Purpose, Scope, and Approach

The purpose of this course is to teach students the fundamental aspects of slope stability evaluation and seepage analysis. I will focus on fundamental principles that can be employed in design rather than step-by-step design procedures. The homework assignments will include design-oriented problems and activities. Many of these activities will be open-ended; however, this is the nature of design, and students will become more comfortable with these problems as the course proceeds. If these conditions are unacceptable to you, consider dropping this course and taking another one among the other geotechnical engineering courses.

The course will include a review of the shear strength concepts, seepage analysis and slope stability analysis methods. I will avoid duplicating information that is contained in other courses. University of Maryland has a strong interdisciplinary program that covers many aspects of geotechnical and waste-related problems. I suggest that students interested in pursuing a career in this area examine these courses as you further your education.
Prerequisite Skills

ENCE340 or equivalent.

Useful Previous Coursework

Students in ENCE 647 should understand and be able to work with basic principles of geotechnical engineering as covered in ENCE340. Students should have the capability to use computer software to analyze the stability of slopes. The capability to program spreadsheets for using in analysis is also required.

Objectives

At the end of this course:

• Students should have a general idea about the stability of slopes.
• Students should have a general idea about the seepage in soils.
• Students should have the ability to analyze and design of man-made and natural slopes.
• Students should be able to apply engineering principles to slope stability issues with realistic site information.

Schedule and Office Hours

The class will ordinarily meet on Tuesdays. However, I do travel for the other responsibilities of my job and thus will miss some lectures. These lectures will be made up at times that are acceptable to most, but not necessarily all students.

Regarding office hours, please note that there will inevitably be times during the semester when scheduled office hours conflict with faculty meetings, travel, etc. I will try to notify the students via e-mail about any changes ahead of time.

Grading

Homework Assignments

The due date for the homework assignment that is required for each unit will be specified by the instructor. Homework should be turned in at the beginning of the class on the assigned due date. Do not place homework in my mailbox or under my door. Assignments turned in up to one day late will receive 50% credit, after which no credit will be given.

Students are expected to perform their homework neatly and in an organized fashion. Any homework which is sloppy, difficult to read, or difficult to understand will receive a reduced grade. Finally, it is the responsibility of the student to determine the correct solution of the problems, which contained errors. Solutions will be posted on the course web page.

Exams

Two take-home exams will be given during the semester. The tentative due dates for the exams are October 18 and December 13. A presentation about a term project will also be given at the
end of semester. Prior consent of the instructor or a doctor's certificate are the only satisfactory excuses from the exams and assignments.

**Grading Scheme**

Grades will be based according to the following scheme:

*Exams 20% each*

*Homework Assignments 45%*

*Term Project 15%*

It should be noted that the effort a student puts into performing and understanding the homework is often reflected in the student's performance on the exams.

**Reading Assignments**

Various journal/conference papers will be handed in during the class. Students are responsible for all material in the assigned readings. The material readings cover will not necessarily be discussed in detail in the lecture.

**Special Arrangements**

If you observe a religious holiday and would like to ask for a change in your schedule, please inform me at least a week ahead of it. Also I will make every effort to accommodate you if you need a special arrangement due to your disability.

**SCHEDULE FOR ENCE 647- Slope Stability and Seepage**

**I. Review of Shear Strength Principles (2 lectures)**
- Stress, strain and strength
- Drained and undrained strength parameters
- Laboratory and field tests for shear strength

**II. Groundwater and Seepage (4 lectures)**
- Flow through porous media
- Hydraulic conductivity
- Flow nets
- Determination of water pressure, seepage forces and quantity of seepage
- Laboratory and field tests for shear strength

**III. Slope Stability Analysis (5 lectures)**
- Infinite slope
- Water forces on soil
- Block analysis
- Method of slices
- Design charts
- Seismic analysis
• Effective and total stress analysis
• Computer program for slope stability analysis

IV. Specialized Slope Stability Issues (3 lectures)
• Slope stability problems in waste disposal
• Capping of high water content geomaterials
• Construction excavations
• Reinforced embankments
• Embankments on soft ground

TERM PROJECT

The term project will include a written report of a topic related to the course and a 15 minutes in-class presentation of the selected topic. Each presentation will be followed by a 5 minutes Q&A session. Room 1179 (Civil Engineering Conference Room) will be reserved for the presentation on Tuesday, December 6 between 5 and 7:30 pm. Students are strongly encouraged to prepare their presentations in Microsoft Power Point and to present it using a computer projector, since most professional presentations (i.e. conferences, interviews, meetings, etc.) are done in this way. Slides and transparencies are discouraged; however, if the students would like to use these materials they should consult with the instructor ahead of time. A computer projector and a computer will be available in the room. The students are advised to arrive 30 minutes early (i.e. 4:30 pm) and prepare (i.e. loading the file, ensuring the file is accessible, etc.). The grading scheme is based on the instructor’s grade and peers’ grades. The presentation grade will be based on organizational skills, time management, clarity of visuals, and delivery of the speech.

The projects require teamwork and the students are expected to work in groups of two. Both of the team members are responsible for the preparation and presentation of the topic. Students could select a topic among the ones covered in class or other topics after consulting with the instructor. Students working on a project (i.e. thesis, dissertation, scholarly paper) are encouraged to select a topic relevant to their area of interest. Case histories are encouraged. The selections must be conveyed to the instructor by Tuesday, November 8.

The content of the report should provide a general background and historical perspective of the subject matter, and analysis and discussion of the applicable design methods used. Reports including a laboratory study should define the materials and methods used for the study. Numerical studies should give a description of the methods employed in the solution and, if possible, a sensitivity analysis should be conducted. A report describing new technologies in slope remediation, stability of waste containment systems or slopes constructed on difficult soils can also be selected.

**Maximum report length** is 15 pages and this includes double-spaced text, figures, tables, references, and appendices. Points will be taken off for reports exceeding 15 pages. A font size of 12 and a font type of Arial or Times New Roman should be used. A cover sheet and a table of contents should be provided and they are not included in the 15 page maximum length. Equations should be properly written using the Equation Editor. Handwritten equations or table/figure captions are not acceptable. Figures should preferably be redrawn. However, if they are scanned, the scan quality will be considered in grading. Neatness and organization of the paper will also be considered during grading. It is strictly forbidden to directly copy sentences
from references. Students are expected to read and understand a number of references and summarize the information that they obtained in their own words.

In addition, a one-page summary of the report should be distributed to the class (including the instructor) on the presentation day. The summary should include a brief background of the selected topic with an emphasis on design considerations, or results. A list of 3-4 recommended references on the selected topic should also be included at the end of the summary.

**Access to References**

**Search Tools**

Search using EI Compendex Database-Could be reached from UMD library web page-www.lib.umd.edu

**Journals**

(Available in the UMD Engr.&Physical Sciences Library-electronic issues after 1999 are also available on the web, and can be accessed from E-journals)

- ASCE Journal of Geotechnical and Geoenvironmental Engineering
- ASCE Journal of Environmental Engineering
- Others

**Conference Proceedings**

- Various Conferences related to Waste Containment, Geosynthetics, and Soil Remediation

**Books**

- ASTM Special Technical Publications (STPs)
- Various Text Books