CE 341A – 141: Soil Mechanics Lab

Lectures Friday: 1:00 pm – 2:50 pm
Colton Hall 314

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Office Hours: M/09:30 am – 10:30 am
T/09:30 am – 10:30 am

Prerequisite **:** No prerequisite is needed for this course

Required Textbook

Das, Braja, Soil Mechanics Laboratory Manual, 10th Edition, Oxford University Press, ISBN: 9780197545812

Course Description *(from NJIT's course catalog)*

Corequisite: CE 341. Students perform basic experiments in soil mechanics.

Course Objectives (General)
By the end of this course, the student will be able to:

Course Topic 1: Learn index properties of soils and laboratory methods of soil classification.

Course Topic 2: Learn Compaction and Hydraulic Conductivity Tests.

Course Topic 3: Learn principles of Consolidation and shear strength.

Course Topic 4: Learn to design and analyze a custom experiment.

POLICIES & PROCEDURES

Academic Integrity: It is expected that NJIT's University Code on Academic Integrity will be followed in all matters related to this course. Refer to NJIT's Dean of Students website to become familiar with the Code on Academic Integrity and how to avoid Code violations.

https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Policies and Instructions
Communication: The Professor/TA/instructor should be primarily contacted through emails. Emails must include in the subject: [CE 341A] – "the main purpose of the email".

Lectures/Class: The following applies:

1. Attendance is mandatory and students must be in the room on time (The Professor/TA/instructor will call by each name of the students during each session).
2. **Attendance** will be taken any time 5 minutes of starting of class. If students are not on time and if the name of students is called but they do not reply/sign their names, 15% will be

deducted from the final grade of the report. After 30 minutes of the beginning of the class, late students will not be allowed to perform the experiment, the attendance points will be deducted, and the report will be graded zero.

3. Official documents regarding missing classes must be submitted to the Dean of Students and Campus Life Office to be subjected to approval. The Professor/TA/instructor does not review those documents.
4. If the instructor sees any wrong behavior, all involved students will be asked to leave the class and the report will be graded as zero.
5. The NJIT Laboratory General Lab Safety Guidelines apply to this course. Please see the guidelines outside the Soil Mechanics lab (Colton 314 – Geotechnical Teaching Laboratory).
6. If any modifications or deviations from the syllabus throughout the semester are made, the students will be notified through the online system.

Handouts: The handouts will be available on NJIT Canvas before the lab. Please read the laboratory manual and the handouts, before coming to class.

Homework: Prepare your homework as follows:

1. Individual introductions/reports. Each member will hand in an individual laboratory introduction/report that reflects their analysis and commentaries. Group introductions/reports are not allowed.
2. The introductions/reports are always uploaded to the system used by NJIT by the students. If the online system (i.e., Canvas) is not working, an email must be sent to the Professor/TA/instructor regarding this issue; however, the report must be sent by email on time. If not delivered on time: 20% would be deducted per day.
3. Assignments will be due on the date mentioned by the Professor/TA/Instructor (please see the online submission tab in the online system to know the exact hour and date).

Homework Format: The Assignments must be typed. No double space, font Arial or similar, and size 10, justified. Please follow the following instructions when formatting your assignments:

1. The **Introduction Assignment** (1/2 to 1 page) must be written **in your own words (even the procedure)**. References are mandatory, if students use information that was not developed by them (please include the lab manual). The Introduction assignment must be delivered before each class. No partial grade is given if the Introduction Assignment is delivered late. In this document, students need to include the information that can answer the following questions:

a. **Standard number**: what is the standard number that is used for this experiment (2 points)
b. **Importance and Purpose**: Why do we need to experiment (purpose of experiment)? (2 points)
c. Procedure: How do we run the experiment, in terms of steps performed? What equipment needs to be used (2 points)
d. **Outcome and Results:** What kind of results do you expect to obtain and how to get them? (3 points)
e. **References**: all references you used to write the document must be in the document (0.5 points)
f. **Presentation**: The document must be presented in an organized and in a neat way (0.5 points)

2. The **Cover page** should contain the title, the name of the student, course number and section, date of the class(es), deadline of the report, and group members.
3. Show one **sample calculation** (formulas and values used), similar to that shown in the manual, for each experiment. If you need to use any values of tables/graphs/etc., an explanation must be included. If you use symbols, they must have a label (e.g. “” is the void ratio).
4. Results should include the completed data sheets, tabulated results and/or graphs, and computer output sheets (when applicable). Tables and graphs must have captions and must be well-labeled (titles, units, points of interest, tangents, etc.).

