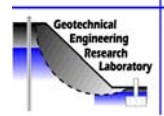




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DEPARTMENT OF CIVIL AND
ENVIRONMENTAL ENGINEERING

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Professor



CIVE 5330 ADVANCED FOUNDATION ENGINEERING Spring 2017 Tuesday, 6:30 – 9:20PM, in KI-302 and Online

Recommended Textbook: "Foundation Analysis and Design", Joseph E. Bowles, 5th. ed., 1996, McGraw Hill.

The class does not follow any specific text. The above reference is recommended with additional material from different sources to be distributed. The class syllabus refers to chapters in the above text. The following reference texts will be used and/or referred to.

Class Website: <http://faculty.uml.edu/spaikowsky>

Reference Texts:

1. *Foundation Engineering Handbook*, edited by Hsai-Yang Fang, Van Nostrand, 2nd ed. (1991).
2. *Principles of Foundation Engineering*, B.M. Das, PWS-Kent, 8th ed. (2015), 7th ed. (2010) and 6th ed. (2006).
3. *NCHRP Report 651 LRFD Design and Construction of Shallow Foundations for Highway Bridge Structures*, Paikowsky et al., 2010.
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_651.pdf (Google "NCHRP 651")
4. *Soil Mechanics, and Foundations and Earth Structures*, NAVFAC DM7.1 and 7.2, May 1982.
http://www.wbdg.org/ccb/DOD/UFC/ufc_3_220_10n.pdf
5. *Soils and Foundations*, Workshop Manual, National Highway Institute, NHI course No. 132012, Pub. No. FHWA-HI-88-009 <http://www.nhi.fhwa.dot.gov/home.aspx>
6. *Geotechnical Engineering Circular No. 5 – Evaluation of Soil and Rock Properties*, Sabatini et al., Pub. No. FHWA-IF-02-034, 2002.
http://www.fhwa.dot.gov/engineering/geotech/library_listing.cfm
7. *Geotechnical Engineering Circular No. 6 – Shallow Foundations*, Kimmerly, Pub. No. FHWA-IF-02-054, 2002. http://www.fhwa.dot.gov/engineering/geotech/library_listing.cfm
8. *Canadian Foundation Engineering Manual*, Canadian Geotechnical Society, 3rd ed (1992), 4th ed. (2007).
9. *Shallow Foundations*, NHI Course No. 13237 – Module 7, June 1999.
10. *Manual on estimating soil Properties for Foundation Design*, EPRI EL-6800, Aug.1990.
http://www.geoengineer.org/EPRI_reports/EL-6800.pdf
<http://my.epri.com/portal/server.pt> then search "EL-6800" for PDF download
11. *Manuals for the Design of Bridge Foundations*, Transportation Research Board, NCHRP Report. #343.
12. *Steel Sheet Piling Design Manual*, USS, reprint by FHWA, 1984.
13. *Load and Resistance Factor Design (LRFD) for Highway Bridge Substructures*, NHI Course No. 13068, July 1998.
14. *Foundation Analysis*, R.F. Scott, Prentice-Hall, 1981

Reference Web Sites:

FHWA Geotechnical Publications (under Bridge and Structures):

<http://www.fhwa.dot.gov/bridge/geopub.htm>

US Army Corps of Engineers – Engineering Manuals

<http://www.publications.usace.army.mil/USACEPublications/EngineerManuals.aspx>

Geotechnical Software Directory

<http://www.GGSD.com>

NCHRP Report 507 (Deep Foundations)

http://trb.org/publications/nchrp/nchrp_rpt_507.pdf (Google “NCHRP 507”)

NCHRP Report 651 (Shallow Foundations)

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_651.pdf (Google “NCHRP 651”)

