

Western University - Faculty of Engineering
Department of Civil and Environmental Engineering

CEE 3322B – Introduction to Geotechnical Engineering - Course Outline
2023/2024

This is the second course in soil mechanics and geotechnical engineering for students enrolled in the Department of Civil and Environmental Engineering. The students are required to attend lectures, participate in laboratory sessions to measure the engineering properties of soil, interpret experimental data, attend tutorial sessions, prepare complete and concise laboratory reports. The general objectives are for the student to become able to:

- Calculate total and effective stress in soil
- Analysis of simple stress distribution in soil medium.
- Understand the concepts of soil consolidation including primary consolidation, secondary compression and time-rate of consolidation.
- Analyze one-dimensional settlement
- Understand soil shear strength and its measurement using laboratory experiments
- Introduction to stability of slopes

Course delivery with respect to the COVID-19 pandemic

Although the intent is for this course to be delivered in-person, the changing COVID-19 landscape may necessitate some or all of the course to be delivered online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor.

When deemed necessary, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>

Calendar Copy:

Effective stress principles, stress distribution, soil consolidation and compressibility, time-rate of settlement, soil shear strength of soils.

Prerequisites: CEE 2202A/B, CEE 2224

Corequisites:

Antirequisite: CEE3326

Note: It is the **student's responsibility** to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the **student's responsibility** to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions. The decisions regarding either prerequisite or anti-requisite may not be appealed.

Instructor:

Safwat Ramadan, Ph.D. Candidate, P.Eng., email: sramada6@uwo.ca.

Contact Hours:

3 lecture hours/week; 4 tutorial and laboratory hours; (recommended additional personal study - 3 hours/week). Classes, tutorial and laboratory session attendance are **mandatory**.

Textbook:

Prepared class notes should be brought to each class and may be downloaded from the course website (<http://owl.uwo.ca>).

Coduto, D. P., Yeung, M R, and Kitch, W A “Geotechnical Engineering, Principles and Practices”, Prentice-Hall, Inc., 2nd edition, 2011. Hardcopy or ebook is required.

Lab manual:

Das B.M. “Soil Mechanics Laboratory Manual” 9th Edition, Oxford University Press, 2015.

Laboratory:

Three mandatory laboratory reports should be submitted for:

1. *Consolidation Oedometer Test*
2. *Direct Shear Test*
3. *Triaxial – Consolidated Undrained Test*

Laboratory reports should be prepared in groups and submitted online to the course website by the specific due dates which will be announced by the instructor. Late reports will be deducted 10% per day and will not be accepted seven (7) days after the due date. All reports should be typed, and graphs prepared using a professional drawing software (e.g, MS Excel). Every report should include a mandatory cover page showing the experiments title, submission date, student name and number.

Computing:

Assignments and laboratory reports may require the use of Microsoft Excel for calculation and developing engineering plots.

Units:

SI units will be used in lectures and examinations

Specific Learning Objectives: [GA Indicator]

1. Effective Stress and stress distribution
 - a) Calculate the total stress, pore pressure and effective stress in soil [PA2]
 - b) Define the distribution of stress in the ground using simple methods [PA2]
2. Soil Compressibility and Settlement Analysis
 - a) Describe the components of soil settlement [PA1]
 - b) Calculate settlement of soil [PA2]
 - c) Perform consolidation tests [I2]
 - d) Calculate the preconsolidation pressure, compressibility, coefficient of consolidation and stiffness of soils from consolidation test data [I3]
3. Time Rate of Consolidation
 - a) Calculate the degree of consolidation and degree of settlement of clay soils using analytical and finite difference solutions [PA2]
 - b) Describe the concept of secondary consolidation [PA1]
4. Shear Strength of Soils
 - a) Define the soil shear strength for short- and long-term conditions [PA1]
 - b) Use Mohr-Coulomb failure criterion to define failure in soil [PA2]
 - c) Describe the shear strengths of sand and clay [PA1]
 - d) Measure the shear strength of sands and clays in lab and in-situ [I3].

The instructor may expand or revise material presented in the course as appropriate.

