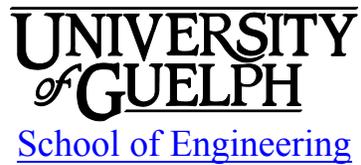


ENGG*3670 Soil Mechanics

Fall 2013



(Revision 0: September 5, 2013)

1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Bahram Gharabaghi, Ph.D., P.Eng.
Office: THRN 2417, ext. 58451
Email: bgharaba@uoguelph.ca
Office hours: TBA on Courselink or by appointment

1.2 Lab Technician

Technician: Ryan Smith
Office: THRN 1114, ext. 53278
Email: rsmith17@uoguelph.ca

1.3 Teaching Assistants

GTA	Email	Office Hours	Responsibility
Kelly Baah	kbaah@uoguelph.ca	TBA on Courselink	Bi-Weekly Labs
Mohammadali Jahanfar	mjahanfa@uoguelph.ca	TBA on Courselink	Weekly Seminars

2 LEARNING RESOURCES

2.1 Course Website

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

<https://courselink.uoguelph.ca/shared/login/login.html>

2.2 Required Resources

1. **TEXTBOOK:** Donald P. Coduto, Man-chu Ronald Yeung, William A. Kitch. 2014. Geotechnical Engineering: Principles and Practices; Custom Edition for University of Guelph; Pearson Custom Library; ISBN 10: 1-269-25924-5; ISBN 13: 978-1-269-25924-8, eTextbook option: <http://www.coursesmart.com/geotechnical-engineering-principles-and-practices/donald-p-coduto-man-chu-ronald-yeung-william/dp/9780136081418>; and
2. **LAB MANUAL:** Cheng Liu; Jack B. Evett. 2008. Soil Properties: Testing, Measurement, and Evaluation, Sixth Edition. Prentice Hall; ISBN-13: 978-0-13-614123-5. eTextbook option: <http://www.coursesmart.com/soil-properties-testing-measurement-and-evaluation/cheng-liu-jack-b-evett/dp/9780135018163>

2.3 Recommended Resources

Geotechnical testing, observation, and documentation; 2nd ed.; Davis, Tim, 1954-Reston, Va. : American Society of Civil Engineers c2008; Available Online at University of Guelph Library: <http://site.ebrary.com/subzero.lib.uoguelph.ca/lib/oculguelfh/docDetail.action?docID=10435366>

2.4 Additional Resources

GeoStudio 2012 Student Edition (includes free student licenses): Software, Users' Manual and Tutorials available at: <http://www.geo-slope.com/downloads/2012.aspx>

2.5 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its student.

3 ASSESSMENT

3.1 Dates and Distribution

Labs: 30%

Lab Report 1, due Monday Oct. 14 (worth 10%)

Lab Report 2, due Monday Nov. 11 (worth 10%)

Lab Report 3, due Thursday Nov. 28 (worth 10%)

All lab reports must be submitted electronically on the course website designated drop box folder for the specific Lab report and the file name must be as follows: Group_##_Lab_Report_#.

Midterm Exam: 35%

Friday, October 18, 19:00-22:00, Room MACHALL 149.

Final Exam: 35%

Tuesday, December 3, 08:30-10:30, Room TBA on WebAdvisor.

3.2 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 information on regulations and procedures for Academic Accommodation of Religious Obligations:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml>

Passing Grade: In order to pass the course, you must pass both the laboratory (30%) and exams (70%) course portions. Students must obtain a grade of 50% or higher on the exams portion (i.e. sum of the midterm and the final exam grades should be at least 35) of the course in order for the laboratory write-up portion (30%) of the course to count towards the final grade.

Missed Midterm Exam: If you miss midterm exam due to grounds for granting academic consideration or religious accommodation, the weight of the missed test will be added to the final exam. There will be no makeup midterm exam.

Lab Work: 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.

Lab Reports: All lab reports must be submitted electronically on the course website on the designated drop box folder by the due date. Late submissions of lab reports will not be accepted.

Grade Dispute: If a student feels that a Lab Report or Midterm was graded unfairly, or if there is an error in the grading, it should be brought to the attention of the Instructor within one week after the graded material is handed back. Scores will not be reconsidered beyond this period.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 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.

Prerequisite(s): ENGG*2120, ENGG*2230

4.2 Course Aims

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.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. 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 (especially spreadsheets) and mathematical models.
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.

