Civil Engineering
CIVENG 3J04
Reinforced Concrete Design
Winter 2026

McMaster University
ENGINEERING

Instructor Information

Saber Fosoul, Ph.D., EIT.
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Office Hours:
By Appointment

TA Information

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Class Times

Class dates and times

Lectures:	Mondays, Wednesdays, Thursdays	5:30 PM - 6:20 PM

Tutorials:	Fridays	2:30 PM - 4:20 PM
Labs:		
L01	Mondays	2:30 PM - 5:20 PM
L02	Thursdays	8:30 PM - 11:20 PM
L03	Wednesdays	2:30 PM - 5:20 PM
L04	Tuesdays	2:30 PM - 5:20 PM

Class Format

In-person attendance is required for this course.

Course Dates: 01/05/2026 - 04/07/2026
Units: 4.00
Course Delivery Mode: In Person
Course Description: Design by limit states methods to ensure adequate capacities for bending moment, shear and diagonal tension, axial force, bond and anchorage; and design to satisfy serviceability requirements for deflection and cracking; practical design requirements; interpretation of building code for behaviour of structures. Three lectures, one tutorial (two hours), one lab (three hours); second term Prerequisite(s): Credit or registration in CIVENG 3G04, 3P03 or 3P04

Instructor-Specific Course Information

- **Attendance and Participation**
  Attendance at all lectures and tutorials is mandatory. Students are expected to come prepared to participate by reviewing posted materials on the course website in advance and to engage actively in every class.
- **Email Communication**
  All course-related communication must be conducted using McMaster University

email accounts. Emails sent from non-McMaster accounts will not receive a response and will not be considered valid communication through Avenue. Please begin the subject line of your email with **"3J04"** to help ensure timely and effective communication.

- **Course Materials and Announcements**
  Lecture notes, supplementary materials, assignments, and announcements will be posted on Avenue. Students are responsible for regularly checking Avenue and reviewing all posted materials.
- **Use of Electronic Devices in Class**
  Electronic devices may be used during class for course-related purposes only.
- **Professional Conduct and Code of Ethics**
  As future engineers, students are expected to exercise the principles of the **Engineers Canada Code of Ethics**, including treating colleagues and instructors with respect, dignity, and fairness. Students are expected to arrive on time, remain quiet and attentive during class, and communicate, both verbally and in writing, in a respectful and professional manner.

Important Links

- Mosaic
- Avenue to Learn
- Student Accessibility Services - Accommodations
- McMaster University Library
- eReserves

Course Learning Outcomes

- Design Reinforced Concrete Structural Components Design basic reinforced concrete members in accordance with CSA A23.3 – Design of Concrete Structures, satisfying strength and serviceability limit states.

- Interpret laboratory observations of reinforced concrete behavior, including crack initiation, crack propagation, and failure and relate these observations to analytical models and design assumptions.

- Explain the behavior of reinforced concrete structural members (beams, columns, beam-columns, and one-way slabs) subjected to axial, shear, flexural, and combined loading.

Graduate Attributes

The Canadian Engineering Accreditation Board (CEAB) is a division of Engineers Canada and is responsible for accrediting undergraduate engineering programs across Canada. Accreditation by the CEAB ensures that the engineering programs meet a national standard of quality and cover essential educational requirements. Graduate Attributes are a set of qualities and skills that the CEAB expects engineering graduates to possess. These attributes are a benchmark for the learning outcomes of accredited engineering programs. This section lists the Graduate Attribute Indicators associated with the Learning Outcomes in this course.

Upon successful completion of this course, students will demonstrate the ability to:

- **[CEAB Indicator 2.1]:** Identify and state reasonable reinforced concrete analysis and design assumptions and suitable associated engineering fundamentals, before proposing a solution path to the relevant problem.
- **[CEAB Indicator 2.2]:** Propose reinforced concrete analysis and design problem solutions supported by substantiated reasoning, recognizing the limitations of your solutions.
- **[CEAB Indicator 4.4]:** Justify and reflect on analysis and design decisions, giving consideration to limitations, assumptions, constraints and other relevant factors.
- **[CEAB Indicator 8.2]:** Integrate appropriate standards, codes, legal and regulatory factors into relevant decision-making.

