

# **ENGG\*3670 Soil Mechanics**

01

Fall 2023 Section(s): C01

School of Engineering Credit Weight: 0.50 Version 1.00 - September 03, 2023

# **1 Course Details**

## **1.1 Calendar Description**

Relations of soil physical and chemical properties to strength; soil water systems and interactive forces. Visco-elastic property and pressure-volume relationships of soil systems. Stress-strain characteristics of soil under dynamic loads. Application of engineering problems. Laboratory and field investigation methods.

Pre-Requisites:	ENGG*2120, ENGG*2230
Restrictions:	Non-BENG students may take a maximum of 4.00 ENGG
	credits.

## **1.2 Course Description**

This course is an introductory course in geotechnical engineering, which is a basic course in most civil, environmental and water resources engineering programs. The main goals of the course are to teach students (1) the fundamental concepts in soil properties and its measurement; (2) environmental engineering applications and (3) software design tools.

## 1.3 Timetable

ENGG*3670*01011	M/W/F 8:30 AM - 9:20 AM	ALEX, 028	LEC
	T 3:30 PM - 5:20 PM	THRN, 1107	LAB
	T 2:30 PM - 3:20 PM	THRN, 1319	SEM
	T 2:30 PM - 3:20 PM	MCKN, 234	SEM
ENGG*3670*01021	M/W/F 8:30 AM - 9:20 AM	ALEX, 028	LEC
	M 2:30 PM - 4:20 PM	THRN, 1107	LAB
	T 2:30 PM - 3:20 PM	THRN, 1319	SEM
	T 2:30 PM - 3:20 PM	MCKN, 234	SEM

ENGG*3670*01031	M/W/F 8:30 AM - 9:20 AM	ALEX, 028	LEC
	F 3:30 PM - 5:20 PM	THRN, 1107	LAB
	T 2:30 PM - 3:20 PM	THRN, 1319	SEM
	T 2:30 PM - 3:20 PM	MCKN, 234	SEM

## 1.4 Final Exam

Thursday, December 14th, 2023 at 8:30 am - 10:30 pm, Room TBD on WebAdvisor.

# **2** Instructional Support

## 2.1 Instructional Support Team

Instructor:	Fatima Haque	
Email:	fhaque@uoguelph.ca	
Office:	THRN 2127	
Office Hours:	TBA on CourseLink	
Lab Technician:	Ryan Smith	
Email:	rsmith17@uoguelph.ca	
Telephone:	(519) 824-4120 ext. 53278	
Office:	THRN 1114	

## 2.2 Teaching Assistants

Teaching Assistant (GTA):	Valerie Risch
Email:	vrisch@uoguelph.ca
Office Hours:	TBA on CourseLink

# **3 Learning Resources**

## **3.1 Required Resources**

#### Course Website (Website)

http://courselink.uoguelph.ca

Course material, news, announcements, and grades will be regularly posted to the ENGG\*3670 CourseLink site. You are responsible for checking the site regularly.

Donald P. Coduto, Man-chu Ronald Yeung, WilliamA. Kitch. 2014. Geotechnical Engineering: Principles and Practices, 2nd Edition. Pearson Custom Library; ISBN 10: 1-269-25924-5; ISBN 13: 978-1-269-25924- (Textbook)

## **3.2 Recommended Resources**

Cheng Liu; Jack B. Evett. 2008. Soil Properties: Testing, Measurement, and Evaluation, 6th

Edition. Prentice Hall; ISBN-13: 978-0-13-614123-5. (Lab Manual)

## **4 Learning Outcomes**

## 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

- Understand the basic concepts of Soil Classification, Site Exploration and Characterization; articulate the unique properties that distinguish different natural and engineered soils behavior from solids or fluids.
- 2. Demonstrate knowledge of the broad range of environmental engineering applications of soil mechanics encountered in practice.
- 3. Model practical engineering problems and solve them in a systematic manner using basic software tools.
- 4. Calculate soil stress in a soil mass, lateral earth pressure, soil strength, and the factor of safety against soil shear failure.
- 5. Have a working knowledge of accuracy, precision, and significant digits, and recognize the importance of dimensional homogeneity in engineering calculations.
- 6. Apply integral methods, and basic empirical and sophisticated numerical models, to the analysis of Slope Stability for both natural and engineered soils and landfill slopes.
- 7. Demonstrate fundamental knowledge of specialized laboratory and field equipment, sensors and instruments used in site exploration and characterization.
- 8. Apply knowledge of Soil Mechanics fundamentals combined with effective technical problem solving skills & use of engineering tools to Groundwater Flow problems.
- 9. Follow laboratory testing procedures and standard methods, collect and analyze data and write professional engineering laboratory reports.