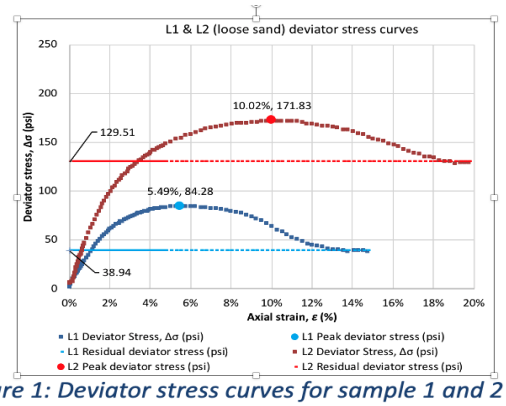
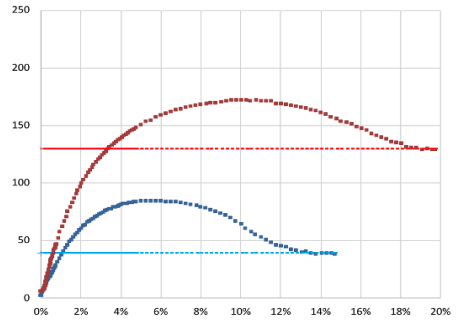


Figure 1: Deviator stress curves for sample 1 and 2

Correct: units, labels, points of interest, title, etc.



Wrong: missing all important information

Correct table

Table 1: Results obtained per type of sample

ID	Void ratio (-)	Relative density Dr (%)	Confining pressure σ3 (psi)	Deviator stress Δσ (psi)	Peak stress ratio σ1/σ3 (-)	Vol. strain ΔV/V (%)	Axial strain ε (%)

Wrong table

ID	e	Dr	σ3	Δσ	σ1/σ3	ΔV/V	ε

5. In the "**Discussion chapter**" comment on the accuracy of your results and compare your results with those of others, in identifying your sample of soil and its properties (do **not** compare your results with other students – you **must** compare your results with scientific articles, journals, books, websites, class notes, etc.). Comment on deviations from the prescribed procedure (do not write the procedure), limitations of equipment, and explanation of sources of error, and how all of these affect (or not) the results. (1 to 2 pages). Specific questions might be asked during the classes that need to be answered accordingly in this chapter. When commenting and/or discussing, the final results must be explained why and how they were achieved.
6. In the "**Conclusion chapter**", the students must write a brief summary of the laboratory exercise (1 paragraph). The students need to include all final conclusions (values and points of interest that were analyzed in the discussion chapter, type of soil, etc.) (1 paragraph).
7. **References** if any shall be provided in standard ASCE format (see ASCE citation style guide[1]). In the "References chapter", the detailed information of each reference used must be included: if the information is used from any website/book/lecture notes/etc., but the credits are not given to the author (in the Report and Introduction assignments), points will be deducted from the report's final grade. There are two types of copying:

● Direct copying – when information is directly copied without changing the author's words. Quoting symbols ("XXX") and references must be used

● Indirect copying – when information is rewritten in students' own words. References must be used: e.g. - According to Bareither et al. (2008), it is believed…
8. Students are not allowed to copy and paste information that was not developed by them. Students cannot, as well, share their reports with other students, allowing other students to copy from them. Students can change ideas between them in order to write their reports and to improve their social skills and knowledge. However, the students are not allowed to share information that was developed by them, namely reports, excel documents, graphs, tables, equations, formulas, etc.

Late Homework: Late Assignments: Late "introduction" assignments will be graded zero; Late "report" assignments will have a late penalty (if delivered more than 2 days late, it will be graded zero).

General Procedures:

1. To keep work benches clean, spread paper on the workbench and floor when necessary.
2. Each student/group will be responsible for the equipment he/she will be using. Please make sure that the equipment is in proper working condition before and after completion of the experiment.
3. Students must clean and/or wash assigned equipment and place all the equipment and accessories at the proper locations (cabinets have been labeled) after their experiment. Before leaving, you must check with the lab's instructor so that he can inspect your work area. Not following this guideline will result in a penalty in the report grade (starting at 10 points).
4. After the completion of an experiment, complete as much of the computation as possible (including name of group members and date), and have the instructor sign the data sheets before leaving. These sheets (original) must be attached to the laboratory report. Reports that do not include signed data sheets will not be graded.
5. Remove water-content containers from the oven within 48 hours. Otherwise, they will be discarded.
6. Keep wet samples in cans covered with lids until they have been weighed.
7. For drying, place the cans in a tray, making sure the lids are under the cans and not on top of them. Place a slip of paper in the tray. Write on the slip, the laboratory section number, date, and group number. Do not write on cans or lids.
8. Be observant - if you see something that does not look right, do not continue with the test and consult the instructor. For example, while mixing soil with water, if you see some dark and light-colored soil lumps, this means that the mixing has not been done properly.
9. No food or drinks inside the laboratory.
10. Proper attire must be worn while in the laboratory. No open-toed shoes, short pants or skirts, etc.
11. No pranks, practical jokes, or fooling around.
12. If the instructor sees any wrong behavior (including the previous points), all involved students will be asked to leave the lab and the report will not be graded.