Software

1. A simple straightforward Geotechnical Software package by the name of GEOPRO 5.0 (by DataSurge, Bradford, MA). In most cases this software will be used for verification/check of hand calculations only. The software is up and running in the PC lab. You need to go in and select the specific application as the general icon is not active. This package is capable of carrying out a variety of analyses including those that are relevant to the class:
 - a. Stress distribution – Vertical stress below surface and lateral stress due to surcharge.
 - b. Settlement Analyses - consolidation, immediate settlement, time rate settlement
 - c. Foundation Design - bearing capacity
 - d. Retaining Structures - earth pressures, cantilever sheet pile wall (clay and sand), anchored sheet pile wall
2. LimitState geo version 3.0 by Limitstate Ltd., UK, (download a free version from LimitState.com)
3. DEEPXCAV 2011, Deep Excavation Engineering Program (either we'll upgrade or you will install individually 2016 version)
4. PLAXIS2016 – Geotechnical Finite Element Program

Final Grade

The approximate grade components are:

- | | |
|---|-----|
| 1. Attendance and guest lecture summaries | 15% |
| 2. Homework and computer exercises | 25% |
| 3. Project | 25% |
| 4. Exams | 35% |

Planned Schedule and Details of Class Conduct

1. Attached please find the outline of the planned schedule. The classes consist of regular, guest lectures, and online classes. Your **participation** in the events is mandatory and will be considered part of your grade.
2. Guest lecture will be given as detailed below and online lectures may be scheduled in advance.
3. Classes via GoToMeeting.com will require your live web attendance, meaning you will have to be connected to the web at the time of the lecture wherever you want to be at the time.
4. In the meeting following each of the **guest lectures**, you will be required to submit a short (1 to 2 page) typed summary, based on your notes during that lecture.

5. Each of the students will conduct an independent **project** according to the attached material. The final grade of the project will consider your performance during all of the required stages, i.e. preparation submittal, manuscript, review and presentation.
6. Dr. Seth Robertson may assist in some of the lectures and computer programs exercises. Details will be provided.
7. There will be a **midterm** currently planned for March 28; a take home **final exam** is planned for April 25.

<u>Class #</u>	<u>Date</u>	<u>Topic</u>	<u>Text</u>
1	Tue 1/17/17	<ul style="list-style-type: none"> • Introduction, Definitions, Classification, • Overview Geotechnical Engineering • Field and Lab Classification of Soils and Rocks 	Chapts. 1 & 3
2	Tue 1/24/17	<ul style="list-style-type: none"> • Soil Origin and Deposition – “Subsurface Explorations & the Geology of the New England Area” • Soil and Rock Identification 	
3	Tue 1/31/17	<ul style="list-style-type: none"> • Site Exploration • In-Situ Measurements and Laboratory Testing • Submittal of Project Title/ Description/ Extent 	Chap. 3 Chap. 3
4	Tue 2/07/17	<ul style="list-style-type: none"> • In-Situ Measurements and Laboratory Testing (Cont’d) 	
5	Tue 2/14/17	<ul style="list-style-type: none"> • Limit Equilibrium and Limit Analysis Theories • Bearing Capacity of Shallow Foundations • Different Influencing Factors e.g.: Eccentric and Inclined Loading, Layered Soils, Slopes, Water. • B.C. Analysis - Examples 	Chap. 4 Chap. 4
	Tue 2/21/17	NO CLASS (Monday Class Schedule)	
6	Tue 2/28/17	<ul style="list-style-type: none"> • B.C. Analysis – Reliability of the B.C. Analysis • Short & Long Term Settlement Analysis of Shallow Foundations 	Chap. 5
7	Tue 3/07/17	<ul style="list-style-type: none"> • Short and Long Term Settlement Analysis of Shallow Foundations (cont’d.) • Reliability of Settlement Analysis • Submittal of Project Abstract, Headings and References 	
8	Tue 3/14/17	<ul style="list-style-type: none"> • NO CLASS (Spring Break) 	
9	Tue 3/21/17	<ul style="list-style-type: none"> • Lateral Earth Pressure at rest, active, passive and following Compaction 	
10	Tue 3/28/17	MIDTERM	Chap. 11
11	Tue 4/04/17	<ul style="list-style-type: none"> • Retaining Structures Including Gravity Walls and Sheet Pile Walls 	Chapts. 12&14