## 4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1
1.1	Recall, describe and apply fundamental mathematical principles and concepts	1
1.2	Recall, describe and apply fundamental principles and concepts in natural science	1

#	Outcome	Learning Outcome
1.3	Recall, describe and apply fundamental engineering principles and concepts	1
1.4	Recall, describe and apply program-specific engineering principles and concepts	1
2	Problem Analysis	4, 6, 8
2.1	Formulate a problem statement in engineering and non-engineering terminology	4, 6, 8
2.2	Identify, organize and justify appropriate information, including assumptions	4, 6, 8
2.3	Construct a conceptual framework and select an appropriate solution approach	4, 6, 8
2.4	Execute an engineering solution	4, 6, 8
2.5	Critique and appraise solution approach and results	4, 6, 8
3	Investigation	7
3.1	Propose a working hypothesis	7
3.2	Design and apply an experimental plan/investigative approach (for example, to characterize, test or troubleshoot a system)	7
3.3	Analyze and interpret experimental data	7
3.4	Assess validity of conclusions within limitations of data and methodologies	7
5	Use of Engineering Tools	3, 7, 8
5.1	Select appropriate engineering tools from various alternatives	3, 7, 8
5.2	Demonstrate proficiency in the application of selected engineering tools	3, 7, 8
5.3	Recognize limitations of selected engineering tools	3, 7, 8
6	Individual & Teamwork	9
6.1	Describe principles of team dynamics and leadership	9
6.2	Understand all members' roles and responsibilities within a team	9
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	9
6.4	Apply strategies to mitigate and/or resolve conflicts	9
6.5	Demonstrate leadership through, for example, influencing team vision and	9

#	Outcome	Learning Outcome
	process, promoting a positive team culture, and inspiring team members to excel	
7	Communication Skills	2, 5, 9
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	2, 5, 9
7.2	Interpret technical documentation such as device specification sheets, drawings, diagrams, flowcharts, and pseudocode	2, 9
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	2, 9
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	2, 5, 9
7.5	Demonstrate ability to process oral and written communication by following instructions, actively listening, incorporating feedback, and formulating meaningful questions	2, 9
8	Professionalism	5
8.3	Demonstrate professional behaviour	5

# **5 Teaching and Learning Activities**

## 5.1 Lecture

## Weeks 1-12

Topics:		Lecture	
Learning Out Lectures	come: Lecture Topic	1, 2, 3, 4, 5, 6, 7, 8, <b>s</b>	9 Learning Objectives
1 - 3	Site exploratio	n and composition	1,2,3,5,7,8,9
4 - 6	Soil Classifica	tion and excavatior	1,2,7
7 - 9	Groundwater		2,3,7

10 - 12	Groundwater	2,7

- 13 15 Stress in Soil Mass 3,4
- 16 18Stress in Soil Mass3,4
- 19 21 Soil Strength 2,3,9
- 22 24 Stability of Earth Slopes 2,4,9
- 25 27 Soil Settlement 3,4,6
- 28 30 Soil Settlement 3,4,6
- 31 33Rate of Consolidation2,3,5
- 34 36Lateral Earth Pressure2,9

## 5.2 Term Test

Term Test 1 (in class): Friday, October, 6, 2023

Term Test 2 (in class): Friday, November, 10, 2023

Each Term Test is worth 15% each (total of 30%).

## 5.3 Bi-Weekly Laboratory Experiments and Reports

Students will form groups of two (occasionally three students) from the same lab section and collaborate in conducting the experiments, taking notes, discussions and submit a report as a group electronically on the course website designated drop box, due within 7 days of conducting each test, for marking. Each Lab Report is worth 5% for a total of 20% for all four lab reports. Late submissions will have a 1% penalty per hour (i.e. if you submit 12 hours late the grade will be multiplied by 0.88).

