

CIVE 4208: Geotechnical Engineering

Course Syllabus - Fall 2022

Faculty of Engineering and Design, Carleton University
Department of Civil and Environmental Engineering

Sections: A & B

Instructor: [Dr. Mehdi Pouragha](#)

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Office Hours: To be announced

1 Course Overview:

In this course, we explore the application of soil mechanics concepts (obtained in CIVE 3208) to analysis and design of geotechnical systems such as foundations, slopes, embankments, and retaining walls. The course also includes training and assignments using GeoStudio simulation software.

2 Student Learning Outcomes:

At the end of this course, students will be able to:

- Calculate shear strength of different types of soils under various loading conditions.
- Analyze stability of slopes using common methods and computer simulations.
- Analyze water flow in geotechnical structures and its effect on stability.
- Calculate lateral pressure of soil.
- Analyze stresses applied to rigid and flexible earth retaining walls
- Understand and apply common criteria in design of earth retaining walls.
- Calculate the bearing capacity of shallow foundations in different soils, and design for different load conditions.

3 Textbook:

The course textbook is the following: **Soil Mechanics and Foundations (3rd Edition)**, by M. Budhu

Other useful sources: **Craig's Soil Mechanics, (7th Edition)**, by R.F. Craig

4 Tentative Lecture Schedule:

Table 1. Lectures Content

Lec #	Topic	Book Chapter*
1 & 2	Shear Strength of Soils	7, 8, 10
2 & 3	Slope Stability	16
4	GeoStudio Training†	-
5 & 6	2D Flow of Water through soils	14
7	GeoStudio Training	-
8	Lateral Earth Pressure	15
9 & 10	Design of Soil Retaining Structures	15
11	Shallow Foundations	12
12	Review & Problem Solving	-

* Chapters from: Soil Mechanics and Foundations (3rd Edition), by M. Budhu

† Lecture 4 on GeoStudio Software training will be asynchronous and online.

5 Preparation (**Important**)

This course builds on the **basic understanding of geotechnical mechanics** (CIVE 3208) and solid mechanics (CIVE 2200) as delivered at Carleton University. Most relevant topics from CIVE 3208 include **phase relations, stresses in soil, geotechnical tests (triaxial and direct shear), Shear strength of soils, and seepage**. We will also use the concept of **Mohr circle** from CIVE 2200 and CIVE 3208. Use the textbook (by M. Budhu) to refresh or acquire the basis knowledge that we will build upon. In particular, make sure you review these chapters: Chapter 4 (phase relations), Chapter 6 (1D flow of water in soil), Chapter 7 (Effective stress, Mohr circle), Chapter 10 (Shear strength, Mohr-Coulomb failure, triaxial test, Pore pressure).

6 Mode of Delivery

All the exams and lectures will be **in-person**, except for lecture 4 which will be asynchronous online to allow for a better software training. The videos for lecture 4 will be posted at the beginning of the week. The mode of delivery may change according to university policies.

7 Assessment:

Breakdown of the final grade is given in **Table.2**. A minimum of **35%** in each component is required to obtain a passing grade. Attendance is not mandatory. Exams will be in person.

Table 2. Assessment Breakdown

#	sections	Description	Weights
1	Assignments	Bi-Weekly assignments (4-5 Assignments)	15%
3	Midterm Exam	2 hours, closed-book, formula sheet provided*, (tentative date: Nov 5 th).	35%
4	Final Exam	2 hours, closed-book, formula sheet provided*. Date and time TBD.	50%

* The exam conditions are subject to change if the universities exam policies change during the semester (online vs face-to-face exam).

Late Submission Policy for Assignments:

Assignments submitted after the deadline, and up to one day late, will receive a penalty of 10% of the full grade. Work submitted after this time, and up to three days late, will receive a penalty of 25% of the full grade. Work that is more than three days late will not be graded.

A student may request an extension, stating the reason in writing at least one day before the deadline. An extension may be granted at the discretion of the instructor.

8 Course Policies (**Important**)

8.1 Classroom Behaviour:

Students are required to observe standards of behaviour expected in a university environment and in the profession of engineering. Please maintain a professional, quiet, attentive, and engaging classroom environment.

8.2 Communications:

Course materials will be distributed through the course's **BrightSpace** page. Students are responsible for ensuring they are correctly registered through **BrightSpace**, and for checking the **BrightSpace** course management site regularly. Lecture slides will be made available before class; however, lecture slides will not include all the information discussed during the (e.g. solutions, calculations, and extra clarifications).

Important Note: All electronic communications with the instructor must be through official **Carleton email accounts**. In your email, include your **full name, student number, course, and section number**. Professionalism is expected in all course communications; e-mails with **improper language will not receive a response**. Electronic correspondence should be limited to the scheduling of meetings or providing information (e.g. absence from an exam). **Course material cannot be clarified through e-mail.**

8.3 Attendance and Absences:

Attendance is not mandatory for lectures. However, attendance in examinations is mandatory and you will lose the designated mark for the exams that you have miss. In case of emergency (e.g. serious illness), proper communications with your instructor is mandatory. Acceptable documentation is required to justify your absence within three days of the date of the coursework deadline or exam date. In case of illness, a doctor note or a completed self-declaration form will be required (<https://carleton.ca/registrar/special-requests/deferral/>). You must obtain approval prior to the exam if you cannot write at the scheduled time (except in cases of unexpected emergencies). If you miss an exam and present acceptable documentation, there will be a deferred midterm. Exact place and time to be confirmed.

8.4 Appeals:

All grade appeals in this course must be made within seven days of the posting or return of the graded component. Appeals for assignments are to be addressed to the marking TA first. The final exam is for evaluation purposes only, and the paper will not be returned or made available to students by the instructors after it is marked. You will be able to make arrangements with the instructor or with the department office to see your marked final examination after the grades have been made available.

9 Graduate Attributes:

The Canadian Engineering Accreditation Board (CEAB) requires the faculty to collect data on graduate attributes and use that data to improve our program. The aggregate data is used for accreditation purposes and to guide program improvements **only**, and have no impact on individual student progression or evaluation. Data is collected in many courses across the faculty. The attributes being measured in this course relate to (i) Knowledgebase of geotechnical engineering concepts, (ii) Problem definition, (iii) Approach to the problem, (iv) Use of assumptions, and (v) Interpreting the solution and validity of results.

10 Academic Integrity:

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensure that a degree from Carleton University is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. Carleton University's Policy on Academic Integrity (<http://www.carleton.ca/registrar/academic-integrity>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. It is your responsibility to be familiar with these policies. Any students who do not act with academic integrity will face severe consequences including immediate referral to the Associate Dean of Student Affairs.

11 Academic Accommodation:

Students with diverse learning styles and needs are welcome in this course. You may need special arrangements to meet your academic obligations during the term. For more information, please consult: <http://students.carleton.ca/course-outline>.

12 Accommodations for Students with Disabilities

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your **Letter of Accommodation** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). **Requests made within two weeks will be reviewed on a case-by-case basis.** After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (<http://www.carleton.ca/pmc>) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

13 Copyright on Materials (**Important**)

The materials created for this course (including the course outline and any slides, posted notes, labs, project, assignments, exams and solutions) are intended for personal use and should not be reproduced, redistributed, or posted on any **website** without prior written permission from the author(s).