McMaster University | Engineering
Civil Engineering

COURSE OUTLINE
Fall 2026

1. COURSE INFORMATION

Course Name: Civil Engineering Materials and Design

Course Code: CIVENG 3P04

Course credit hours: 4 credit hours

Session offered: Fall 2026

Calendar description: Characteristics, behaviour and use of Civil Engineering materials: concrete, steel, wood, and composites; Physical, chemical and mechanical properties; Quality control and material tests; Concepts of structural design, limit states design, estimation of structural loads.

Teaching approach: Weekly two lectures plus one lab and tutorial

Pre-requisites: Structural Mechanics (2C04), Structure and Properties of Materials (MATLS1M03)

Instructor: Hisseine Ousmane

Email: hisseino@mcmaster.ca **Office Hours:** Friday 11:30 – 12:30 PM

Teaching assistants (TA): **Office hours are held via Teams. Reach out if an in-person meeting is needed.**

Ahmed Fageeri	fathelra@mcmaster.ca	—
Anas Mustapha	mustaa22@mcmaster.ca	Friday 10:00 – 11:00, weeks 2 to 5
Asim Abbas	abbasa53@mcmaster.ca	Friday 10:00 – 11:00, weeks 6 to 9
Ayman Mdallal	mdallala@mcmaster.ca	Friday 10:00 – 11:00, weeks 10 to 13

Schedule: **Class lectures**:

Time: Monday 2:30 PM – 4:20 PM
Wednesday 2:30 PM – 3:20 PM

Labs:

Labs L01 to L03 and Labs L04 to L06 occur in alternating weeks. This means that in any given week, only one set of labs will run: if sections L01 to L03 are scheduled, then sections L04 to L06 will run the following week.

Lab session	Timing	Location
CIVENG 3P04-L01	Tuesday 8:30 AM - 11:20 AM	
CIVENG 3P04-L02	Tuesday 2:30 PM - 5:20 PM	
CIVENG 3P04-L03	Thursday 8:30 AM - 11:20 AM	
Lab session	**Timing**	**Location**
CIVENG 3P04-L04	Tuesday 8:30 AM - 11:20 AM	
CIVENG 3P04-L05	Tuesday 2:30 PM - 5:20 PM	
CIVENG 3P04-L06	Thursday 8:30 AM - 11:20 AM	

Tutorials:

Tutorial session	Timing	Location
CIVENG 3P04-T01	Thursday 04:30PM - 06:20PM	
CIVENG 3P04-T02	Wednesday 10:30AM - 12:20PM	

Website: Please refer to **Avenue to Learn** (http://avenue.mcmaster.ca) where course documents, important information, and announcements will be posted regularly. It is the student's full responsibility to check the course website regularly.

Accommodations: If you have unique circumstances, please feel free to reach out so that an accommodation may be arranged to help you achieve your learning goals for this course.

2. COURSE LEARNING OUTCOMES (CLOs)

Upon successful completion of this course, you will be able to:

CLO 1: **Identify** the key factors that affect the engineering properties of common construction materials (i.e., concrete, structural steel, and wood) as well as the important properties relevant to the design, construction and performance of structures made of these materials [CEAB Indicator 1.2].

CLO 2: **Characterize** aggregates and **calculate** concrete mix proportions to **formulate** and **produce** a concrete mix for a target strength and durability [CEAB Indicator 4.1].

CLO 3: **Perform** key laboratory tests/analysis of data to **assess** fresh and mechanical properties of concrete as well as **report** test results in a systematic and coherent form—following applicable engineering practice [CEAB Indicators 6.1; 6.2].

CLO 4: **Describe** the engineering properties of reinforcing steel, structural steel, and other ferrous alloys necessary to meet the Canadian Standards (CSA) specifications [CEAB Indicators 1.2].

CLO 5: **Identify** the key properties and applications of fibre reinforced polymers (FRP) in construction [CEAB Indicator 1.2].

CLO 6: **Identify** the structure, properties, and use of wood in construction and its limitations as well as the factors that influence the mechanical properties and durability of wood [CEAB Indicator 1.2].

CLO 7: **Describe** the structural design process, the concepts of load and resistance, as well as the concepts of uncertainty in design and its effect on the safety and serviceability of structures—with particular focus on the National Building Code of Canada [CEAB Indicators 4.1; 7.2].

To achieve these CLOs, course content has been structured around five themes as depicted in below figure.

Graduate attributes and CEAB indicators

Through this course, you will develop 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.

1.2 Competence in Natural Sciences

4. Design

An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, economic, environmental, cultural and societal considerations.

4.1 Recognizes and follows an engineering design process. (This means an iterative activity that might include recognizing the goal, specifying the constraints and desired outcomes, proposing solutions, evaluating alternatives, deciding on a solution, and implementing.)

6. Individual and teamwork

An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.

