# CEE4405B Introduction to Geotechnical Engineering

**Schedule and Location:**

| | | |
|---|---|---|
| Lecture: | M/W 08:25 am - 09:15 am | Mason 3133 |
| Lab: | W/R 12:30 pm - 3:15 pm and 3:30 pm – 6:15 pm | Mason 1132 |

**Instructor:**

Jorge Macedo, Assistant Professor, Geosystems Engineering
Contact: jorge.macedo@ce.gatech.edu | (404) 894 3052 | Mason, 2279

**Teaching Assistants:**

| | | |
|---|---|---|
| Cody Arnold | Email: cody.arnold@gatech.edu | Office: Mason, 2141 |
| Karie Yamamoto | Email: kyamamoto8@gatech.edu | Office: Mason, 2254 |

**Course Objectives:**

This course introduces students to the engineering properties of soils and their use in common geotechnical and geoenvironmental engineering applications. Specific topics include: soil characterization and classification; compaction and soil improvement; stresses in soils; shear strength; fluid flow through porous media; settlement analyses; and earth retaining structures. The course includes 7 laboratory sessions.

**Textbook:**

Course Text: Budhu, Muniram. Soil Mechanics Fundamentals, Metric Version. Wiley-Blackwell, 2015, 368 pp. ISBN: 978-1-119-02007-3

**Grading:**

| | | |
|---|---|---|
| Exam I | Wednesday, September 29th | 20% |
| Exam II | Monday, November 8th | 20% |
| Final Exam | Wednesday, December 15th, 8:00 AM | 25% |
| Class participation | | 5% |
| Lab reports | due throughout the semester | 15% |
| Homework | | 15% |

**Office Hours:**

| | |
|---|---|
| Jorge Macedo | M: 12:30 - 1:30 pm, F - 3:30 - 4:30 pm (Online) |
| Karie Yamamoto | T: 2:00 - 3:00 pm (Mason, 1132) |
| Cody Arnold | R: 9:00 - 10:00 am (Mason, 1132) |

**Academic Honor Code:**

This course will be conducted under the guidelines of the Georgia Tech Academic Honor Code. Please refer to http://www.honor.gatech.edu for further questions involving the Academic Honor Code. In particular, cheating of any kind is unethical and unacceptable; quote and attribute any words/ideas that are not your own; wireless communication systems of all kinds must be turned off while in the classroom.

*Attendance*

Attendance at all lectures is mandatory. Class participation is highly encouraged. In accordance with the Institute requirement, verification of participation of the class will be reported to the Registrar's Office and the Office of Scholarships and Financial Aid.

*Homework*

In total 8 homework (HW) throughout the semester. HW is due at 6:00pm on the due date.

HW will be submitted through CANVAS. Grades for HW turned in after that time will be reduced by 10% per day late, including weekends and holidays. You are allowed (and encouraged) to work in study groups on HW, but each completed assignment shouldbe your own work.

It is **NEVER** acceptable for different students to turn in copies of the same printout. Please list any people with whom you studied on your assignment.

The following formats are **REQUIRED** for all homework assignments.

1. Turned-in HW must be neat, legible, and organized.
2. Be certain to place your name, the HW number, and the date.
3. All graphs must be computer generated. Hand drawn graphs will not be graded.
4. Experimental data should be plotted as discrete points, while theoretical relationships should be shown as continuous lines.
5. Show all units. Be certain to track units throughout the assignment and include them in the final answer.
6. Clearly state any assumptions (such as an assumed unit weight or density) you have made in solving the problems.

*Laboratory Periods*

The laboratory schedule is attached at the end of this syllabus. We will have 7 lab meetings. The experimental tests will cover: (1) Soil classification, (2) Grain size analysis, (3) Atterberg limits, (4) Compaction, (5) Hydraulic conductivity, (6) Consolidation, and (7) Shear strength.