Lab Information

This course includes a mandatory laboratory component designed to connect theory with real structural behavior. Through hands-on testing, students will observe and interpret the behavior and failure of reinforced concrete members.

All laboratory sessions will be conducted at the Applied Dynamics Laboratory (ADL). Laboratory dates and times are posted on the course website, and students are expected to arrive on time. Due to time and equipment limitations, no alternate lab sessions will be provided for missed labs.

During the lab, students will participate in the testing of a reinforced concrete beam subjected to four-point loading until failure. To maximize learning, all students are expected to actively participate in every part of the experimental work. Students are encouraged to collaborate during laboratory activities; however, all laboratory reports must be completed and submitted individually.

Each student is responsible for preparing their own laboratory report based on their assigned lab session. Detailed instructions and submission requirements will be posted on the course website.

Lab 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". 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 Health and Safety. The Lab Safety Handbook is available here, as well as on A2L.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment. A laboratory-specific set of rules can also be added to ensure that students fully understand laboratory safety rules that are in place prior to their first session.

Safety is a critical component of this course. All students must comply with the Civil Engineering laboratory health and safety requirements at all times. **Students who do not**

comply with these requirements will not be permitted to participate in the laboratory sessions.

General Civil Engineering Laboratory Safety

- Safety glasses or goggles must be worn in the laboratory at all times.
- Contact lenses are **not permitted** in the laboratory.
- Short pants (above the knee) or skirts are not permitted. If worn, a lab coat must be worn over clothing.
- Long hair must be securely tied back.
- Gloves must be worn when handling hazardous materials, as instructed by the laboratory instructor.
- No loose or dangling clothing is permitted in the laboratory.
- CSA-approved closed-toe shoes with CSA's Green Triangle Patch must be worn at all times.

Course-Specific Safety Requirements (Applied Dynamics Laboratory)

The following additional safety requirements apply to this course and are enforced by the Applied Dynamics Laboratory:

- **Personal Protective Equipment (PPE):**
  Students must wear **CSA-approved closed-toe safety boots with a Green Triangle Patch**, a **hard hat**, and **safety glasses** at all times during the lab.
  - Students are responsible for providing their own safety boots.
  - Hard hats and safety glasses are available in the laboratory.
  - Prescription glasses are considered safety glasses **only if they include side shields**.
- **Safe Conduct During Testing:**
  Students must maintain a safe distance from the universal testing machine while specimens are being loaded.
- **Compliance with Instructions:**
  Students must not create any situation that could compromise or jeopardize their

own safety or the safety of others. All instructions provided by the instructor, teaching assistants, and laboratory technical staff must be followed at all times.

Safety Enforcement and Acknowledgement

- Safety requirements are emphasized through:
    1. A mandatory pre-lab safety form signed by each student,
    2. Written laboratory instruction sheets, and
    3. Direct checks by instructors, teaching assistants, and lab technicians to ensure compliance.
- Prior to each lab session, students will be verbally reminded of required safety equipment and lab-specific safety procedures.
- Failure to comply with laboratory safety rules will result in the student being denied access to the lab and receiving a “Did Not Complete” grade for that lab session. For CIVENG 3J04, this will result in an automatic F grade for the course.

Course Schedule

A weekly breakdown of the course schedule

Week	Topic	Assessment
1	Introduction to design process, codes & standards, loads on buildings etc.	
2	Introduction to beam flexural behavior, analysis & design	Assignment 1
3	Singly and doubly reinforced rectangular beam analyses	Assignment 2
4	Flanged sections analysis	Assignment 3
5	Beams under flexure: Design logic and processes	Assignment 4
6	Beam shear behavior, analysis & design	Assignment 5
Midterm Break		

Week	Topic	Assessment
7	Introduction to one-way slab behavior, analysis & design	Term Test 1
8	Column behavior: Introduction & concepts	
9	Column behavior & interaction diagrams	Assignment 6
10	Column uniaxial and biaxial bending design	Assignment 7
11	Slender columns: Serviceability, deflection and crack width calculation	Term Test 2
12	Bond & anchorage of reinforcement: Development length, hooks, bar cut-off	Assignment 8
13	Review	

Required Materials and Texts

Please sign in with your MacID here to view your booklist



Concrete Design Handbook
Publisher: Cement Association of Canada
Edition: 5th Edition

