CEE 6447 Ground Modification

Professor: ***Dr. Susan E. Burns***, sburns@gatech.edu Skype: susan.burns.gt
Office: Mason, 1108 (404) 894-2285

Course: MWF 11:15 am – 12:05 pm Mason 3132

Course overview: The objective of this course is to develop the scientific and engineering principles that govern modifications that can be made to improve soil strength, deformability, and water transmission properties in order create a suitable construction material from substandard soil deposits. Alteration of soil properties through physical, chemical, thermal, and biological methods will be discussed in detail, along with analysis of the sustainability and life cycle costs associated with current technologies used in practice. Emphasis will be placed on innovative and emerging ground improvement technologies.

Catalog Description:
Methods for improving marginal construction sites for geotechnical engineering projects and rehabilitation of geoinfrastructure.

Reference text (for reference only, not required):
Han, J. (2015). Principles and Practice of Ground Improvement, Wiley, ISBN: 978-1-118-25991-7, 432 pp.
FHWA (2017). Ground Modification Methods Reference Manual – Volumes I and II, Publication No. FHWA-NHI-16-027, FHWA GEC 013, https://www.fhwa.dot.gov/engineering/geotech/pubs/nhi16027.pdf and https://www.fhwa.dot.gov/engineering/geotech/pubs/nhi16028.pdf.
Hausmann, H.R. (1990). Engineering Principles of Ground Modification, McGraw-Hill, ISBN-13: 978-0070272798, 624 pp.
Nicholson, P. (2015). Soil Improvement and Ground Modification Methods**,** Butterworth Heinemann/Elsevier, 9780124080768, 472 pp.

Course Topics:
1. Mechanical densification of substandard soil deposits
    a. Shallow Compaction
    b. Deep compaction
    c. Dynamic compaction
    d. Vibro compaction and replacement
2. Hydraulic modification
    a. Preloading with vertical drains
    b. Sand drains
    c. Stone columns
3. Physical and Chemical modification
    a. Mixture theory
    b. Admixtures
    c. Grouting
4. Thermal modification
    a. Heating
    b. Vitrification
    c. Freezing
5. Biological modification

   a. MICP
   b. MIDP
   c. EICP
6. Modification by inclusions and confinement
   a. Soil nailing
   b. MSE walls
   c. Ground anchors
   d. Micropiles
7. Problematic Soils: expansive soil, peat/organic soil
8. Liquefaction mitigation/lateral spreading
9. Beneficial use/Geoenvironmental applications
10. Life Cycle Costs

Assessment:

Midterm Exam	25%
Homework	25%
Project: Oral presentation	25%
Project: Written report	25%

Exams and Project Deliverables:

Midterm Exam Wednesday 10/9/2019
Project Presentations 11/22/2019 & 11/25/2019
Final Exam Wednesday 12/11/2019 written report due in lieu of final exam

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%

Office Hours:

I have an open door policy, so please also feel free to stop by, and I will help as long as I am not in another meeting. Also, you may email me to schedule an appointment to meet in person, or e-mail me at any time with questions.

Course Website and Other Classroom Management Tools

We will use Canvas for assignments, posting of notes/reading from the class, grading, and all aspects of course management.

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/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.

Homework is designed to stimulate thought and further insight into the topics discussed in class and presented in the reading, so please be certain that you have a thorough understanding of all concepts presented. *I encourage you to work in study groups and I do not view this as a violation of the honor code. However, each completed assignment should be your own work.* Because each homework assignment should be your own work, it is not appropriate to use assignments from previous years; however, old homework assignments can be used for test preparation. For assignments using computer-generated outputs, it is ***NEVER*** appropriate for different students to turn in copies of the same printout. Please list any people with whom you studied on your assignment.

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/, 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.

Field Trips:
We will try to take at least one field trip during the semester. Because the field trip will take longer than our allotted class time, I won't require attendance, but it should be an interesting trip so I strongly encourage you to attend. We will talk about the logistical details further in class closer to the time of the field trip.

Project:
Choose a ground modification case study that interests you. Analyze the details of the initial site conditions, the proposed land use, the ground modification method that was implemented, and the outcome. Analyze at least one alternative method of ground improvement that could have been implemented at the site. Perform a critique of the methods that includes cost, technical feasibility, time, sustainability, and impact on the surrounding community and infrastructure. The submitted report will be a 1000 word written project analysis, and a 10 minute presentation about your chosen project during the last week of November.
Please be certain to familiarize yourself with the definition of plagiarism:
http://www.plagiarism.org/plagiarism-101/what-is-plagiarism
Plagiarism is one of the most serious academic offenses that can be committed, and all instances of academic dishonesty will result in serious consequences.