Each lab report is due by 6:00pm *ONE WEEK* after your lab session has met, and should be submitted through CANVAS. Grades for lab reports turned in after that time will be reduced by 10% per day late, including weekends. While you will conduct the experiments in a group, you need to submit your own copy of the lab report.

**Information Related to Covid-19**

Students are expected to be familiar with and abide by the Institute guidelines, information, and updates related to Covid-19. Find campus operational updates, Frequently Asked Questions and details on campus surveillance testing and vaccine appointments on the Tech Moving Forward site. (https://health.gatech.edu/tech-moving-forward)

**Academic Integrity**

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit:
http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/19/

**Accommodations for Individuals with Disabilities**

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

**Diversity Statement**

We consider the class environment to be a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

**Student-Faculty Expectations Agreement**

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

**Class Schedule**

| Week | Day | Class | Date | Topic | Reading | Assigned | Due | Lab |
|---|---|---|---|---|---|---|---|---|
| 1 | M | 1 | 23-Aug | Introduction | 1.1 – 1.2 | | | -- |
| | W | 2 | 25-Aug | Composition of Soils | 1.3 | HW#1 | | |
| 2 | M | 3 | 30-Aug | Clay minerals/Fabric | 1.3 | | | |
| | W | 4 | 01-Sept | Grain size analysis of soils | 1.4 | | HW#1 | L1 |
| | R | | 02-Sept | | | | | |
| 3 | M | -- | 06-Sept | *Labor Day* | | | | |
| | W | 5 | 08-Sept | Characterization | 1.5 - 1.7 | HW#2 | | L2 |
| | R | | 09-Sept | | | | | |
| 4 | M | 6 | 13-Sept | Phase relationships | 2.1 - 2.3 | | | |
| | W | 7 | 15-Sept | Classification | 2.4 - 2.7 | | | L3 |
| | R | | 16-Sept | | | | | |
| 5 | M | 8 | 20-Sept | Site and soil investigation | 3.1 - 3.7 | | HW#2 | |
| | W | 9 | 22-Sept | Hyd conductivity, fluid flow | 4.1 - 4.5 | HW#3 | | |
| | R | | 23-Sept | | | | | |
| 6 | M | 10 | 27-Sept | Fluid flow (1D) | 4.6 - 4.9 | | | |
| | **W** | **11** | **29-Sept** | **Exam I** | | | | L4 |
| | R | | 30-Sept | | | | | |
| 7 | M | 12 | 04-Oct | Fluid flow (2D) | 4.10 - 4.12 | HW#4 | HW#3 | |
| | W | 13 | 06-Oct | Compaction | 5.1 - 5.6 | | | |
| | R | | 07-Oct | | | | | |
| 8 | M | -- | 11-Oct | *Fall Break* | | | | |
| | W | 15 | 13-Oct | Compaction | 5.7 - 5.9 | HW#5 | HW#4 | L5 |
| | R | | 14-Oct | | | | | |
| 9 | M | 16 | 18-Oct | Stresses from Surface Loads | 6.1 -6.3 | | | |
| | W | 17 | 20-Oct | Total and effective stress | 6.4 | | HW#5 | |
| | R | | 21-Oct | | | | | |
| 10 | M | 18 | 25-Oct | Lateral earth pressure | 6.5 - 6.7 | | | |
| | W | 19 | 27-Oct | Soil settlement | 7.1 - 7.5 | HW#6 | | L6 |
| | R | | 28-Oct | | | | | |
| 11 | M | -- | 01-Nov | Consolidation test | 7.6 | | | |
| | W | -- | 03-Nov | Consolidation settlement | 7.8 - 7.10 | HW#7 | HW#6 | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | R | | 04-Nov | | | | | |
| 12 | **M** | **20** | **08-Nov** | **Exam II** | | | | |
| | W | 21 | 10-Nov | Consolidation settlement | 7.8 - 7.10 | | | L7 |
| | R | | 11-Nov | | | | | |
| 13 | M | 22 | 15-Nov | Time rate of settlement | 7.11 - 7.14 | | | |
| | W | 23 | 17-Nov | Shear strength | 8.1 - 8.4 | HW#8 | HW#7 | |
| | R | | 18-Nov | | | | | |
| 14 | M | 24 | 22-Nov | Shear strength | 8.5 - 8.6 | | | |
| | W | 25 | 24-Nov | Shear strength | 8.5 - 8.6 | | HW#8 | |
| | R | | 25-Nov | *Thanksgiving* | | | | |
| 15 | M | 26 | 29-Nov | Introduction to CSSM | To be provided | | | |
| | W | 27 | 1-Dec | Introduction to CSSM | To be provided | | | -- |
| 16 | M | 28 | 6-Dec | Final Instructional Day | | | | |
| | W | -- | 8-Dec | Reading Period | | | | |
| 17 | M | -- | 11-Dec | | | | | |
| | W | 29 | **15-Dec** | **Final Exam: 8:00 am – 10:50 am** | | | | |