4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1,4,5	Exams
2. Problem Analysis	1,3,6,8	Exams
3. Investigation	1,3,6,7	Labs
4. Design	3,6,8	Exams
5. Use of Engineering Tools	3,6,8,9	Seminars/Lab Reports
6. Communication	3,7,8,9	Lab Reports
7. Individual and Teamwork	3,7,8,9	Labs
8. Professionalism	7,9	Labs and Lab Reports
9. Impact of Eng. on Society and the Environment	1, 2	-
10. Ethics and Equity	2	-
11. Env., Society, Business, & Project Management	-	-
12. Life-Long Learning	-	-

4.5 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/D2L but these are not intended to be stand-alone course notes. 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 project.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. 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.

4.7 Relationships With Other Courses & Labs

Previous Courses:

ENGG*2120: Chemical and engineering properties of materials

ENGG*2230: Fundamentals of fluid flow in porous media

Follow-on Courses:

ENGG*4370: Design of buried pipe, ditches and drainage systems

ENGG*4250: Design of earth dams and natural channel systems

ENGG*4340: Slope stability analysis for solid waste landfills

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Monday	10:30 – 11:20	ANNU 156
Wednesday	10:30 – 11:20	ANNU 156
Friday	10:30 – 11:20	ANNU 156

Weekly Seminars:

Wednesday	Sec 11 & 21	9:30 – 10:20	MACK 229 or THRN 1319
Friday	Sec 12 & 22	9:30 – 10:20	MACK 229 or THRN 1319

Bi-Weekly Laboratory:

Monday	Sec 11 or 12	14:30 - 16:20	THRN 1107
Friday	Sec 21 or 22	14:30 - 16:20	THRN 1107

5.2 Lecture Schedule

Lectures	Lecture Topics	References	Learning Objectives
1-3	Site Exploration	Chapter 1	1,7
4-6	Soil Composition	Chapter 2	1,7
7-9	Soil Classification	Chapter 3	1,2,7
10-12	Excavation & Compacted Fill	Chapter 4	2,7
13-15	Groundwater Fundamentals	Chapter 5	2,3,8
16-18	Groundwater Applications	Chapter 6	2,3,5,8,9
19-21	Stress in Soil Mass	Chapter 7	3,4
22-24	Compressibility & Settlement	Chapter 8	2,3,9
25-27	Rate of Consolidation	Chapter 9	2,4,9
28-30	Soil Strength	Chapter 10	3,4,6
31-33	Stability of Earth Slopes	Chapter 11	2,3,5,6,9
34-36	Lateral Earth Pressures	Chapter 12	2,9

5.3 Lab Experiment Schedule

Students will form groups of two or three students from the same lab section and collaborate in conducting the experiments, taking notes, discussions and submit a report as a group for marking electronically on the course website designated drop box. In total three reports will be submitted; the first report focuses on soil classification and covers Particle Size Analysis, Atterberg Limits Tests, and soil classification methods; the second report focuses on groundwater flow and covers the Falling Head Test, SEEP-W program, the CEC Test and the CTRAN-W program; the third report focuses on soil strength (Direct Shear Test) and slope stability analysis (SLOPE-W program).

Date	Activity	Sections	Groups	Room	
Friday*	Sep. 6	Orientation & Safety	21 and 22	1 to 16	THRN 1107
Monday*	Sep. 9	Orientation & Safety	11 and 12	17 to 32	THRN 1107
Friday	Sep. 13	Particle Size Analysis	21	1 to 8	THRN 1107
Monday	Sep. 16	Particle Size Analysis	11	17 to 24	THRN 1107
Friday	Sep. 20	Particle Size Analysis	22	9 to 16	THRN 1107
Monday	Sep. 23	Particle Size Analysis	12	25 to 32	THRN 1107
Friday	Sep. 27	Atterberg Limits	21	1 to 8	THRN 1107
Monday	Sep. 30	Atterberg Limits	11	17 to 24	THRN 1107
Friday	Oct. 4	Atterberg Limits	22	9 to 16	THRN 1107
Monday	Oct. 7	Atterberg Limits	12	25 to 32	THRN 1107
Friday	Oct. 11	Falling Head Test	22	9 to 16	THRN 1107
Monday	Oct. 14	Thanksgiving Holiday - NO LABS SCHEDULED			
Friday	Oct. 18	Falling Head Test	21	1 to 8	THRN 1107
Monday*	Oct. 21	Falling Head Test	11 and 12	17 to 32	THRN 1107
Friday	Oct. 25	CEC Test	21	1 to 8	THRN 1107
Monday	Oct. 28	CEC Test	11	17 to 24	THRN 1107
Friday	Nov. 1	CEC Test	22	9 to 16	THRN 1107
Monday	Nov. 4	CEC Test	12	25 to 32	THRN 1107
Friday	Nov. 8	Direct Shear Test	21	1 to 8	THRN 1107
Monday	Nov. 11	Direct Shear Test	11	17 to 24	THRN 1107
Friday	Nov. 15	Direct Shear Test	22	9 to 16	THRN 1107
Monday	Nov. 18	Direct Shear Test	12	25 to 32	THRN 1107
Friday**	Nov. 22	Open Lab	21 and 22	1 to 16	THRN 1107
Monday**	Nov. 25	Open Lab	11 and 12	17 to 32	THRN 1107
Thursday	Nov. 28	Open Lab	All	All	THRN 1107