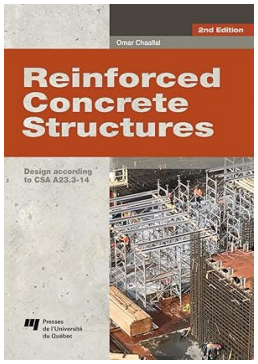
Optional Course Materials

Please sign in with your MacID here to view your booklist

Thumbnail Image

Reinforced Concrete Design: A Practical Approach
ISBN: 978-1-3234-9655-8
Authors: Svetlana Brzev, John Pao
Publisher: Pearson Learning Solutions
Publication Date: August, 22, 2016

Edition: 3rd
The *Reinforced Concrete Design: A Practical Approach* is written in accordance with **CSA A23.3-14** and not the latest edition, **CSA A23.3-19**. The differences between these two versions of the standard are minimal and do not affect the core design principles covered in this course. Any relevant changes or updates will be highlighted and discussed during lectures as needed.



Reinforced Concrete Structures
ISBN: 2760549976
Authors: Omar Chaallal
Publisher: Presses de l'Université du Québec
Publication Date: August 28, 2018
Edition: 2nd
The *Reinforced Concrete Structures* is written in accordance with **CSA A23.3-14** and not the latest edition, **CSA A23.3-19**. The differences between these two versions of the standard are minimal and do not affect the core design principles covered in this course. Any relevant changes or updates will be highlighted and discussed during lectures as needed.

Course Evaluation

Evaluation Components and Weighting

ASSESSMENT	WEIGHT (%)
Assignments	20
Term tests	30
Laboratory report	10
Final Exam	40

Course Evaluation Details

To successfully pass this course, students must satisfy **all** of the following requirements:

- **Final Exam Requirement**
  Students must obtain a minimum of 50% on the final exam. Assignment marks will only be considered toward the final course grade if this requirement is met.
- **Laboratory Requirement**
  Students must participate in their assigned laboratory session at the Applied Dynamics Laboratory (ADL), submit the required laboratory report, and obtain a minimum of 50% on the laboratory report.

Failure to meet any of the above requirements will result in a failing grade for the course, regardless of overall term performance.

Undergraduate Grading Scale

The McMaster 12 Point 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

Late Assignments

Late submissions without granted relief will incur a penalty of 20% per day, and assignments submitted more than five days past the deadline will not be accepted.

Absences, Missed Work, Illness

Your well-being and success in this course matter. If you experience illness, personal challenges, or other circumstances that affect your ability to meet course requirements, please feel free to reach out. I am always open to discussing your individual situation, and we will work together to arrange reasonable accommodations where possible to help you achieve your learning goals.

- **Assignments**
  Assignment deadlines may be extended by **48 hours** upon submission of an approved **MSAF** form.
- **Term Tests**
  There will be **no make-up tests**. If a term test is missed for an approved reason, the weight of the missed test will be **re-allocated to the final examination**.

Students are encouraged to communicate early and honestly if challenges arise. Support is available, and you are not expected to navigate difficulties on your own.

Generative AI: Some Use Permitted

Example One

Students may use generative AI in this course in accordance with the guidelines outlined for each assessment, and so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside assessment guidelines or without citation will constitute academic dishonesty. It is the student's responsibility to be clear on the limitations for use for each assessment and to be clear on the expectations for citation and reference and to do so appropriately.

Example Two

Students may use generative AI for [editing/translating/outlining/brainstorming/revising/etc] their work throughout the course so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside the stated use of [editing/translating/outlining/brainstorming/revising/etc] without citation will constitute

academic dishonesty. It is the student's responsibility to be clear on the limitations for use and to be clear on the expectations for citation and reference and to do so appropriately.

Example Three

Students may freely use generative AI in this course so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside assessment guidelines or without citation will constitute academic dishonesty. It is the student's responsibility to be clear on the expectations for citation and reference and to do so appropriately.

Turnitin.com

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.

APPROVED ADVISORY STATEMENTS

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.

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

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. Avenue to Learn, 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, 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

In the event of an absence for medical or other reasons, students should review and follow the Policy on Requests for Relief for Missed Academic Term Work.

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.

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, Avenue to Learn and/or McMaster email.