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

CEE 3322b – Introduction to Geotechnical Engineering
Course Outline 2018/19

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, conduct laboratory experiments to measure the engineering properties of soil, interpret experimental data, attend tutorial sessions, submit homework assignments, and complete and concise laboratory reports. The general objectives are for the student are to be able to:

- Calculate total and effective stress in soil;
- Analyse simple stress distributions in soil media;
- Understand the concepts of soil consolidation, including primary consolidation, secondary compression and time-rate of consolidation;
- Analyse one-dimensional settlement problems;
- Understand soil shear strength and its measurement using laboratory experiments.

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

Contact Hours:
3 lecture hours/week; 2.5 laboratory/tutorial hours; (recommended additional personal study - 3 hours/week). Attendance at the laboratory sessions is mandatory.

Prequisites: CEE3321a, CEE 2202a/b, AM 2411 or AM 2415

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:

Dr. Tim Newson, SEB3084, email: tnewson@eng.uwo.ca. Administrative Support: SEB 3005

Textbook:


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

Lab manual:


Laboratory:

Four mandatory afternoon laboratory sessions for:

A) Soil Consolidation Test  
B) Direct Shear Test  
C) Unconfined Compression Test  
D) Triaxial Compression Shear Test

The laboratory experiments should be conducted by the student groups. Laboratory reports should be dropped off in Locker #55, Second Floor of the Spencer Engineering Building, by 4:30 pm on the due date following the laboratory. Late reports will be deducted 0.5 (out of 4 marks) per day and will not be accepted 7 days after the due date.

Computing:

Students are required to use personal computers running a Windows environment. Assignments 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:

1. **Effective Stress**
   a) Calculate the total stress, pore pressure and effective stress in soil;
   b) Define the distribution of stress in the ground using simple methods;
   c) Calculate the capillary rise in soil and recognize its influence on soil behaviour.

2. **Soil Compressibility and Settlement Analysis**
   a) Describe the components of soil settlement;
   b) Describe the soil compressibility;
   c) Calculate immediate settlement of soil;
   d) Perform consolidation tests;
   e) Calculate the preconsolidation pressure, compressibility, coefficient of consolidation and stiffness of soils from consolidation test data;
   f) Perform design calculation for the final settlement of soils.

3. **Time Rate of Consolidation**
   a) Describe Terzaghi’s one-dimensional consolidation theory, including assumptions made during the derivation;
   b) Calculate the degree of consolidation and degree of settlement of clay soils using analytical solutions;
   c) Describe the concept of secondary consolidation;
   d) Describe the design implications of soil settlement.

4. **Shear Strength of Soils**
   a) Define the soil shear strength for short and long-term conditions;
   b) Use Mohr-Coulomb failure criterion to define failure in soil;
   c) Describe the shear strengths of sand and clay;
   d) Describe the peak and residual shear strengths of soils;
   e) Measure the shear strength of sands and clays in lab and in-situ;
   f) Understand the concept of critical states for soils;
   g) Describe the design implications of the soil shear strength.

General Learning Objectives

E=Evaluate, T=Teach, I=Introduce

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**Evaluation:**

The final course mark will be determined as follows:

- Homework assignments: 15%
- Lab reports: 20%
- Mid-term exam: 15%
- Final exam: 50%

Total 100%

**Note:**

(a) **Students must pass the final examination** (by achieving a minimum of 50% in the final exam) **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, attend all labs, 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

1. **Examinations:**

A 45-minute mid-term exam will be scheduled during a lecture period (5:40 to 6:25 pm), on Thursday, Feb 28th. Programmable calculators are **not** permitted in the final and mid-term exams. The final examination will be 3 hours, held during the examination period of the fall 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.
2. Assignments

The course includes three homework assignments will be assigned on the course website (http://owl.uwo.ca). Due dates of individual assignments will be noted on the assignments. Solutions should be submitted on the due date at 4:30 p.m. in LOCKER #55, 2ND FLOOR, SEB. Late submissions will be deducted 10% per day and not be accepted 7 days after the due date. Data plots and other figures may be drawn with a computer or by hand on graph paper. When needed, neatly draw all sketches and data plots using a straight edge, French curve, compass, etc., and show all relevant labels. When feasible, site plans and schematics should be drawn to a proportional scale. Failure to submit legible, neat, professional looking assignments will adversely affect assignment marks. Extensions are to be negotiated with the course instructor, not the teaching assistants.

3. Tutorial Sessions

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 and the students will be asked to first solve those problems on their own. The TA will then review and solve the tutorial questions. Attending tutorial sessions is highly encouraged and recommended to practice relevant problems and prepare for the mid-term and final examinations.

4. 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 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: http://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](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/](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](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](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.