Calculation of Course Grade: A weighted average grade will be calculated as follows:

Introduction[1]	10%
Attendance[2]	15%
Cover Page[3]	5%
Sample Calculations[4]	10%
Results including graphs and tables[5]	20%
Discussion[6]	20%

Summary and Conclusions[7]	10%
References[8]	2%
Quality of Presentation, graphs, tables, etc.	8%
Total	100%

Each "Lab Experiment" will have a maximum grade of 100 points (Orientation class and Direct Shear test do not count for the final grade). The course grading is based on:

- Introduction assignment (10% of the grade),
- Attendance (15% of the grade) and
- Written document (75% of the grade).
- The grades are formatted with 2 decimals.

The minimum requirements for final letter grades are as follows:

A = 90.00%, B+ = 80.00%, B = 70.00%, C+ = 65.00%, C = 60.00%, D = 50.00%, F < 49.99%

Grades are not curved in computing the final grade.

Instructor Commitment: You can expect the instructor to be courteous, punctual, organized, and prepared for lectures and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if office hours are moved; to provide a suitable guest lecturer or pre-recorded lecture when they are traveling or unavailable; and to grade uniformly and consistently.

AI statement: *The use of artificial intelligence (AI) is permitted in this course only when explicitly stated in assignments. If students use AI for any course-related work, they must cite it according to the guidelines provided on the* ***NJIT Library AI Citation page****.*

If you have any questions about AI use in this course, please contact the course instructor before submitting any assignments. In cases where AI use is not allowed, students are expected to complete work without AI assistance to develop their skills in this subject area.

Students with Documented Disabilities: NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, Room 205, (973) 596-3414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)

Course Schedule:

Class #	Lab Experiment*	Assignments		Chapter#
Week 1	Orientation + Sieve Analysis	-	Report 1	4
Week 2	Hydrometer Analysis	Introduction	Report 2	5
Week 3	Atterberg Limits (Liquid limit test, Percussion cup method, and Plastic limit test)	Introduction	Report 3	6,8
Week 4	Determination of Field unit weight of compaction by Sand Cone Method	Introduction	Report 4	11
Week 5	Standard Proctor Compaction test	Introduction	Report 5	10
Week 6	Constant-head Permeability Test in Sand	Introduction	Report 6	13
Week 7	Consolidation Test	Introduction	Report 7	17
Week 8	Unconfined Compression Test	Introduction	Report 8	16

* Some modifications to the schedule may be required to ensure that the laboratory sessions follow the lectures/NJIT's Calendar.

# Indicates the experiment number in the laboratory manual (**9th Edition**).

** The students have **1 (one) missed Report** that they can deliver during the last week of classes without the Professor/TA/instructor needing an email from the Dean of Students Office (excuse the students to deliver the assignments on time). Assignments named "Introduction" do not count as missed "Report". If the students deliver any report that will not count as a missed report, and it will count for the final grade (there are no make-ups). The outline/data of "missed" Reports might change. The Custom design experiment (midterm report) cannot be delivered as a missed report.

Course Objectives Matrix – CE314A–141

Strategies and Actions	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Methods/Metrics
Student Learning Outcome 1: Test and analyze the properties of soil.			
Show different test equipment used to measure the engineering properties of soils.	1	1	Attendance, class participation.

Measure engineering properties of soils using different test equipment.	1	1	Attendance, class participation.
Interpret the test data to obtain the engineering properties of soils.	1	1	Attendance, class participation.
Present the test results in the form of a laboratory report.	3	1, 2	Final report
Student Learning Outcome 2: Determine ranges of numerical values expected from soil tests.			
Interpret the test data to obtain engineering properties of soil.	6	1	Attendance, class participation.
Compare the calculated results with typical soil data.	6	1	Final report
Present the test results in the form of a lab report	3	1, 2	Final report
Student Learning Outcome 3: Recognize how to use those properties in geotechnical designs.			
Compare the calculated results with typical soil data.	1	1	Final report.
Present the test results in the form of a laboratory report.	3	1, 2	Final report.
Student Learning Outcome 4: Design and complete a custom experiment, analyze data, and draw conclusions.			
Based on the experience gained, plan a set of tests that will yield answers to the problem at hand.	3, 6	1	Verbally presenting their approach and solution to the instructor and final report.

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program's educational objectives are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward safe, practical, resilient, sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
2. **Professional Growth:** Alumni will advance their skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as business and law through further education.
3. **Service:** Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.

Our **Student Outcomes** are what students are expected to know and be able to do by the time of their graduation:

1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies