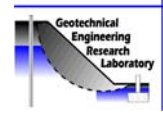




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DEPARTMENT OF CIVIL AND  
ENVIRONMENTAL ENGINEERING

Samuel G. Paikowsky, Sc.D  
Professor



**14.536 Soil Engineering**  
**Spring 2012**  
**Thursday 6-9 PM Kitson 301**

**Course Website:** <http://faculty.uml.edu/spaikowsky>

**Textbook:**

The purchase of a textbook is not required, as it is out of print. An “official” textbook is assigned to the class and the subjects in the syllabus are related to the chapters in this book: "Foundation Engineering Handbook", edited by Hsai-Yang Fang, Van Nostrand, 2nd ed., 1991.

**Reference Texts:**

1. “Earth and Earth-Rock Dams”, Sherard J.L. et al, John Wiley, 1963.
2. “Design of Small Dams”, U.S. Dept. of the Interior, Bureau of Reclamation.
3. “Soil Mechanics”, Design Manual 7.1 Dept. of the Navy, Naval Facilities Eng. Command, (NAVFAC DM7.1, May 1982).
4. “Foundations and Earth Structures”, NAVFAC DM7.2, May 1982.
5. “Seepage Drainage and Flow Nets”, Cedergren H.R., Wiley, 3rd ed., 1989.
6. “Engineering and Design Stability of Earth and Rock-Fill Fams” Dept. of the Army, Manual No. 1110-1902, April 1970, (see website below for EM110-2-2300, July 2004).
7. “Designing with Geosynthetics”, Koerner R.M., Prentice hall, 5<sup>th</sup> ed., 2005.
8. “Engineering Principles of Ground Modification”, Hausmann, M.R., McGraw-Hill, 1990.
9. “Treatment of Problem Foundations for Highway Embankments”, National Research Council, NCHRP Synthesis #147, July 1989.
10. “An Introduction to Geotechnical Engineering”, second edition, Holtz, R.D., Kovacs, W.D. and Sheahan, T.C., Pearson Education Canada, 2010.
11. “Geotechnical Instrumentation for Monitoring Field Performance”, Dunncliff, J. and Green, G.E., John Wiley, 1988.
12. “Landslides, Investigation and Mitigation. Special Report No. 247”, Transportation Research Board, National Academy Press, 1996.
13. “Soil Engineering”, Spangler, M.G. and Handy, R.L., Harper Collins 4<sup>th</sup> edition, 1982.
14. “Slope Stability and Stabilization Methods” Abramson, Lee, Sharma, and Boyce, 2<sup>nd</sup> edition, Wiley, 2001

**Reference Web Sites:**

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

FHWA Geotechnical Software:  
<http://www.fhwa.dot.gov/bridge/geosoft.htm>

US Army Corps of Engineers – Engineering Manuals  
<http://www.usace.army.mil/inet/usace-docs/eng-manuals/em.htm>

Geotechnical Software Directory  
<http://www.GGSD.com>

## **Software:**

- Slide/Analyze - 2-D Bishop Slope Stability Analysis
- Seep/W - Finite Element Groundwater Flow Analysis
- Reslope - Design Procedure for Geosynthetic Reinforced Steep Slopes, (RSS)
- DEEP Excavation Engineering Program, version 2010

## **Planned Schedule**

1. Attached please find the outline of the planned schedule. The classes consist of regular lectures, seminars and guest lectures. Your participation in the events therefore becomes mandatory and will be considered as part of your grade.
2. For each of the guest lectures, you will be required to submit in the following meeting a short (1 to 2 pages) typed summary based on your notes during that lecture.
3. 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 the required stages.
4. There will be a mid term and a final exam planned on March 22 and May 3<sup>rd</sup>, 2012.

## **Final Grade**

The approximate grade components are:

- |   |     |
|---|-----|
| 1. Attendance and guest lecture summaries | 15% |
| 2. Homeworks and computer exercises       | 20% |
| 3. Project                                | 25% |
| 4. Midterm and Final Exams                | 40% |

## 14.536 Soil Engineering Spring 2012

<u>Class #</u>	<u>Date</u>	<u>Topic</u>	<u>Text</u>
1	1/26/12	<ul style="list-style-type: none"> <li>• Review - Shear Strength of Soils</li> <li>• <u>Landslides and Slope Stability</u>: Overview, Infinite Slope (dry &amp; flow), wedge (Culman)</li> </ul>	Sect. 3.13, text and Holtz & Kovacs Ch. 11;  Chs. 10 & 11
2	2/2/12	<ul style="list-style-type: none"> <li>• <u>Slope Stability</u>: Friction Circle (Taylor) Swedish Circle (Fellenius), Bishop method of slices</li> <li>• <b>Discuss Project Preference with the Instructor</b></li> </ul>	Chs. 10 & 11
3	2/9/12	<ul style="list-style-type: none"> <li>• <u>Dam Design</u>; design consideration, seepage analysis, piping and filter design</li> <li>• <b>Submittal of Project Title/ Description/ Scope</b></li> </ul>	
4	2/16/12	<ul style="list-style-type: none"> <li>• <u>Embankment &amp; Earth Dam Design</u>, Shear strength and selection of soil parameters, stability conditions and analysis</li> <li>• Library Information gathering instructions by the Librarian, Margaret Manion, Lydon 203 @ 7:45pm</li> </ul>	
5	2/23/12	<ul style="list-style-type: none"> <li>• <u>Earth Pressures</u></li> <li>• <u>Earth Retention Systems</u>: Classification, components and design consideration</li> <li>• <u>Earth Retention Systems</u> - Braced Excavations</li> <li>• <b>Submittal of Project Abstract, Headings and References</b></li> </ul>	Ch. 6 Ch. 12 Ch. 12
6	3/1/12	<ul style="list-style-type: none"> <li>• <u>Earth Retention Systems</u> - Braced Excavations</li> </ul>	Ch. 12
7	3/8/12	<ul style="list-style-type: none"> <li>• Midterm</li> </ul>	
	3/15/12	<ul style="list-style-type: none"> <li>• University Closed – Spring Break</li> </ul>	
8	3/22/12	<ul style="list-style-type: none"> <li>• <u>Guest Lecture</u>: “Design of Braced Excavations.” By Dimitrios Konstantakos, President, Deep Excavation, LLC. And former UML CEE student</li> <li>• <u>Tutorial, PC Lab</u>: DEEP Excavation Engineering Program – Excavation support software developed and distributed by Dimitrios Konstantakos</li> </ul>	

<u>Class #</u>	<u>Date</u>	<u>Topic</u>	<u>Text</u>
9	3/29/12	<ul style="list-style-type: none"> <li>• <u>Stability of Open Excavations – Unbraced Cuts</u></li> <li>• <b>Submittal of Project Progress Report</b></li> </ul>	Ch. 12
10	4/5/12	<ul style="list-style-type: none"> <li>• <u>Dewatering and Ground Water Control</u></li> </ul>	
11	4/12/12	<ul style="list-style-type: none"> <li>• <u>Guest Lecturer</u>: “Groundwater Control for Construction”, followed by a session of designing a deep well system and analysis session, Mr. Greg Landry, Asst. Chief Engineer, Moretrench American Cooperation, Dewatering systems and services</li> </ul>	
12	4/19/12	<ul style="list-style-type: none"> <li>• <u>Instrumentation for Soil Engineering Projects</u></li> <li>• <b>PROJECT Due Date</b></li> </ul>	
13	4/26/12	<ul style="list-style-type: none"> <li>• <u>Observations of Field Performance</u>: Instrumentation and Measurements Interpretation</li> <li>• <b>PROJECT Reviews are Due</b></li> </ul>	Ch. 7
14	5/3/12	<ul style="list-style-type: none"> <li>• <u>Students’ Seminars</u></li> <li>• <u>Final Exam</u></li> </ul>	

**Spring 2012**  
**14.536 Soil Engineering**

**Term Project**

As part of the Soil 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, and laboratory study. The students are required to choose one of the following subjects. Other independent relevant topics may be approved after a discussion with the instructor.

The project will be submitted typed, 12 point (double spaced) and should not exceed 15 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.

The project's progress will be followed according to the following steps and time schedule:

- |             |  |
|-------------|--|
| 1/26 & 2/02 | Choose a topic and discuss its acceptability with the instructor.  |
| 2/09        | Submit the title for your project with a short description of the subject and the intended scope of your work. |
| 2/23        | Submit an abstract, headings for the subjects and a list of references.  |
| 3/29        | Progress report of the project is due.   |
| 4/19        | Completed term projects (2 copies) are due. Each student will be assigned someone else's project for review.   |
| 4/26        | Typed, one page discussion with marked comments of the reviewed projects are due.                              |
| 5/3         | Project presentation.  |

**General Ideas for projects:**

Computer Programs or Parametric Studies

1. Different slope stability programs
2. Different flow analysis programs
3. Radial consolidation around drains or piles
4. Writing a code – discuss with instructor

**Possible Topics:**

1. Pore Pressure Dissipation in Cone Penetration testing CPTU
2. Site characterization using a Cone Penetration Test (CPT)
3. Pile Capacity Gain with Time
4. Soil Plugging of Open Pipe Piles
5. Methods of Improving Lateral Resistance of Piles
6. Serviceability Criteria of Bridges and Structures
7. Lateral Response of Large Diameter Piles
8. Model Pile Testing
9. Deterioration assessment of concrete water conduits
10. Deterioration assessment of steel water conduits
11. Design of segmental cut and cover water pressure tunnels

12. Design of water tunnels in rock
13. Maintenance of water tunnels in rock
14. Maintenance management of large diameter concrete water supply conduits
15. Maintenance management of large diameter steel water supply conduits
16. Maintenance management of large diameter concrete coated steel water supply conduits
17. Open canals for water supply
18. Maintenance of concrete water canals for water supply
19. Dewatering
20. Stability of Reinforced Slopes
21. Construction of reinforced walls
22. Different applications of geosynthetics
23. Seismic design of dams
24. Soil stabilization
25. Settlement of dams
26. Stability of Rock Slope
27. Rock fill dams
28. Field instrumentation, review, performance, and/or case histories
29. Staged construction of embankments over soft soils

**Note: All projects must contain a written report.**

**Project Grading:** The project's grade will reflect the intermediate steps, the soundness of the study, the writing, the review and the presentation in the following way:

- Preparation / Timely submission of subject and intermediate stages 15%
- Project / Soundness, originality, manuscript presentation, completeness 45%
- Presentation / Technical, set-up structure, aids, speaking, time management 25%
- Review / see below 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 has 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 References. Check for numbering and headings, page numbering, appearance of text, titles of tables and figures, 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.