General Learning Objectives

E=Evaluate, T=Teach, I=Introduce; (I) = Introduction, (D) = Developing, (A) = Advanced level

Knowledge Base	I	Engineering Tools	I	Impact on Society	
Problem Analysis	E (D)	Team Work	I	Ethics and Equity	
Investigation	T	Communication		Economics and Project Management	
Design	I	Professionalism		Life-Long Learning	

Evaluation:

The final course mark will be determined as follows:

Weekly Assignments:	20%
Lab reports:	15%
Mid-term exams:	25%
Final exam:	40%

Total	100%

- Note:
- (a) **Students must pass the final examination to pass this course.** Students who fail the final examination will be assigned the aggregate mark, as determined above, or 48%, whichever is less.
 - (b) **Students must turn in all laboratory reports, and achieve a passing grade in the laboratory component, to pass this course.** Students who do not satisfy this requirement will be assigned 48% or the aggregate mark, whichever is less.
 - (c) **Students who have failed this course previously must repeat all components of the course.** No special permissions will be granted enabling a student to retain laboratory, assignment or

test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.

- (d) Should any of the exams conflict with a religious holiday that a student wishes to observe, the student must inform the instructor of the conflict no later than two weeks before the scheduled test. (For further information on Accommodations for Religious Holidays see http://www.uwo.ca/univsec/handbook/appeals/accommodation_religious.pdf)

Examinations:

A 120-minute mid-term exam will be scheduled during the Lecture period on Wednesday, February 28th (tentatively). The final examination will be 3 hours, held during the examination period of the winter term. Both the midterm and the final examinations will be **CLOSED BOOK: no programmable calculators or other external sources of information, including books, notes or crib sheets, are permitted.** In addition to the material covered in the class lectures, the exams may include questions from the laboratory portion of the class. Students will need to bring their own calculator, straight edge, compass, and protractor to the exams.

Tutorials

The course includes several tutorial sessions, which will alternate with the laboratory sessions. At the beginning of each tutorial session, a teaching assistant will display a series of problems. The TA will solve 2 to 3 problems, and the students will solve the rest of problems.

Weekly Assignments

Homework assignments will be posted on the course website (<http://owl.uwo.ca>). The assignments should be solved **individually** and submitted online to the course website by the specific due dates which will be announced by the instructor. Late submissions will be deducted 10% per day and not be accepted seven (7) days after the due date. The weekly assignments are worth **20%** of the total evaluation mark. Data plots and other figures may be drawn to scale by hand or plotted from a computer. All plots should be clearly labelled with all required information. Sub-standard figures and plots, unprofessional and/or disorganized reports will adversely affect assignment marks.

Use of English

In accordance with Senate and Faculty Policy, students may be penalised up to 10% of the marks on all assignments, tests, and examinations for the improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Plagiarism Checking:

The University of Western Ontario uses software for plagiarism checking. Students are required to submit their Laboratory Reports and exams in electronic form to Turnitin.com for plagiarism checking.

Cheating:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

For more information on scholastic offenses, please see:

https://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Attendance:

Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Accessibility:

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Conduct:

Students are expected to arrive at lectures on time, and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Late comers may be asked to wait outside the classroom until being invited in by the Instructor. Please turn off your cell phone before coming to a class, tutorial, lab, or exam.

On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: <http://www.uwo.ca/univsec/board/code.pdf>

Sickness and Other Problems:

Students should immediately consult with the Instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the Instructor or Department Chair regarding how best to deal with the problem. Failure to notify the Instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

Students that are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help

For more information concerning medical accommodations, please see:
http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf

Notice:

Students are responsible for regularly checking their email, course website (<https://owl.uwo.ca>) and notices posted outside the Civil and Environmental Engineering Department Office

Consultation:

Students are encouraged to discuss problems with their teaching assistant and/or instructor in tutorial sessions. Office hours will be arranged for the students to see the instructor and teaching assistants. Other individual consultation can be arranged by appointment with the appropriate instructor.

Course breakdown:

Engineering Science = 60%; Engineering design = 40%

The document "INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED" is part of this course outline.