Week	Date	Activity
Week 1	(Sep. 11 – Sep. 15)	Safety & Orientation

Week 2	(Sep. 18 – Sep. 22)	No Lab
Week 3	(Sep. 25 - Sep. 29)	Lab 1: PSA & Hydrometry Test
Week 4	(Oct. 2 – Oct. 6)	No Lab
Week 5	(Oct. 9 – Oct. 13)	Fall break. No labs this week.
Week 6	(Oct. 16 – Oct. 20)	Lab 2: Atterberg Limits
Week 7	(Oct. 23 – Oct. 27)	No Lab
Week 8	(Oct. 30 – Nov. 3)	Lab 3: Falling Head Test
Week 9	(Nov. 6 – Nov. 10)	No Lab
Week 10	(Nov. 13 – Nov. 17)	Lab 4: Direct Shear Test
Week 11	(Nov. 20 – Nov. 24)	Open Lab
Week 12	(Nov. 27 - Dec. 1)	No Lab

In this course, your instructor will be using Turnitin, integrated with the CourseLink Dropbox tool, to detect possible plagiarism, unauthorized collaboration or copying as part of the ongoing efforts to maintain academic integrity at the University of Guelph. All submitted lab reports will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such reports. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Accounts are available to students on Turnitin to help with the editing of their submissions to ensure that plagiarism did not take place.

## 5.4 Weekly Seminar Schedule

Students will form groups of three and collaborate in learning two engineering analysis and design software tools, namely: SEEP-W and SLOPE-W. The SEEP-W and SLOPE-W software programs greatly enhance the analysis and design capabilities for complex geotechnical engineering problems. Students of the same lab group will collaborate in building computer models for the assigned problems, discussions and submit a report electronically on CourseLink. The SEEP-W report is due Sunday **November 5** and the SLOPE-W report due Sunday **November 19** by midnight for marking. Each of the software lab reports for SEEP-W and SLOPE-W are worth 10% for a total contribution of **20%** towards the final grade. However, late submissions will have a 1% penalty per hour (i.e. if you submit 12 hours late the grade will be multiplied by 0.88). The other main activity during the weekly seminars include tutorials in preparation for the term tests and the final exam.

Date	Activity
Week 1 (Sep. 11 – Sep. 15)	Tutorials in MCKN 234
Week 2 (Sep. 18 – Sep. 22)	Tutorials in MCKN 234
Week 3 (Sep. 25 - Sep. 29)	Tutorials in MCKN 234
Week 4 (Oct. 2 – Oct. 6)	Tutorials in MCKN 234

Week 5 (Oct. 9 – Oct. 13)	Fall break. No seminar this week.
Week 6 (Oct. 16 – Oct. 20)	SEEP-W Tutorial, Part I (in THRN 1319)
Week 7 (Oct. 23 – Oct. 27)	SEEP-W Tutorial, Part II (in THRN 1319)
Week 8 (Oct. 30 – Nov. 3)	SLOPE-W Tutorial, Part I (in THRN 1319)
Week 9 (Nov.6 – Nov. 10)	SLOPE-W Tutorial, Part II (in THRN 1319)
<mark>Week 10 (Nov. 13 – Nov. 17)</mark>	Tutorials in MCKN 234
Week 11 (Nov. 20 – Nov. 24)	Tutorials in MCKN 234
Week 12 (Nov. 27 - Dec. 1)	2 sets of Tutorials this week in MCKN 234 (Makeup for Fall break on Thursday Nov 30)

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## **5.5 Other Important Dates**

• Monday, October 9

Holiday--NO CLASSES SCHEDULED -- classes rescheduled to Friday, December 1

• Tuesday, October 10

Fall Study Break Day - NO CLASSES SCHEDULED -- classes rescheduled to Thursday, November 30

- Thursday, November 30: Make up for Study Day (Tuesday Schedule)
- Friday, December 1: Make up for Thanksgiving Day (Monday Schedule) Classes conclude

Undergraduate calendar: https://calendar.uoguelph.ca/undergraduate-calendar/schedule-dates/fall-semester/

# **6** Assessments

## 6.1 Marking Schemes & Distributions

The final grade for this course will be calculated as a weighted average according to the following distribution scheme.