- | | | |
|----|-------------|---|
| 12 | Tue 4/11/17 | <ul style="list-style-type: none">• Guest Lecture by Dimitrios Konstantakos, P.E. founder and developer of "Deep Excavations" "From Peck to Virtual Reality" Design of Sheet Pile Walls <u>CEE comp Lab FA 105</u> Chap. 13• PROJECT Due Date |
| 13 | Tue 4/18/17 | <ul style="list-style-type: none">• Seismic Design of Footings and Walls• Load Resistance Factor Design (LRFD) of Shallow Foundations• Project Review is Due |
| 14 | Tue 4/25/17 | <ul style="list-style-type: none">• Project Presentations• Take Home FINAL EXAM |

CIVE 5330 ADVANCED FOUNDATION ENGINEERING
Spring 2017

Term Project

As part of the Advanced Foundations Engineering class you are required to prepare and present a term project. The project may consist of one or more of the following: literature survey, computer program, case history, data analysis or laboratory study. Any topic relevant to Geotechnical or Geo-Environmental Engineering may be applicable.

The project will be submitted typed (double spaced) and will not exceed 20 pages including figures and references. All projects should contain an abstract, table of contents, statement of engineering significance and relevance, conclusions, and a list of references.

Work on the project will proceed according to the following steps and time schedule:

1/17 & 1/24	Choose a topic and discuss it's acceptability with the instructor.
1/31	Submit a title for your project with a short description of the subject and the intended extent of your work
3/07	Submit an extensive abstract, section headings for the write up subjects and a list of references.
4/11	Due Date - Two copies of the completed term project are due and are exchanged with other students for review.
4/18	Review submittal
4/25	Project presentations

The project grade will reflect the intermediate steps, the soundness of the study, the writing, and the presentation.

General Ideas for Possible Projects:

Computer Programs

1. Simulation of shallow foundation load test
2. Static capacity of shallow foundations
3. Sheet pile wall analysis (cantilever and/or anchored)
4. Interpretation of a shallow foundation load test
5. Beam on elastic foundations
6. Shallow foundation settlement analysis (immediate and/or time dependent)

Others:

1. Drainage problems; foundations or retaining structures.
2. Shear strength parameters including interface friction.
3. Dewatering and/or braced excavations.
4. Field instrumentation following the structure's performance.
5. Frost problems; foundations or retaining walls.
6. Mat foundations/ floating structures
7. Lateral resistance of shallow foundations.
8. In-situ testing/Interpretation methods.
9. Comparisons of load test interpretation methods
10. Mechanically stabilized Earth Walls.
11. Lightweight artificial and waste materials for embankments over soft soils.
12. LRFD of industrial or highway substructures.

13. Comparison between calculated to measured capacity or settlement of shallow foundation.
14. Bridge pier or abutment design.

Project Grading:

- Preparation / Timely submission of subject 15%
- Project 45%
- Presentation 25%
- Review 15%

Project Review

Each student will be assigned to review a project of another student. You are graded on the quality of the review, hence, praising a poor project or “killing” a good project have no merit. In reviewing a project, read the manuscript, make comments on the manuscript and then summarize your review considering the following:

1. Format and Appearance: Table of contents, Abstract, Body of Project, Summary and Conclusions, List of Figures, Tables and References. Check for numbering and headings, page numbering, appearance of text, titles of tables (above) and figures (below), and extremely important referencing of all material not original in text, tables and figures.
2. Presentation: Clarity of writing and language, choice of subdivision of headings and sub-headings. Usefulness of graphs, figures, case histories, effectiveness and deficiencies.
3. Content: Comment about the subject engineering interest and merit. Coverage by the project. What is clear and what is not. What is missing and what is good. For that purpose, you wish to make constructive suggestions including spending some time reviewing the subject looking for references, etc., so you can suggest improvements based on your knowledge and findings.

Presentation Guidelines

(Excerpts from ASCE website: <http://content.asce.org/files/pdf/SPGuidelines.pdf>)

PREPARING YOUR PRESENTATION:

When you organize your presentation, it may be helpful to begin by considering the following:

1. **What is the topic of my presentation?**
Of course, you know this, but be sure your audience is fully aware of your goals.
2. **Who is my audience?**
How would you like the information presented if you were a member of the audience.
3. **What is the objective of my presentation?**
Choose main points and elaborate on them.

