

CEE 6243 Syllabus - Spring 2020

In-Situ Geotechnical Testing: Section A, and 3.0 Credits

Tuesdays & Thursdays, 08:00 to 09:45 a.m., Location: Mason 3132

Instructor Information

Instructor
Paul W. Mayne, PhD, P.E.

Email
paul.mayne@ce.gatech.edu

Office Hours & Location
Tues & Thurs 09:00 a.m.-12 noon*
Mason 2245

General Information

Description

The course provides an overview on the types of in-situ geotechnical tests (SPT, CPT, CPT_u, DMT, PMT, VST) and geophysical methods (Refraction, CHT, DHT, SASW, CSW, MASW, PSW, and ReMi), with emphasis on the utilization of the expedient seismic piezocone test SCPT_u (and related SDMT_a) for efficient collection of site-specific data for geotechnical investigations. Interpretative methods are reviewed for obtaining a suite of soil parameters and geoparameters often required in geotechnical analyses, especially numerical simulations. The importance and usefulness of the small-strain shear modulus (G_{max}), obtained from shear wave velocities, is documented as it represents the beginning of all stress-strain-strength curves. Numerous case studies are interwoven to show the general applicability of the approaches in soil behavior.

Pre- &/or Co-Requisites

There are no formal pre-requisites yet the student is expected to have taken some background in soil mechanics, such as introduction to geotechnical engineering per BSCE background.

Course Goals and Learning Outcomes

The student will learn to appreciate the various site investigative tools that are necessary for geotechnical site characterization, including laboratory, in-situ field testing, and geophysics.

Course Requirements & Grading

Depending upon enrollment and students' backgrounds and enthusiasm, the instructor and class participants may elect to change the below scoring and weighting to best reflect the success of learned lessons.

Assignment*	Date	Weight (Percentage)
Homeworks (usually 6 to 8)	Various	20%
Midterms* (2)	approx. week 6 or 7 and approx. week 10 or 11, but varies	25% 25%
Final*	As per GT Registrar	30%

*Note: Or alternate of take home assignments, small projects, lectures & discussions, in-class quizzes, group assignments, and/or short field trips during class hours for field testing and/or in-situ test demonstrations, as chosen by the instructor and GTA. Final may be optional based on performance in midterm exams.

Extra Credit Opportunities

Normally, no extra credit problems or assignments are given, unless special circumstances occur

Description of Graded Components

Homeworks usually involve calculations made using computer software, mainly Excel spreadsheets, although some students use MathCad, MatLab, or other. Please use the graphics capabilities of these programs so that a nice professional presentation of the data and results are available. If your set of data and calculations goes beyond a single page, make sure to annotate (either by computer text or hand-written) the names of the various columns and legends. Always show units (SI units preferred) and titles of information. In most geotechnical calculations, answers with up to two or three decimal places will be sufficient. Answers with up to 10 or more decimal places are not practical. Use of color and special symbols (σ_v' , ϕ' , γ_t , etc.) are encouraged for geotechnical nomenclature.



Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A: 90-100%; B: 80-89%; C: 70-79%; D: 60-69%; F: 0-59%

Despite the grading scale given above, it has been common to curve the entire class grades based on overall performance in the homeworks, midterms, and final grade.

Course Materials

Course Text

There are no required textbooks to purchase for this course.

Course reading materials will be provided in the form of PDF notes of the lectures, supplemented with design manuals, technical documents, and selected papers that are assigned by the Instructor, for instance: **NCHRP (2019) Manual 258 on Subsurface Investigations**: www.trb.org

Also, National Highway Institute Manual on Geotechnical Site Characterization (NHI) by Mayne, et al. (2002); NCHRP Synthesis 368 on Cone Penetration Testing (Mayne 2007); FHWA GEC 5 - Evaluation of Soil & Rock (Sabatini et al. 2005), technical papers and reports. Many of these are posted online at our website:

<http://geosystems.ce.gatech.edu/Faculty/Mayne/papers/index.html>

Course Website and Other Classroom Management Tools

We usually post notices, homework assignments, and some technical documents on **Canvas** for download by the class attendees.

