Department of
Civil and Environmental
Engineering

THE UNIVERSITY OF MAINE

207B Boardman Hall
Orono, Maine 04469-5711
Tel: 207.581.1277
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CIE-598: Experimental Soil Mechanics-Fall 2024

Instructor information

Luis Zambrano-Cruzatty, Ph.D.	
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Course description

Credits: 3(CIE-598). Laboratory and in-situ testing is a critical and necessary activity in geotechnical engineering. This course covers advanced topics about soil laboratory and in-situ tests used to evaluate soil behavior under various loading and environmental conditions. To begin, the course discusses the fundamentals of sampling, disturbance, and uncertainty in soil parameters. Following that, students will learn about the various laboratory tests through group practice sessions in which they will prepare, test, and report the results of various experiments to get consolidation and shear strength data. Similarly, advanced issues about in-situ testing are covered in this course.

Course information

Location	Boardman Hall 115
Day	Tuesday and Thursday.
Time	9:30 AM to 10:45 AM.
Exam date	Project based (TBD).
Office hours	Anytime by appointment.

Course delivery method

This is an in-person, synchronous course.

Digital services, hardware, software

Brightspace will be used as a learning management system for the course. All class handouts, homework, quizzes, grades, and communications will be hosted there.

Instructional materials

The following are **suggested** textbooks:

- Bardet, J.-P. (1997). Experimental soil mechanics. Upper Saddle River, N.J: Prentice Hall.
- Holtz, R. D., Kovacs, W. D., & Sheahan, T. C. (1981). An introduction to geotechnical engineering (Vol. 733). Prentice-Hall Englewood Cliffs.

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Course objectives

This course has the following objectives:

1. To learn about the different tests to obtain shear strength and consolidation parameters of soils.
2. To understand the effect of water drainage in soils to select the appropriate laboratory test and soil model.
3. To comprehend and learn the limitations and assumptions in the design and analysis of soil laboratory results.
4. To understand the advantages and limitations of different in-situ tests and their applicability for soil characterization.

Learning outcomes

After completing this course you will be able to:

1. Describe the sources of sampling disturbance and its effects on the quality and accuracy of laboratory results.
2. Describe the best practices for sample storage and preparation.
3. Describe the assumptions, boundary conditions, and stress and strain paths of laboratory tests.
4. Distinguish between drained and undrained analysis and total and effective parameters.
5. Produce technical specifications for a laboratory test, including drainage conditions, loading rates, loading magnitude, consolidation pressure, back-pressure, and the like.
6. Perform advanced laboratory testing, including consolidation, direct shear, direct simple shear, triaxial, and vane shear tests.
7. Critically review laboratory reports and judge the quality and accuracy of reported results.
8. Analyse in-situ test results such as cone penetration testing, standard penetration test, and similar situations when intact sampling is not feasible.
9. Describe the significance, steps, laboratory tests, and limitations of SHANSEP for characterizing the shear strength of clay.
10. Describe the significance, steps, laboratory tests, and limitations of determining the critical state line of soils.

Course assessment

Participation in laboratory practice	20%
Homework and reports	50%
Final project (Take home)	30%

Participation in laboratory practice policy

Your class participation is mandatory and has a significant impact on achieving our learning objectives. You are expected to engage in the laboratory actively asking and answering questions and completing the test procedures in teams.

Before the laboratory practice, I expect that you have read the test standards, equipment manuals, and laboratory tutorials, and therefore are aware of the steps required to conduct the experiments successfully. If you fail to demonstrate a minimum knowledge of the experiment, you will not obtain full credit for this item.

Be aware that performing the experiments will require more than the time available for the lecture; therefore, you will require additional time to complete the tests. You are responsible for completing the

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tests, controlling the equipment, ensuring that sensors are not overloaded, ensuring sample quality, cleaning your station, and reporting the results. Team collaboration and communication are paramount in ensuring a successful practice.

Homework and reports policy

You will be responsible for completing one homework assignment and seven laboratory reports throughout the course. These assignments are individual tasks, and it is important that you complete them independently, without the assistance of large language models such as ChatGPT. Keep in mind that language generated by these tools, particularly for specific technical content, is often easily identifiable. Any work submitted that is found to have used such assistance will receive zero credit.

Submission guidelines

Each assignment must be accompanied by a memo addressed to me. The memo should be written in a professional tone, as if you were submitting a report to a client. Please note that any homework or report submitted without a memo will not be graded. Additionally, if the memo is submitted after the assignment deadline, a late penalty will be applied to your grade.

The memo should directly address the questions posed in the homework assignment. Ensure that your work adheres to ASTM standards for significant figures and reporting parameters. Any hand calculations, tables, figures, or materials required for your analysis should be consistently referenced within the body of the memo. Additionally, all pages must be numbered, and your name should be clearly indicated on each page.

When reporting variables, use the class-specific nomenclature provided during lectures. Figures must be clear, with properly labeled axes and any necessary labels. The overall quality of your work, including clarity and attention to detail, will be a factor in your grade.

