University of Manitoba	Fall XXXX
Department of Civil Engineering	CIVL 4220

Course identification	
Course name:	Geotechnical Design
Prerequisites:	CIVL 3730, GEOL 2250
Lecture hours:	11:30 AM – 12:45 PM Tuesday, Thursday
Tutorial hours:	2:30 – 4:20 PM Monday

Instructor	
Instructor:	Marolo C. Alfaro, PEng, PhD
Contact information:	Room E1-368, Phone: 474-8155
Office hours:	10:30 - 11:30 AM MWF

Teaching Assistants	
Teaching Assistant(s):	David Kurz, EIT, PhD Student and Andew Weiss, EIT, MSc Student
Contact information:	David: umkurzdr@cc.umanitoba.ca; Andrew: umweiss4@cc.umanitoba.ca

Course description and learning outcomes

The course introduces students to the principles of geotechnical design. It builds on the preceding courses GEOL 2250 Geology for Engineers and CIVL 3730 Geotechnical Materials and Analysis. The Geology course provided an understanding of the geological framework in which geotechnical design is undertaken. This was followed by Geotechnical Materials and Analysis course that detailed compression and strength properties of engineering soils. It will be appreciated that geotechnical materials are quite different from engineered materials such as steel, concrete, and asphalt. We can consider the philosophical difference wherein engineering properties must be measured rather than specified. The analysis component presented "tools and techniques" for analyzing typical soils problems including retaining walls, slopes, footings, and piles. Students were introduced to high quality commercial software for finite element analysis of stresses, strains, and seepage as well as to limit equilibrium analysis of slope stability.

This final core course, Geotechnical Design synthesizes this broad understanding of geology, material properties, and analysis into methodologies that can be used for designing solutions to geotechnical engineering projects.

Learning Outcomes
The student should be able to:
1) synthesize the broad understanding of geology and material properties that can be used for designing solutions to geotechnical engineering.
2) plan, interpret and examine field investigation/laboratory testing programs to obtain the necessary soil and site information.
3) design geotechnical infrastructure including shallow foundations, deep foundations, excavations, embankments, dams, earth retaining structures and remediation of engineered and natural slopes.

In order to complement the course material with case histories of local practice, guest speakers will be invited to give presentations on completed engineering works, presenting details on the engineering process from conceptual design to final construction. The guest lectures are considered part of the course and examinations will cover materials presented.

Course web site

Your Jump Portal Server

Textbook

Required Textbook
Budhu, M., Soil Mechanics and Foundations (3rd Edition), John Wiley and Sons, 2010.

References
Lecture Notes on Geotechnical Design prepared by Drs. J. Graham and J. Blatz
Craig, R.F., Soil Mechanics (6th Edition), Chapman and Hall, 1997.

As much as possible, material in the course will conform to recommendations in the Canadian Foundation Engineering Manual (4th Edition, 2007, Canadian Geotechnical Society) and the National Building Code of Canada, 2010. Additional material will be taken from Teng: Foundation Design (Prentice Hall), Peck, Hanson, and Thornburn: Foundation Engineering (Wiley), Coduto: Foundation Design (Prentice Hall), and Bowles: Foundation Analysis and Design (McGraw Hill). Some of these materials are available in the U of M Libraries.

Assignments/projects/lab reports

Numerical problems will be assigned regularly. They have to be submitted on the indicated due date. Late assignments will be assessed a 10% reduction per day late to a maximum of 50% at 5 days late after which a mark of zero will be recorded unless written justification is provided *or* an extension is agreed to (in writing) by the student and professor prior to the submission date. Solutions will be provided after the assignments are marked. You are also required to undertake group projects to design foundations and earth structures.

Please understand the importance of conscientiously completing assignments as an aid to understanding the course work and preparing for the examinations.

Term tests

Mondays, 17 Oct and Nov 14 2011, 2:30 - 4:30 PM, Rm. E2-155. Closed book exam. Formulas provided.

Final exam

To be arranged by Student Records Office. Closed book exam. Formulas provided.

Assessment method

There are two components of this course: lectures and tutorial sessions. Two 1.5-hour lectures (Tuesday and Thursday) will be given each week. There will be two mid-term examinations (1 hour and 45 minutes each) contributing 30% of the final grade, and a three-hour final examination contributing 50%. If for legitimate reason you miss a midterm exam, the weight of that exam will be added to the weight of the final exam. Students are required to achieve a passing grade in the individual, supervised assessment component of the course (combination of two midterm exams and final exam).

You are required to attend tutorials on Monday afternoons. The tutorial sessions are done to reinforce the lectures (that is, they concentrate on solutions to problems) and additional explanation. Tutorial sessions also involve the use of commercially available computer software. Numerical problems will be assigned regularly. Submission of all the Assignments will contribute 10% of the final grade and the group design report contributing 10%.

Policies

The Faculty of Engineering expects regular attendance of all students at lectures, tutorials and laboratories (Faculty of Engineering, Section 4.12, of The University of Manitoba General Calendar). Attendance will be taken during lectures and tutorials. If the number of unexcused absences of a student exceeds 10%, that student may be barred from writing the final exam. Valid absences should be reported to the instructor.

The undergraduate calendar defines plagiarism as taking ideas or words of another person and passing them off as one's own. In short, it is stealing something intangible rather than an object. It will be considered plagiarism and/or cheating if you copy the answers of another student in any examination or take-home assignment. Plagiarism or any other form of cheating in tests, examinations or take-home assignments is subject to severe academic penalty (e.g. suspension or expulsion). A student found guilty of contributing to cheating is also subject to serious academic penalties.

Additional information

Please check your Jump Portal Server for periodic announcements and updates.

Teaching assistants are available for consultation only during their office hours. Appointments outside their office hours may be arranged with them under special circumstances. Teaching assistants will arrange later their office hours and locations. Students should not be consulting teaching assistants in their office to avoid disruption to other graduate students who share office space.

Detailed course content

Course Content	*Estimated Lecture Hours*	*Textbook Reference*
1 Site Characterization	4.5 hours	Chapter 3
1.1 Planning of site investigation		
1.2 Drilling and sampling techniques		
1.3 In-situ testing		
2 Shallow foundations	9 hours	Chapter 12
2.1 General bearing capacity equations		
2.2 Settlement calculations		
2.3 Allowable stress design and limit state design		
3 Deep foundations	9 hours	Chapter 13
3.1 Pile capacity from laboratory test soil parameters		
3.2 Pile capacity from in-situ test soil parameters		
3.3 Pile group capacity		
4 Earth retaining structures	9 hours	Chapters 15
4.1 Earth pressure theory		
4.2 Gravity retaining walls		
4.3 Flexible retaining walls		
5 Natural slopes and embankments	7.5 hours	Chapter 16
5.1 Stability of slopes using computer solutions		
5.2 Stability of slopes using chart solutions		
Total	39 hours	