Once you have answered these questions, you may then begin to outline your presentation. A speech may be divided into three parts:

1. **Introduction/Opening**
 - State your goal or ideas in general terms.
 - Share a relevant story, anecdote, or quote.
 - Startle them with a statistic.
 - Use a metaphor or comparison to your topic.
 - Use humor very carefully; it can be powerful and engaging, but jokes, as a particular form of humor are risky and difficult to use successfully.
 - Any one or a combination of these introductory methods may be used in your opening to draw your audience into the presentation.
2. **Body**
 - Discuss your main idea(s) in detail.
 - Use supporting examples
 - Use visual aids to reinforce.
 - Reiterate your points.
 - Develop a theme.
3. **Closing**
 - Summarize your main points.
 - Restate your goal, in a memorable way.
 - Explain the value of your discussion.
 - Reiterate the plan of action or any future plans.
 - Return to the opening theme or story.
 - Share another relevant story, anecdote, or quote.

GUIDELINES FOR PREPARING YOUR VISUAL AIDS:

Once you have prepared your presentation, you may then decide to incorporate visual aids. Remember, "A picture is worth a thousand words." A Harvard University study reveals that individuals comprehend about 7% of information they obtain verbally. They comprehend 87% when information is delivered both verbally and visually.

- There are many different types of visual aids available to you including 35mm slides, videos, computer driven, or exhibits*.
- No matter what types of visual aids you choose, remember the acronym KISS (Keep it Short & Simple) and the old saying "Less is More".
- Choose your visual aids carefully and make each one count.
- Determine if the information really needs visual representation – will it really help to explain your point? Too much information may overwhelm an audience.

- It is also important to prepare your visual aids so that everyone in the audience will be able to see the information. There is nothing worse than telling an audience, “Those in the back of the room won’t be able to see some of the information on this slide, so I’ll explain...”

Slides

- Use only one (1) idea per slide.
- Keep it bold, simple, uncluttered and colorful.
- With color copy, never use black type on a dark-colored background or white letters on a light colored background.
- Use large, (18+ point size) simple block letters; the best type font is a bold sans serif (e.g. Arial).
- Use upper and lower case letters.
- Use only vertical, not slanted (italic) letters
- For graphs and charts, use heavy lines for curves and use a minimum of lightweight grid lines. No more than two curves or bars on a graph.
- Space between lines should equal the height of the letters.
- Use only horizontal lettering unless absolutely necessary (such as on graphs); other lettering is difficult for the audience to read, especially at longer distances.

If you choose to use **slides** you may want to note the following suggestions:

- The life expectancy of an average slide is 30sec or fewer.
- Begin and end the presentation with a thematic logo slide.
- IF you anticipate the need to stop for discussion during the slide presentation, insert a black slide so that you won’t have a slide up that has outlived the interaction.
- If you refer to a particular slide twice during your presentation, make two copies of the slide and place them in the appropriate sequence, this will allow your presentation to flow smoothly.
- Check and double-check your carousel.
- The speaker preparation room will be available for your use during the conference.

Video...

- Video can be used effectively to show examples.
- Show only top quality tapes, never those that have been copied over and over.
- Review your tape ahead of time, make sure the video and sound quality are good from the beginning to end.

Computer-driven...

- The technology now exists that will allow presentations to be driven from a notebook computer; the same rules of thumb for slides (e.g. type face, color, size, etc.) apply for computer-driven presentations.
- Computer-based presentations increase the capabilities of the presenter; however, a speaker does not want to be upstaged by his/her visual aides.

The Final Step:

- Practice, Practice, Practice!
- The presentation should be well rehearsed, as papers should not be read, but rather a presentation prepared.
- As you practice, be extra conscious of such things as elocution and time constraints.
- If you have practiced your presentation and are comfortable with your material and visual aids, then you will be a more relaxed, effective speaker.

BEST OF LUCK ON YOUR PRESENTATION!