**Lab Schedule**

| Lab # | Week | Day | Date | Group | Laboratory Tests |
|---|---|---|---|---|---|
| | 1 | W | 8/25 | -- | No Lab |
| | | R | 8/26 | -- | |
| L1 | 2 | W | 09/01 | B1 – All | Classification & Sieve Analysis |
| | | | | B2 – All | |
| | | R | 09/02 | B3 – All | |
| | | | | B4 – All | |
| L2 | 3 | W | 09/08 | B1 – All | Hydrometer |
| | | | | B2 – All | |
| | | R | 09/09 | B3 – All | |
| | | | | B4 – All | |
| L3 | 4 | W | 09/15 | B1 – Group A | Atterberg Limits |
| | | | | B2 – Group A | |
| | | R | 09/16 | B3 – Group A | |
| | | | | B4 – Group A | |
| | 5 | W | 09/22 | B1 – Group B | |
| | | | | B2 – Group B | |
| | | R | 09/23 | B3 – Group B | |
| | | | | B4 – Group B | |

| | | | | | |
|---|---|---|---|---|---|
| L4 | 6 | W | 09/29 | B1 – Group A | Compaction |
| | | | | B2 – Group A | |
| | | R | 09/30 | B3 – Group A | |
| | | | | B4 – Group A | |
| | 7 | W | 10/06 | B1 – Group B | |
| | | | | B2 – Group B | |
| | | R | 10/07 | B3 – Group B | |
| | | | | B4 – Group B | |
| L5 | 8 | W | 10/13 | B1 – Group A | Hydraulic Conductivity |
| | | | | B2 – Group A | |
| | | R | 10/14 | B3 – Group A | |
| | | | | B4 – Group A | |
| | 9 | W | 10/20 | B1 – Group B | |
| | | | | B2 – Group B | |
| | | R | 10/21 | B3 – Group B | |
| | | | | B4 – Group B | |
| L6 | 10 | W | 10/27 | B1 – Group A | Consolidation |
| | | | | B2 – Group A | |
| | | R | 10/28 | B3 – Group A | |
| | | | | B4 – Group A | |
| | 11 | W | 11/03 | B1 – Group B | |
| | | | | B2 – Group B | |
| | | R | 11/04 | B3 – Group B | |
| | | | | B4 – Group B | |
| L7 | 12 | W | 11/10 | B1 – Group A | Strength |
| | | | | B2 – Group A | |
| | | R | 11/11 | B3 – Group A | |
| | | | | B4 – Group A | |
| | 13 | W | 11/17 | B1 – Group B | |
| | | | | B2 – Group B | |
| | | R | 11/18 | B3 – Group B | |
| | | | | B4 – Group B | |
| | 14 | W | 11/24 | No Lab | |
| | | R | 11/25 | THANKSGIVING | |