Name	Scheme A (%)
Two Term Tests (2 x 15%)	30
Software Reports (2 x 10%)	20
Lab Reports (4 x 5%)	20
Final Exam (1 x 30%)	30
Total	100

#### **6.2 Assessment Details**

#### Four Lab Reports (5% each) (20%)

**Date:** Due within 7 days of conducting each test., Submit Electronically on Courselink DropBox.

Learning Outcome: 1, 7, 9

#### Term Test #1 (15%)

**Date:** Fri, Oct 6, 8:30 AM, ALEX 028 **Learning Outcome:** 1, 2, 4, 5, 6, 8 8.30 am to 9.20 am.

#### SEEP-W Software Report (10%)

**Date:** Due November 5 by midnight., Submit Electronically on Courselink DropBox. **Learning Outcome:** 1, 2, 3, 4, 5, 6, 7, 8, 9

#### Term Test #2 (15%)

**Date:** Fri, Nov 10, 8:30 AM, ALEX 028 **Learning Outcome:** 1, 2, 4, 5, 6, 8 8.30 am to 9.20 am

#### **SLOPE-W Software Report (10%)**

**Date:** Due November 19th by midnight., Submit Electronically on Courselink DropBox. **Learning Outcome:** 1, 2, 3, 4, 5, 6, 7, 8, 9

Final Exam (30%) Date: Thu, Dec 14, 8:30 AM, Room TBD on WebAdvisor Learning Outcome: 1, 2, 4, 5, 6, 8 Th 8:30 AM - 10:30 AM

12/14/2023 - 12/14/2023

## **7 Course Statements**

## 7.1 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email. This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

## 7.2 Course Grading Policies

**Missed Assessments:** If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor at the start of the semester to make alternate arrangements. See the undergraduate calendar for more detail on this topic: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

**Missed Term Tests:** If you miss any of the Term Tests due to grounds for granting academic consideration or religious accommodation, the weight of the missed tests will be added to the final exam.

**Laboratory Experiments and Lab Report:** You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab and submit an individual lab report within seven days for grading.

**Computer Model Reports:** All computer model reports must be submitted electronically on the course website on the designated drop box folder by the due date. Late submissions of the reports will receive 1% penalty per hour.

**Grade Dispute:** If a student feels that a Lab Report, Computer Model Report, or a Term Test was graded unfairly, or if there is an error in the grading, it should be brought to the attention of the Instructor by email within one week after the grade is posted on CourseLink. Scores will not be reconsidered beyond this period.

## 7.3 Academic Honesty and Integrity Pledge

· Academic honesty and integrity are essential principles of the University of Guelph and

engineering as a profession. All UoG students are expected to behave as honest and responsible members of an academic community.

- **Engineering students** have an even greater responsibility to maintain the highest level of academic honesty and integrity as they prepare to enter a profession with those principles as a cornerstone.
- **Cheating on exams or projects**, plagiarizing or any other form of academic dishonesty are clear violations of these principles.
- Some examples of cheating in your Lecture/Lab Quizzes, include:

•Any recording of the exam screens, including taking screenshots, pictures, or video,

•Copying the exam questions or answers,

•Leaving mobile devices/smart phones, other web browsers, software applications, or other computers on during the exam,

•Bringing in resource materials other than those allowed,

•Allowing other individuals (other than examinee and invigilator) to come in and out of the room during the exam.

## 7.4 Diversity, Equity and Inclusion

It is important to recognize that each of us enters the classroom (virtual or physical) with different histories, cultural, racial, gender, and sexual orientations, which are also layered on by class, ability/disability, religion, etc, which results in unique experiences and perspectives. These differences can provide opportunities to explore and engage with multiple perspectives that can lead to much more informed and critical course interchanges. However, these perspectives and experiences are also impacted by larger social relations of power and oppression, which results in some groups experiencing racism, discrimination, and marginalization that can be expressed through verbal behaviour (e.g., direct or indirect comments, insults) and non-verbal behaviour (e.g., body language, avoidant behaviour, glances, rolling of eyes, who speaks, who does not speak). These behaviours, whether in the form of direct acts of exclusion or micro-aggressions, including comments in on-line discussion forums, will not be tolerated and will be challenged when they occur. It is the responsibility of all members of the course to address these practices and behaviours and to identify how we might be implicated, and assume responsibility for interrupting, resisting and preventing them.

## **8** School of Engineering Statements

## 8.1 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

## 8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

## 8.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

# **9 University Statements**

## 9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

## 9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml Associate Diploma Calendar - Academic Consideration, Appeals and Petitions https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

### 9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-regregchg.shtml

Associate Diploma Calendar - Dropping Courses https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

## 9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

### 9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website

https://www.ridgetownc.com/services/accessibilityservices.cfm

## 9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08amisconduct.shtml

Graduate Calendar - Academic Misconduct https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

## 9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

#### 9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars https://www.uoguelph.ca/academics/calendars

### 9.9 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).