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.
- Analyse one-dimensional settlement
- Understand soil shear strength and its measurement using laboratory experiments

**Calendar Copy:**
A continuation of CEE 3322B. Effective stress analysis, one dimensional settlement and consolidation theories for clayey soils, time-rate of consolidation, shear strength of soils.

**Prerequisites:**
CEE 3321A, CEE220A/B

**Anti-requisites:**
None

**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.

**Contact Hours:**
3 lecture hours/week; 2.5 laboratory/tutorial hours; (recommended additional personal study - 3 hours/week). Attendance at the tutorial/laboratory session is **mandatory**
Lectures will be delivered in person. Lectures will be organized into learning modules which students should review on a weekly basis. Quizzes at the end of each module will be used to track participation. Review of lecture material and self-study should take approximately 5 hours per week. Four tutorial sessions will be delivered during the scheduled tutorial hours. Tutorials are not mandatory but students seeking assistance with assignments or clarification on lecture material are strongly encouraged to attend.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

**Instructor:**
Dr. A. Sadrekarimi, P. Eng., SEB3010D, email: asadrek@uwo.ca

Administrative Support: civil@uwo.ca, SEB 3005

**Textbook:**

Course notes are available on OWL and can be downloaded from the course website (http://owl.uwo.ca).

**Lab manual:**

Students are responsible for checking the course OWL site (http://owl.uwo.ca) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

All course material will be posted to OWL: http://owl.uwo.ca.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

**Laboratory:**

Three mandatory laboratory reports should be submitted for:

A) Consolidation Oedometer Test

B) Direct Shear Test

C) Triaxial Compression Shear Test

Laboratory reports should be prepared in groups and submitted online to the course website by 4:30 pm of the specific due dates which will be announced by the instructor for each lab. Late reports will be deducted 0.5 (out
of 4 marks) per day and will not be accepted 7 days after the due date. All reports should be typewritten and graphs prepared using a professional drawing software (e.g., MS Excel), and converted to a PDF file for submission. Every report should include a mandatory cover page showing the experiments title, submission date, student name and number.

**Students must turn in all laboratory reports, attend all laboratory sessions, and achieve a passing grade in the laboratory component, to pass this course.** Students who do not satisfy this requirement or miss a laboratory session will be assigned 48% or the aggregate mark, whichever is less.

**Computing:**

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

**Units:**

Both SI and FPS unit systems may be used in lectures, tutorials and examinations.

**Specific Learning Objectives:**

The lectures and tutorial assignments will prepare students to do the following [GA Indicator - **Bold** denotes evaluated indicator]:

1. **Effective Stress**
   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 immediate 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

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<thead>
<tr>
<th>Knowledge Base</th>
<th>I</th>
<th>Engineering Tools</th>
<th>I</th>
<th>Impact on Society</th>
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<tr>
<td>Problem Analysis</td>
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<td>Team Work</td>
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<td>Design</td>
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<td>Professionalism</td>
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<td>Life-Long Learning</td>
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**Evaluation:**

The final mark will be determined as follows:

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<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Mid-term Exam</td>
<td>20%</td>
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<tr>
<td>Lab Reports</td>
<td>30%</td>
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<tr>
<td>Final Examination</td>
<td>40%</td>
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<tr>
<td>Participation</td>
<td>10%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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**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, attend all laboratory sessions, and achieve a passing grade in the laboratory component, to pass this course.** Students who do not satisfy this requirement or miss a laboratory session will be assigned 48% or the aggregate mark, whichever is less.
(c) Students who miss the mid-term exam will lose 20% of the course.
(d) Participation credit will be based on attending lectures and tutorials.
(e) **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.

**Examination:**

A 60-minute mid-term exam will be held tentatively during the lecture period on Thursday, March 2nd. The final examination will be 3 hours, held during the examination period of the winter term. In addition to the material covered in the class lectures, the exams may include questions from the laboratory portion of the class. 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 solutions will adversely affect your exam mark. Students will need to bring their own calculator, straight edge, compass, and protractor to the exams.

**Tutorials:**

Four tutorial sessions will be available for your benefit and learning. At the beginning of each tutorial session, the teaching assistants will display the problems and the students should solve those problems. The TA will then review and provide the solutions for the past assignments, and answer student questions.

**Course Breakdown:**

(Values given in accreditation units)

Engineering Science = 60%; Engineering design = 40%
**Academic Policies**

The website for Registrar Services is http://www.registrar.uwo.ca.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual’s official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Non-programmable calculators are only allowed during the mid-term and final exams in this course.

**Scholastic offences** are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:


All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

**Academic Consideration for Student Absence**

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

https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html

**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.

https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html
Accommodation

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing.

Attendance

Any student who, in the opinion of the instructor, has not engaged sufficiently in 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.

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

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. Please turn off your cell phone before coming to a class, tutorial, quiz 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

Consultation

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

Course Format

This course will be delivered in-person. In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely 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 remaining assessments will also be conducted online at the discretion of the course instructor.

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

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.
Religious Accommodation
Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance.
https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html

Support Services
Please visit the Western Engineering Undergraduate Services webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.eng.uwo.ca/undergraduate/index.html

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at
http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (https://learning.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, https://westernusc.ca/services/.

Use of English
In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for 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.