Course Expectations & Guidelines

Please follow the best practices for teaching and learning at [Georgia Tech policies and procedures](#).

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 GT Honor Code, please visit

<http://www.catalog.gatech.edu/policies/honor-code/>

<http://www.catalog.gatech.edu/rules/18/>

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students 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/>

Attendance and/or Participation

The university requires that the Instructor report when each of the students last took classes, at set established deadlines during the semester term (usually during the first two weeks, and then again at final exam periods). While it is not mandatory to attend all classes, periodic sign-in sheets will be circulated during class so that the Instructor has some record as to who has attended or not, for reporting purposes.

Collaboration & Group Work

Students are expected to complete their own homework assignments in order to gain full credit on each task. Collaboration on overall strategies and procedures is permissible. However, copying the same spreadsheet and merely changing one's name on the document is not valid.

Homework assignments should be printed out hard-copy and submitted to the Instructor or TA on the assigned due date. In most cases, an extra day or two for late homeworks submission is fine.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

If a student must be excused from a midterm or final examination, please try and coordinate with the Instructor or TA as soon as possible for a make up test.

Homeworks are not usually accepted late if the solution has already been posted on-line (T-square).

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 students, as detailed:

<http://www.catalog.gatech.edu/rules/22/>

A 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.

Student Use of Mobile Devices in the Classroom

Smart phones, computers, and tablets are permitted in the classrooms during lectures, in-class assignments, and/or demonstration sessions. The use of texting, internet, emails, etc. are all allowed. However, voice messages and talking should be reserved for outside of the classroom for courtesy reasons.

During exams, only the use of pencil or pen, paper, rulers, and hand-held calculators, abacus, and slide-rulers are allowed. No smart phones, texting, computers, tablets, or internet is permissible at that time.

Additional Course Policies - Food & Drink

Food and drink within reasonable quantities are okay in the classroom, excepting alcoholic beverages, edible cannabis, psychedelic mushrooms, and poisonous foods.

Campus Resources for Students

Additional resources for GT students include: the Gilbert Price Library, The Communication Center, The Center for Academic Success, Counseling Center, The Division of Student Life, and Women's Resource Center.

Course Schedule* - CEE 6443 - Geotech Foundations - Fall 2020

Week Number	Tuesday Class Date	Thursday Class Date	Remarks
1	Unit weight, overburden stress, hydrostatic pressure, effective stress	Review of Soil Mechanics from Lab Perspective	Hmk 1 - Consol
2	Critical State Soil Mechanics (CSSM)	Geophysical Tests - Electromagnetics, Mechanical Waves	Hmk 2 - CSSM
3	Drilling, sampling, vane shear	standard penetration test	Helix Probe Test
4	pressuremeter, flat plate dilatometer	cone penetration, piezocone	Demo by ConeTec
5	Compendium of in-situ devices; Evaluation of soil type and unit weight from in-situ tests	effective friction angle	Hmk 3
6	stress history and yield stress ratio	calibration chamber testing	Demo by EGSci
7	relative density and state	Midterm One*	Hmk 4
8	undrained shear strength	organic soils	
9	porewater dissipation testing	residual soils and national test site at Opelika, Alabama	Hmk 5
10	seismic geotechnics: ground motions	soil liquefaction (cyclic)	Hmk 6
11			Spring Break 15-21 March
12	flow liquefaction	sensitive clays and Canadian Test Site 1, Ontario	
13	full flow penetrometers twitch testing	Midterm Two*	
14	specialized tests: stepped-blade, multi-friction cone; spade cell, borehole shear test	specialized tests: seismic piezocone, seismic dilatometer, SPT-T	Hmk 7
15	Stiffness and modulus	nonlinear stress-strain-strength of soils	
16	case studies	reading period	
17 Final Exams	Monday, April 27: 8:00 AM - 10:50 AM		

*Tentative based on scheduled meetings, weather, conferences, and other factors