Late submission policy

Late homework will incur a grade penalty (2 points for every day late). It is essential that you submit your assignments on time. If you anticipate needing more time to complete an assignment, please notify me as early as possible so that I can consider granting an extension.

Final project policy

The final project consists of writing a step-by-step guide for one of the laboratory practices.

The guide must contain pictures of tools and equipment needed, screenshot captures of software used, and laboratory and post-processing sheets. Your grade will depend upon the extend to which your guide is useful for future Black Bears taking this class. Make sure you leave a legacy!

Grading

The following grading scheme will apply in this course.

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A	above 93
A-	90-93^{-}
B+	87-90^{-}
B	83-87^{-}
B-	80-83^{-}
C+	77-80^{-}
C	73-77^{-}
C-	70-73^{-}
D	60-70^{-}
F	below 60

$^{-}$ indicates number is not included

Campus policies

Academic honesty

Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, or generated by software or systems without the explicit approval of the instructor, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University. Please see the University of Maine System's Academic Integrity Policy listed in the Board Policy Manual as Policy 314 (*Date Issued: September 1, 2020): https://www.maine.edu/board-of-trustees/policy-manual/section-314/

Students accessibility services

If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, located at the Center for Accessibility and Volunteer Engagement at the UCU, 139 Rangeley Rd, um.sas@maine.edu, 207.581.2319, as early as possible in the term. Students may begin the accommodation process by submitting an accommodation request form online and uploading documentation at https://umaine-accommodate.symplicity.com/public_accommodation/. Once students meet with SAS and eligibility has been determined, students submit an online request with SAS each semester to activate their approved accommodations. SAS creates an accessibility letter each semester which informs faculty of potential course access and approved reasonable accommodations; the letter is sent directly to the course instructor. **Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me (the instructor of the course) privately as soon as possible.**

Sexual violence policy

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of **sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination** involving members of the campus, **your teacher is required to report** this information to Title IX Student Services or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

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For confidential resources on campus: **Counseling Center: 207-581-1392** or **Northern Light Primary Care, University of Maine: at 207-581-4000**. *Confidential Resource Advisor: 207-571-5372 (call or text). Or see the Confidential Resource Advisor website for a complete list of services and resources (https://www.maine.edu/confidential-resource-advisor/) .*

For confidential resources off campus: **Rape Response Services**: 1-800-871-7741 or **Partners for Peace**: 1-800-863-9909.

Other resources: The resources listed below can offer support but may have to report the incident to others who can help:

For support services on campus: Title IX Student Services: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911. Or see the Title IX Student Services website for a complete list of services (https://umaine.edu/titleix/). Also, Student Wellness Resource Center (https://umaine.edu/wellness/).

Observance of Religious Holidays/Events

The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student's grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from the class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

Course Schedule Disclaimer (Disruption Clause)

In the event of an extended disruption of normal classroom activities (due to COVID-19 or other long-term disruptions), the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

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Tentative schedule

Day	Date	Topic	Due
T	3-Sep	Class begins: Syllabus, basic geotechnical review	
Th	5-Sep	Sampling, sampling storage	
T	10-Sep	LIR consolidation test- Lecture	HM1
Th	12-Sep	LIR (G1) and CSR (G2) Consolidation test- laboratory	
T	17-Sep	CSR Consolidation test- Lecture	
Th	19-Sep	LIR (G2) and CSR (G1) Consolidation test- laboratory	
T	24-Sep	Direct shear test- lecture	
Th	26-Sep	Direct shear test (Both groups)- laboratory	BG LR1-LR2
T	1-Oct	CD triaxial test-lecture	
Th	3-Oct	CD triaxial test (G1)-laboratory	BG LR1-LR2
T	8-Oct	CU triaxial test-lecture	
Th	10-Oct	CD triaxial test (G2)-laboratory	BG LR3
T	15-Oct	No class: Fall break	
Th	17-Oct	CU triaxial test (G1)-laboratory	G1 LR4
T	22-Oct	UU triaxial test- lecture	
Th	24-Oct	CU triaxial test (G2)-laboratory	G2 LR4
T	29-Oct	Simple shear: lecture	
Th	31-Oct	UU triaxial test (G1)- laboratory	G1 LR5
T	5-Nov	Advanced in-situ testing: SPT	
Th	31-Oct	UU triaxial test (G2)- laboratory	G2 LR5
T	5-Nov	Advanced in-situ testing: CPT	
Th	7-Nov	Simple shear (G1)- laboratory	G1 LR6
T	12-Nov	Advanced in-situ testing: Vane shear test	
Th	14-Nov	Simple shear (G2)- laboratory	G2 LR6
T	19-Nov	Advanced in-situ testing: Other in-situ tests	
Th	21-Nov	Thanksgiving day break- no class	
T	26-Nov	SHAMSEP Lecture	G1 LR7
Th	28-Nov	SHAMSEP Lecture	
T	3-Dec	Determining the Critical State Line	G2 LR7
Th	5-Dec	Review	
T	10-Dec	Project due	