*, ** Note: on Sep. 6, 9, and Oct. 21 the first section will come for the first hour and the second section for the second hour of the lab period. The Open Lab period is available for the students that may have missed a lab for valid reasons approved by the instructor.

5.4 Seminar Schedule

The focus of the weekly seminars is to teach the students three engineering analysis and design tools, namely: SEEP-W, CTRAN-W and SLOPE-W. These programs greatly enhance the analysis and design capabilities for complex problems. Students of the same lab group will collaborate in building computer models for the assigned problems, discussions and submit a report as a group for marking.

	Date	Lab Report	Sections	Groups	Room
Fri.	Sep. 6	Introduction	12 and 22	9 to 16 and 25 to 32	MACK 229
Wed.	Sep. 11	Finite Element Method	11 and 21	1 to 8 and 17 to 24	MACK 229
Fri.	Sep. 13	Finite Element Method	12 and 22	9 to 16 and 25 to 32	MACK 229
Wed.	Sep. 18	Finite Element Method	11 and 21	1 to 8 and 17 to 24	MACK 229
Fri.	Sep. 20	Finite Element Method	12 and 22	9 to 16 and 25 to 32	MACK 229
Wed.	Sep. 25	SEEP-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Sep. 27	SEEP-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Oct. 2	SEEP-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Oct. 4	SEEP-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Oct. 9	SEEP-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Oct. 11	SEEP-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Oct. 16	CTRAN-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Oct. 18	CTRAN-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Oct. 23	CTRAN-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Oct. 25	CTRAN-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Oct. 30	CTRAN-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Nov. 1	CTRAN-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Nov. 6	SLOPE-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Nov. 8	SLOPE-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Nov. 13	SLOPE-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Nov. 15	SLOPE-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Nov. 20	SLOPE-W	11 and 21	1 to 8 and 17 to 24	THRN 1319
Fri.	Nov. 22	SLOPE-W	12 and 22	9 to 16 and 25 to 32	THRN 1319
Wed.	Nov. 27	Open-W	11 and 21	1 to 8 and 17 to 24	THRN 1319

5.5 Other Important Dates

- Monday, 14 October 2013: Thanks giving holiday
- Thursday, 31 October 2013: drop date – 40th class
- Thursday, 28 November 2013: last class (Monday Schedule in effect)

Undergraduate calendar: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/>

6 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.

Before starting to work in the laboratory, listen carefully to the safety instruction; read carefully labels and equipment instructions; set up and use the equipment as directed by your supervisor/laboratory technician; follow all written and verbal instructions carefully; if you do not understand a direction or part of a procedure, STOP and ask your supervisor/laboratory technician before proceeding with the activity; conduct yourself in a responsible manner at all times in the laboratory; including:

- follow all applicable safety rules and practices as outlined in the lab safety manual
- do not hesitate to ask for help or guidance from to the supervisor/laboratory technician
- no food or drinks allowed in soils lab
- no open-toe shoes, slippers, sandals, or crooks
- all backpacks must be stored on designated area to avoid trip hazard
- wear personal safety protective equipment according to the instructions
- in case of fire alarm, exit the lab orderly and immediately
- in case of breaking glassware follow clean-up protocol
- behave professionally at all times
- wear gloves when removing dried soil samples from the ovens
- wash hands before and after experiments
- declare any serious medical conditions
- report all incidents to the supervisor/laboratory technician
- report all unsafe conditions to the supervisor/laboratory technician
- do not leave your station before inspected by the instructors for tidiness
- collect supervisor/laboratory technician's signature on your data recording sheet before leaving

7 ACADEMIC MISCONDUCT

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 discourages misconduct. 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.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:

<http://www.academicintegrity.uoguelph.ca/>

Please also review the section on Academic Misconduct in your [Engineering Program Guide](#).

The School of Engineering has adopted a Code of Ethics that can be found at:

<http://www.uoguelph.ca/engineering/undergrad-counselling-ethics>

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.csd.uoguelph.ca/csd/>