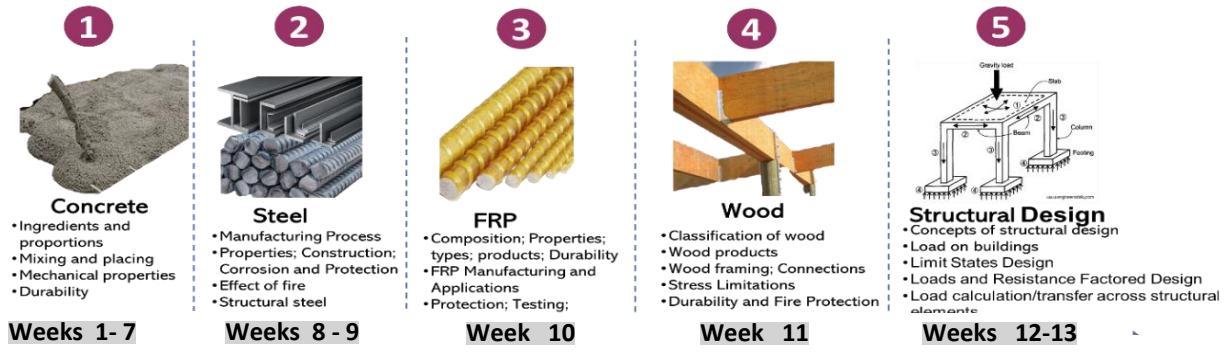
6.1 Manages time and processes effectively, prioritizing competing demands to achieve personal and team goals and objectives.

6.2 Develop and implement processes and methodologies to manage the effectiveness of a team both in terms of the quality of the work produced by the team as well as the inter-personal relationships within the team.

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.

7.2 Presents instructions and information clearly and concisely as appropriate to the audience



3. COURSE SPECIFIC POLICIES

3.1. Expectations

For an enriching learning experience, students are expected to comply with the following guidelines:

- **Punctuality:** Students are expected to be on time. If occasionally delays occurred, please join the class while minimaxing the class.
- **Courtesy:** You are responsible of maintaining an enriching learning ecosystem. Electronic devices should be on either airplane mode or on silence. You are also expected to communicate (orally and in written) politely. **Offensive language or gestures are unacceptable**.
- **Late submission policy:**
    1. From 6-12 hrs – Grace period
    2. From 12-24 hrs – 25% Penalty
    3. No submissions allowed after 24 hrs (A2L submission Dropbox closes, emails will NOT be accepted).

- **Email communications with the teaching team**

  Teaching constitutes 40% of the instructor's workload, with the rest distributed between research (40%) and service for the university (20%). Given that the course's instructor also teaches CIVENG 2P04 this Fall, the time allocated to CIVENG 3P04 is about 20% of the instructor's workload. While the teaching team strives to respond to your emails timely, some delays may occur, considering the expected volume of emails. Therefore, the estimated time to expect response to your emails is:
    - **Emails sent to TAs**: Responses expected within **1 – 2 working days**
    - **Emails sent to the instructor**: Responses expected within **2 – 5 working days**

3.2. Pedagogical approach

This course comprises class lectures, tutorials, and a laboratory component. Lectures are delivered by the course instructor using a blend of power point slides and videos. The laboratory component will take place in the Applied Dynamic Lab (ADL). Course TAs and ADL technical team will ensure lab logistics. Course instructor may occasionally attend lab sessions. Tutorials are run by TAs and are meant to review, discuss, and practice key principles presented in the core lectures.

3.3. Continuous assessment:

To ensure continuous course improvement, students my be asked to respond to an anonymous electronic questionnaire — on course content, delivery method, and instructor's performance — managed through McMaster's Institutional Quality Assurance Process (IQAP).

3.4. Students' responsibilities

1. **Contact hours:** This is a 4-credit hour course. The weekly contact hours are split as follows: 3 hours for formal classes; and 1 hour for lab or tutorial.
2. **Workload:** To complete this course successfully, students must actively in all course components: class lectures, labs, and tutorial sessions.
3. **Concrete mix design lab:** The lab work is to be carried out in teams. Students are encouraged to form their teams following the first lecture. All team members MUST actively contribute to accomplishing the lab work and the associated report.

3.5. Bibliography

Cement Association of Canada, Design and Control of Concrete Mixtures 9th edition (EB101) softcover and online pdf pack, ISBN-13: 9781896553245.
You can access your course material through the Campus Store.

