

Ground Modification Design
CGN 4509 / CGN 6905 All Sections
Class Periods: M, W, F, 5th period, 11:45 – 12:35
Location: MAEB 234
Academic Term: Fall 2023

Instructor:

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352-294-7766
Office Hours: Wednesdays, 4 – 4:50 (Weil Hall 265 G)

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Emily Thompson
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Office hours: Tuesday, 3:55 - 4:55 pm (in person or zoom meetings)

Course Description

Introduction to design of ground modification techniques for improvement of marginal construction sites.

Course Pre-Requisites / Co-Requisites

CEG 4011, CEG 4012 or equivalent.

Course Objectives

Assure students can identify advantages, limitations, and appropriate selection of ground modification techniques, as well as design considerations for different ground modification techniques.

Materials and Supply Fees

N/A

Required Textbooks and Software

There is not a required textbook for this course. A copy of the FDOT Ground Modification Manual is available in PDF on the Canvas site as well as copies of the slides used by Dr. Mohseni in class will be uploaded on Canvas. Be sure to look over these and bring them to class so you can follow along. Lecture notes are the student's responsibilities.

The SLOPE/W components of the Geo-Studio software by Geo-Slope will be used for the 3rd exam. The software only runs on Windows. The technical specification to run the software can be found in:

<https://www.geoslope.com/products/geostudio/tech-specs>

Instructions on how to install the software can be found in Canvas.

Recommended Materials

- *A Compendium of Ground Modifications Techniques by Townsend and Anderson (available in PDF on Canvas)*
- *Soil Improvement and Ground Modification Methods by Peter G. Nicholson*
- *Principles and Practice of Ground Improvement by Jie Han*
- *Ground Improvement Case Histories by Indraratna, Chu and Rujikiatkamjorn*

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance: not required for classes.

Assignments: Homeworks are due by 11:59 pm of the assigned day. **Late homework will be accepted if submitted by 11:59 PM within 24h of the original due date for a 10% penalty. After that, no late HW will be accepted!** All submissions will be online in Canvas. These rules apply unless advance written notice has been submitted to the instructor for a valid excuse. All homework must follow the format below. Illegible homework is subject to being rejected by the T.A.'s for grading purposes.

Exams: Each exam will concentrate on the material most recently covered, and they will be handled through Zoom meeting during the evening with 100 minutes' duration. Exams are open note.

Make-up Exam/Late Assignment Policy: Do not miss an exam unless you have a valid excuse. Make-up exams will only be rescheduled if prior approval is granted and the student must make a reasonable attempt to take the exam prior to the scheduled exam date. Exams can be reviewed at any time in a zoom meeting with the TA. To receive any points back you must talk with the T.A. within the first week after grades are published. **The instructor and assistants will discuss any exam, homework, or lab report within 1 week (excluding holidays) after return. After this time discussion is closed and grades are final.**

Calculator Policy for Exams: The only calculators that are allowed for use during the exams are the ones that are permitted for the Fundamentals of Engineering Exam, which all civil engineering students are required to take prior to graduation. **There are NO exceptions to this policy.**

Homework Submission Instructions:

1. All homework must be submitted on **engineering computation paper unless you are using a tablet or direct on the computer.**
2. Work should be organized and neat. Assumptions should be clearly stated, appropriate units should be noted on answers and answers should be boxed, underlined or otherwise appropriately labeled. If your answer is not clear you will not receive credit.
3. Enough space should be provided between problems to clearly identify each one.
4. Numerical answers should be given with an appropriate number of significant digits.
5. Illegible homework is subject to being rejected by the T.A.'s for grading purposes.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (4)	100 each	15%
Exams (3)	100 each	60%
Seminar (1)	100	25%
Total		100%

Grading Policy

Percent	Grade	Grade Points
94.0-100.0	A	4.00
90.0 - 93.99	A-	3.67
87.0 – 89.99	B+	3.33
83.0 - 86.99	B	3.00
80.0 - 82.99	B-	2.67
77.0 - 79.99	C+	2.33
73.0 - 76.99	C	2.00
70.0 - 72.99	C-	1.67
67 - 69.99	D+	1.33
63.0 – 66.99	D	1.00
60.0 - 62.99	D-	0.67
0 - 59.99	E	0.00

More information on UF grading policy may be found at:
<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.

Tentative Course Outline

1. Introduction to ground modification methods
Overview of modification techniques
2. Compaction
Review of compaction, laboratory procedures, field compaction, properties of compacted cohesive soils, specification
3. Deep dynamic compaction
Introduction, applications, suitability, assess site restrains, examples, specifications, case history

HW-1

4. Preloading
Prefabricated drains, theory, example, radial drainage
5. Stone columns
Description, in-situ ground reinforcement, types, feasibility, design, bearing capacity, settlements improvement, design verification, cost data, budget estimate, case history, contracting methods, specifications

HW-2

TEST 1

6. Soil stabilization
Introduction, lime modification vs. stabilization, soil-lime and soil-cement reactions and benefits, lime-fly ash and cement-fly ash reactions, mix design, properties of soil-lime mixtures, constructions considerations
7. Grouting
Introduction, applications, slope stabilization, feasibility, engineering considerations
8. Jet grouting
Introduction, applications, advantages, soil compatibility, properties
9. Deep soil mixing

Purpose, history, applications, characteristics, design concepts, lime columns, constructions methods and equipment, quality control and tests, cost

HW-3

TEST 2

10. MSE walls

History, applications, construction sequence, backfill materials, theory, design procedure, preliminary sizing, lateral earth pressures, design example, external stability, cost

11. Reinforced soil slopes

Introduction, advantages, disadvantages, geosynthetic reinforcement, construction, cost estimates, design

12. Soil nailing

History, overview, costs, FHWA design charts, design of structures, example, specification

HW-4

TEST 3

SEMINARS (Last week of classes)