms/.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for specific experiments (see course lab manuals) and the laboratory equipment https://www.eng.mcmaster.ca/sites/default/files/civil_lab_health_and_safety_manual.pdf

Additionally, McMaster University's workplace health and safety guidance related to COVID-19 must always be followed (available from https://hr.mcmaster.ca/resources/covid19/workplace-health-and-safety-guidance-during-covid-19/).

## 7. COMMUNICATIONS

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their "@mcmaster.ca" alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

## 8. POLICIES

### 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. **It is your responsibility to understand what constitutes academic dishonesty.**

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. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy*, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/.

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.

### AUTHENTICITY / PLAGIARISM DETECTION

**Some courses may** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

### COURSES WITH AN ON-LINE ELEMENT

**Some courses may** use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, 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 a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

### ONLINE PROCTORING

**Some courses may** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

### CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

**ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES**

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

**REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK**

McMaster Student Absence Form (MSAF): 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".

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period. You may submit a maximum of 1 Academic Work Missed requests per term. It is **your** responsibility to follow up with your Instructor immediately regarding the nature of the accommodation. If you are absent more than 5 days or exceed 1 request per term you **must** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation. This form should be filled out immediately when you are about to return to class after your absence.

**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 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.

**COPYRIGHT AND RECORDING**

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

**PROTECTION OF PRIVACY ACT (FIPPA)**

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades, and all other personal information at all times. For example, the submission and return of assignments and the posting of grades must be done in a manner that ensures confidentiality – see http://www.mcmaster.ca/univsec/fippa/fippa.cfm.

**ANTI-DISCRIMINATION**

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment

Officer, or the Human Rights Consultant, as soon as possible.
https://www.mcmaster.ca/policy/General/HR/Discrimination_and_Harassment.pdf

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

## 9. MCMASTER GRADING SCALE

| Grade | Equivalent Grade Point | Equivalent Percentages |
|---|---|---|
| A+ | 12 | 90-100 |
| A | 11 | 85-89 |
| A- | 10 | 80-84 |
| B+ | 9 | 77-79 |
| B | 8 | 73-76 |
| B- | 7 | 70-72 |
| C+ | 6 | 67-69 |
| C | 5 | 63-66 |
| C- | 4 | 60-62 |
| D+ | 3 | 57-59 |
| D | 2 | 53-56 |
| D- | 1 | 50-52 |
| F | 0 | 0-49 |