4. COURSE SCHEDULE

Class date YYYY-MM-DD	Topics	Description	Assignments/ Other submission
Week 1: Sep 7 • Lecture 1 (Wed)	Background	• Introduction to the course	
Week 2: Sep 14 • Lecture 2 (Mon) • Lecture 3 (Wed)	Ingredients of Concrete	• Aggregates: types, characterization tests, physical properties, choice of nominal size, effect of physical properties of aggregates on concrete performance	
Week 3: Sep 21 • Lecture 4 (Mon) • Lecture 5 (Wed)	Ingredients of Concrete; Basic Concrete mix design	• Cement: history, manufacturing, types, properties, and applications • Water: Effect of Cl^-, Sulphates, Alkalis, etc. • Concrete mix: mix design steps, solved examples, mix design for non-air-entrained concrete	**Quiz 1: Week 2 content (aggregates)**
Week 4: Sept 28 • Lecture 6 (Mon) • Lecture 7 (Wed)	Concrete mix design with moisture correction considerations	• Mix design with moisture correction considerations • Mix design for air-entrained concrete	**Quiz 2: Week 3 content (cement)**
Week 5: Oct 5 • Lecture 8 (Mon) • Lecture 9 (Wed)	Mix design: considerations of admixtures and SCMs	• Tips for enhancing concrete mix designs • High-strength concrete; Concrete admixtures • Supplementary cementitious materials (**SCM**s)	**Lab 1 Report Submission**
Week 6: Oct 12	**READING WEEK: Oct 12 to Oct 16 — Midterm Recess: No Lectures or Tutorial**		
Week 7: Oct 19 • Lecture 10 (Mon) • Lecture 11 (Wed)	Concrete properties	• Slump, temperature, air content • Concrete placing, types of vibrators • Hardened properties: compressive strength, elastic modulus, creep, shrinkage, expansion • Joints, Hot weather placement, cold weather placement; Durability	**Quiz 3: Weeks 4&5 content (concrete mix design)**
Week 8: Oct 26 • Lecture 12 (Mon) • Lecture 13 (Wed)	Durability of concrete	• Physical deterioration: cracking; frost, attrition, fire • Chemical deterioration: sulphates, alkali-silica reaction; Reinforcement corrosion	**Midterm Exam Monday Oct 26** **Quiz 4: Week 7 content (concrete properties)**
Week 9: Nov 2 • Lecture 14 (Mon) • Lecture 15 (Wed	Structural Steel	• Steel Manufacturing Process • Properties; Construction	**Lab 2 Report Submission**
Week 10: Nov 9 • Lecture 16 (Mon) • Lecture 17 (Wed)	Structural Steel	• Corrosion and protection • Effect of fire • Cold formed steel members	**Quiz 5: Week 8 content (concrete durability)**
Week 11: Nov 16 • Lecture 18 (Mon) • Lecture 19 (Wed)	Fiber-reinforced polymers	• Composition; properties; types; products • FRP Manufacturing and applications • Examples: testing; protection	**Quiz 6: Weeks 9&10 content (Steel)**
Week 12: Nov 23 • Lecture 20 (Mon) • Lecture 21 (Wed)	Wood and wood structures	• Classification of wood and wood products • Wood framing; Stress limitations • Durability and fire protection	**Quiz 7: Week 11 content (FRP)**
Week 13: Nov 30 • Lecture 22 (Mon) • Lecture 23 (Wed)	Structural Design	• Concepts of structural design • Load on buildings	**Lab 3 Report Submission**
Week 14: Dec 7 • Lecture 24 (Mon) • Lecture 25 (Wed)	Structural Design	• Limit state design • Loads and resistance factored design • Load transfer across structural elements	**Quiz 8: Week 13 content (Structural Design)**
Check McMaster University calendar for final exams.			

5. ASSESSMENT OF LEARNING

Assessment tools: Students will be evaluated on the following items:

- 8 Quizzes (best 6 quizzes are counted): 15% (2.5% each) – [Additional correctly submitted quizzes will serve for bonus at 0.5% each]. ***Quizzes take place during the tutorial sessions.***
- Concrete mix design lab: 15%
- Midterm exam: 30%
- Final exam: 40%

Evaluation tool	Weight (%)	Week/Date
Quiz 1	Best 6 quizzes are counted as 15%	Week 3
Quiz 2		Week 4
Quiz 3		Week 6
Quiz 4		Week 7
Quiz 5		Week 9
Quiz 6		Week 10
Quiz 7		Week 11
Quiz 8		Week 13
Concrete Lab	15%	
Midterm exam	30%	**2026-10-26**
Final exam*	40%	TBD*

*Check the final exam calendar

Assessment criteria: Resources on course website provide the evaluation grid for each assessment tool.

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 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. 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 (see Department Safety Manual). McMaster University's workplace health and safety guidance related to COVID-19 should always be followed.

The safety requirements for all Civil Engineering laboratories are listed below. Students not abiding by these safety requirements will be given one warning. Second offences will result in the student being asked to vacate the laboratory and receiving a grade of zero for that particular 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).

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.

USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI):

This course represents a fundamental component of your Civil Engineering curriculum. As such, all evaluated work **MUST** be your own manually solved work. The use of generative AI tools to solve problems is **unacceptable** and is considered a breach of academic integrity.

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, usernames for the McMaster email 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