

CEE 651 – Deep Foundations
 20

Instructor: Prof. Phillip Ooi

Office: Holmes Hall 384

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Office hours: _____

Textbook: No formal textbook.

Grading:

Homework	25%
Term Project	25%
Mid-term exam	15%
Final exam	<u>35%</u>
Total	<u>100%</u>

Homework: Homework assignments are due 1 week from the assigned date unless otherwise noted. **A cover memorandum summarizing the pertinent points of the assignment must be attached to all homework submittals.**

Notes:

(a) Any student who feels s/he may need an accommodation based on the impact of a disability is invited to contact the KOKUA program privately. I would be happy to work with you, and the KOKUA Program (Office for Students with Disabilities) to ensure reasonable accommodations in this course. KOKUA can be reached at 956-7511 or 956-7612 (voice/text) in room 013 of the Queen Lili'uokalani Center for Student Services.

(b) The University of Hawaii at Manoa policy for attendance and rules of conduct must be followed.

Department of Civil and Environmental Engineering**CEE 651 – DEEP FOUNDATIONS****_____ 20__****Designation as:** Elective**Course (catalog) description:**

Analysis and design of deep foundations; driven piles and drilled shafts.

Prerequisite(s): 455 or consent.**Textbook(s) and/or other required material:** None

Course Learning Outcomes: Upon completion of this course, students will be able to: (1) identify appropriate theories to calculate vertical and lateral capacities and deflections of single and groups of piles and drilled shafts and use these theories for design of deep foundations; (2) understand the principles of static and dynamic (including low strain, high strain and rapid) testing of deep foundations and the wave equation analysis; and (3) recognize key elements in specifications for driven piles and drilled shafts.

Topics covered:

See class schedule.

Class schedule: 2 sessions, 75-minutes per session.**Laboratory schedule:** None**Relationship of course to student learning outcomes:** Related to outcomes based on the following scale:

“blank” = no emphasis; 1 = some emphasis; 2 = moderate emphasis; 3 = significant emphasis

Outcomes	1	2	3	4	5
Course					
CEE 651	3	3	3		

Person who prepared this description and date of preparation: **Phillip Ooi** (_____,
20__)

**Tentative Class Schedule
CEE 651 – Deep Foundations
Fall 2023**

<u>Week</u>	<u>Date</u>	<u>Topic</u>
1		Introduction/Types of Deep Foundations/ Pile Driving: Effects on Piles, the Ground and Nearby Structures
2		Pile Driving Equipment/ Construction of Drilled Shafts
3		Bearing Capacity of Piles and Drilled Shafts
4		Settlement of Piles and Drilled Shafts
5		Negative Skin Friction/Pile Driving Formula/ Wave Equation Analysis of Pile Driving
6		Wave Equation Analysis of Pile Driving
7		Dynamic Pile Load Testing
8		Static & Statnamic Load Testing of Piles and Drilled Shafts/ Margins of Safety in Design of Deep Foundations
9		Integrity Testing of Deep Foundations
10		Specifications
11		Lateral Loading of Single Piles and Shafts
12		Mid-term Exam & Lateral Loading of Single Piles and Shafts
13		Lateral Loading of Single Piles and Shafts/Pile Groups
14		Lateral Loading of Pile Groups
15		Equivalent Depth to Fixity of Piles and Drilled Shafts; Buckling of Piles and Drilled Shafts/ Term project presentations
16		Q&A session
17		Final exam (_____)

CEE 651 – REFERENCES FOR DEEP FOUNDATIONS**Textbook References – Not Required**

1. Fleming, W.G.K., Weltman, A.J., Randolph, M.F. and Elson, W.K. (2009). *Piling Engineering*, Taylor and Francis, London and New York.
2. Guo, W.D. (2012). *Theory and Practice of Pile Foundations*, CRC Press, Boca Raton, FL.
3. Madabhushi, G., Knappett, J. and Haigh, S. (2010). *Design of Pile Foundations in Liquefiable Soils*. 1st Edition. Imperial College Press, London England.
4. Poulos, H.G. and Davis, E.H. (1980). *Pile Foundation Analysis and Design*, John Wiley and Sons, Inc., New York, USA.
5. Prakash, S. and Sharma, H.D. (1990). *Pile Foundations in Engineering Practice*, John Wiley and Sons, Inc., New York, USA.
6. Rajapakse, R.A. *Pile Design and Construction Rules of Thumb*. (2008). 1st Edition, Elsevier.
7. Reese, L.C., Wang, S.T. and Isenhower, W.M. (2006). *Analysis and Design of Shallow and Deep Foundations*, Wiley.
8. Tomlinson, M.J. (2015). *Pile Design and Construction Practice*, 6th Edition, CRC Press, Boca Raton, FL.
9. Viggiani, C., Mandolini, A. and Russo, G. (2012). *Piles and Pile Foundations*, Spon Press, Abingdon, Oxon, U.K.
10. Reese, L.C. and Van Impe, W.F. (2011). *Single Piles and Pile Groups Under Lateral Loading*, Second Edition, CRC Press, Boca Raton, FL.

Free References**Driven Piles**

1. Hannigan, P.J., Rausche, F., Likins, G.E., Robinson, B.R. and Becker, M.B. (2016). *Geotechnical Engineering Circular No. 12 – Volumes 1 and 2, Design and Construction of Driven Pile Foundations*, FHWA Publications No. FHWA-NHI-16-009 and FHWA-NHI-16-012.

Available at:

http://www.fhwa.dot.gov/engineering/geotech/pubs/gec12/nhi16009_v1.pdf

http://www.fhwa.dot.gov/engineering/geotech/pubs/gec12/nhi16009_v2.pdf

Drilled Shafts

2. Brown, D.A., Turner, J.P., Castelli, R.J. and Loehr, E.J. (2018). *Drilled Shafts: Construction Procedures and Design Methods*, NHI Course No. 132014, Geotechnical Engineering Circular No. 10, FHWA Publication No. FHWA-NHI-18-024.

Available at:

[Drilled Shafts: Construction Procedures and Design Methods \(dot.gov\)](#)

Bridge Foundations (Driven Piles and Drilled Shafts)

3. Barker, R.M., Duncan, J.M., Rojiani, K.B., Ooi, P.S.K., Tan, C.K. and Kim, S.G. (1991). *Manuals for the Design of Bridge Foundations*. Report 343, National Cooperative Highway Research Program, National Research Council, Washington D.C.

Available at:

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_343.pdf

CEE 651 – Deep Foundations

Term Project

A portion of the course will involve preparation of a term project on a subject (that has not been covered in class) of the student's choice. The project will be described in:

- (1) A written report to be submitted on _____. The report should not exceed 10 pages excluding tables, figures and references.
- (2) An oral presentation of 15 minutes. These presentations will be made on _____ and _____.
- (3) A one-page handout containing the highlights of your project to be distributed to every member of the class on the day that you present the term project orally.

The project topic is to be chosen by the student, and should be approved by the instructor by _____. The project should involve approximately 40 hours of work and will count for 25% of the course grade. To find a topic, peruse the issues of the following from the last 5 years:

- a. Journal of Geotechnical and GeoEnvironmental Engineering
- b. Geotechnique
- c. Canadian Geotechnical Journal
- d. Soils and Foundations
- e. DFI Journal.

Use the papers you find to dig deeper into the topic. You should be able to access these journals through the UH Manoa library's website.

Another resource you can look into is the Transportation Research Board's Research Needs Statements website at:

<https://rns.trb.org/>