

DEPARTMENT OF CIVIL ENGINEERING

CEG 6117
SPRING 2022

Advanced Deep Foundation Design

Design and Installation of Axially and Laterally Loaded Piles/ Drilled Shafts Groups

Instructor: Khiem Tran
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Office: Weil Hall 265N
Telephone: (352)-294-3369
Office Hours: M, W (3:00 – 4:30 PM)

Class: M W and F 7th Period (1:55 pm – 2:45 pm)

Texts:

- Foundation Design- Principles and Practices, Third Edition
By Donald P. Coduto, William A. Kitch, and Man-chu Ronald Yeung
- FHWA NHI: Design and Construction of Driven Pile Foundations (Volumes I & II), provided, and Instructor handouts

Software: FBDEEP, GRLWEAP, and FB-MultiPier

NHI course material, Handouts Available on WebCT - <https://lss.at.ufl.edu/>

Course Goals:

The purpose of this course is to instruct students in the successful steps in the analysis, design and construction of deep foundations. For analysis and design this includes: 1) identifying and accounting for future influences; 2) optimum selection of elements based on stresses under service and extreme conditions (combined loading), 3) deformations and 4) constructability. For construction it involves pile drivability, and with drilled shaft inspection and load testing.

Course Objectives:

The student is expected to demonstrate proficiency in the following areas:

1. Estimating axial capacities of driven, bored and cast-insitu piles and drilled shafts
2. Estimating lateral resistance of any deep foundation
3. Determining axial and lateral deformations of single pile/shafts
4. Assessing Group behavior (resistance and deformation) of driven or cast insitu piles/shafts
5. Identifying acceptable deformations and stresses based on service and strength.
6. Designing piles/shafts and their caps for multiple load cases (FB-MultiPier)
7. Perform pile driving analysis (WEAP, PDA, EDC)

Course Outcomes:

Upon successful completion of this course, the student will be able to select appropriate foundation elements (i.e. piles, shafts, etc.), as well as estimate number, size of elements required. As part of selection process, the student will identify if the foundation is constructible (i.e. pile drivability, shafts, etc.).

Grading:	Percentage of Final Grade:
Homework	20% (hand calculation and software)
2 Exams	60% (see syllabus)
Design Project	20% (group report and presentation)

There will be a class design project, which is due at the end of the semester. The project, which encompasses all of the material in this class, will involve alternate design (piles & shafts) of a bridge pier. Each student will be assigned one of the following in the project (site characterization/soil properties, drivability, pile group design, shaft group design). Each student will be responsible for individual components of the project.

Tentative Course Outline

Week day	Month	Day	Topics	Reading
W	Jan	5	Introduction of deep foundations	12.1-12.4
F	Jan	7	Load types and combination	5.1-5.3
M	Jan	10	Static load tests	14.1-14.5
W	Jan	12	Reducing static load test	Excel
F	Jan	14	Site characterization by geophysical methods	Handout
M	Jan	17	Martin Luther King Jr's Birthday – No Class	
W	Jan	19	In situ soil/rock testing, SPT	Handout
F	Jan	21	CPT	Handout
M	Jan	24	Pile capacity via static methods	15.1-15.2
W	Jan	26	Pile capacity via static methods	15.1-15.2
F	Jan	28	Shaft capacity via static methods	16.1-16.2
M	Jan	31	Pile capacity by SPT	Handout
W	Feb	2	FB-DEEP with SPT	Handout
F	Feb	4	Pile capacity with CPT_AASHTO	Handout
M	Feb	8	Pile capacity with CPT_Europe	Handout
W	Feb	9	FB-DEEP with CPT, Exam review	Handout
F	Feb	11	Examination No. 1	

M	Feb	14	Pile driving: Equipment and stresses	Handout
W	Feb	16	Field monitoring of piles	Handout
F	Feb	18	CAPWAP & EDC	Handout
M	Feb	21	Pile drivability – Wave Equation	NHI - 12.3
W	Feb	23	Pile drivability - GRLWEAP	NHI – 12.7
F	Feb	25	Axial load settlement (T-Z curve)	Handout
M	Feb	28	Axial load settlement (T-Z curve)	Handout
W	Mar	2	FB-MultiPier Axial Load	Handout
F	Mar	4	Design Project Overview	Handout
M	Mar	7	Spring Break	
W	Mar	9	Spring Break	
F	Mar	11	Spring Break	
M	Mar	14	Short laterally loaded pile analysis-Sand	NHI – 7.3.7
W	Mar	16	Short laterally loaded pile analysis -Clay	Handout
F	Mar	18	Long Laterally loaded pile analysis	Handout
M	Mar	21	Laterally loaded piles – field P-Y curves	NHI – 7.3
W	Mar	23	FB-MultiPier – Single pile lateral	Handout
F	Mar	25	Laterally loaded piles- finite difference	Handout
M	Mar	28	Pile group behavior	NHI – 7.3-7.6
W	Mar	30	MultiPier –Group piles	Handout
F	Apr	1	Examinations No. 2	
M	Apr	4	Group interaction (Axial and Lateral)	Handout
W	Apr	6	Drilled shaft construction	Handout
F	Apr	8	Drilled shaft design, load-settlement	Handout
M	Apr	11	MultiPier – Group shafts	Handouts
W	Apr	13	Pile Cap Design	NHI – 8.9
F	Apr	15	Pile Cap Design	NHI – 8.9
M	Apr	18	Project Presentation	
W	Apr	20	Project Presentation	

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is highly recommended, but not required. Homework is due when assigned; 25% loss with each successive class unless agreed on by the instructor. Missed exams must be by consent of the instructor or a doctor. Excused absences must be in compliance with university policies in the Graduate Catalog and require appropriate documentation.

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>

Grading Policy

The following is given as an example only.

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure 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://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

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