CVEN4202 Advanced Topics in Geotechnical Engineering

Semester 2, 2016

Never Stand Still | Faculty of Engineering | School of Civil and Environmental Engineering

COURSE DETAILS

Units of Credit	6	
Lecturer and course coordinator	Associate Professor Adrian Russell	
Class	Thursdays 9:00-13:00 Weeks 1-7, 9-13	CLB 3 and computer laboratory 201 in the Civil Engineering building

Note there **WILL NOT BE** any teaching in week 8, and there **WILL BE** teaching in week 9. If a student has to be away in week 9 then they should contact A/Prof Russell.

INFORMATION ABOUT THE COURSE

Students enrolling in this course are assumed to have knowledge of soil mechanics to Bachelor of Civil Engineering standard.

COURSE DESCRIPTION AND OBJECTIVES

To understand the basic principles of critical state soil mechanics and soil plasticity, and use elastic-plastic constitutive models (Mohr-Coulomb, Cam-Clay, Bounding Surface Plasticity) to simulate soil stress-strain behaviour. Extend models to unsaturated soils. Apply stress field analysis in solving simple geotechnical problems. Identify fractal patterns in soils and apply them to understand soil mechanics. Model soil-structure interaction using simple hand calculations and the commercial software PLAXIS through case studies of high profile geotechnical engineering failures (leaning Tower of Pisa in Italy, the Nicoll Highway braced excavation collapse in Singapore).

TEACHING STRATEGIES

Private Study	• Review lecture material and textbooks • Do set problems and assignments • Reflect on class problems and assignments • Download materials from Moodle
Lectures	• Find out what you must learn • See methods that are not in the course notes • Follow worked examples • Hear announcements on course changes
Example classes	• Be guided by lecturer when problem solving • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES

Student-centred and self-directed learning skills to solve problems by ‘hand calculation’ and using commercial software. The problems have been chosen intentionally to include some for which no ‘textbook’ solutions are available.

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

ASSESSMENT

- Assignments (5) 100%
  (Assignments 1 to 4 are worth 17.5% each, Assignment 5 is worth 30%)

Notes:

- The Coordinator reserves the right to adjust the final scores by scaling if agreed to by the Head of School.
- Assignments should be either handed to the lecturer personally in class, or handed in to the School Office. They may also be posted by express mail to the lecturer (a copy must be retained by the student). Email and fax submissions will not be accepted.
- Late work may not be accepted or assessed, or may be penalized. If you have a good reason for being unable to submit your work on time, it is important that you let your tutor, lecturer or course coordinator know promptly. There are two kinds of provisions made for students who have good reasons for late submission, as detailed in the next two points.
- Students who are late with assignments may apply to the subject coordinator for an extension. You must apply for an extension before the due date. Extensions may be refused if you do not present documented medical or other evidence of illness or misadventure. An extension is only for a short period, usually no more than a week.
- Where a longer period is needed, you should apply for Special Consideration. You must make a formal application as soon as practicable after the problem occurs and within three working days of the assessment to which it refers. The application must be made on the 'Request for Consideration' form available from NewSouth Q. The completed application form must be submitted to NewSouth Q.

COURSE PROGRAM

Week 1	Soil elasticity and yielding. Modelling the elastic-plastic behaviour of soils and critical state soil mechanics (9-13 CLB3).
Week 2	The Mohr-Coulomb, Cam-clay and Bounding surface plasticity constitutive models, Assignment 1 introduction (9-13 CLB3).
Week 3	Maple demonstration: solving differential equations as an initial value problem (9-11 CLB 3, no teaching from 11-13)
Week 4	Simulating the stress-strain behaviour of soils (related to Assignment 1) (9-13 computer lab CE201)
Week 5	Unsaturated soil mechanics (9-13 CLB 3)
Week 6	Simulating the stress-strain behaviour of unsaturated soils (related to Assignment 2) (9-13 computer lab CE201)
Week 7	Fractals in soil mechanics (9-11 CLB 3, 11-13 computer lab CE201)
Week 8	No teaching
Week 9	Fractals in soil mechanics (related to Assignment 3) (9-13 computer lab CE201)
Week 10	Elastic stress field analysis & geotechnical engineering applications (related to Assignment 4) (9-11 CLB 3, 11-13 computer lab CE201)
Week 11	Modelling soil-structure interaction using simple hand calculations and PLAXIS analysis (related to Assignment 5) (9-13 CLB 3)
Week 12	Assignment work – Stress field analysis and soil-structure interaction analysis, case study the Nicoll Highway braced excavation collapse in Singapore (9-11 CLB 3, 11-13 computer lab CE201)
Week 13	Assignment work – Stress field analysis and soil-structure interaction analysis, case study the leaning Tower of Pisa in Italy (9-11 CLB 3, 11-13 computer lab CE201)

RELEVANT RESOURCES

No text book is prescribed although the first four books listed below are very good investments for any geotechnical engineer.

1. Muir Wood, D. “Soil Behaviour and Critical State Soil Mechanics”, Cambridge University Press, 1992.
2. Muir Wood, D. “Geotechnical modelling”, Spon Press, 2004.
3. Puzrin, A.M., Alonso, E.E. and Pinyol, N.M. “Geomechanics of failures”. Springer. 2010.
4. Alonso, E.E., Pinyol, N.M. and Puzrin, A.M. “Geomechanics of failures: Advanced Topics”. Springer. 2010.
5. Lambe and R.V. Whitman, "Soil mechanics", John Wiley & Sons, 1969.
6. Atkinson and P.L. Bransby, "The mechanics of soils: An introduction to critical state soil mechanics", McDraw-Hill, 1978.
7. Holtz, Kovacs and Sheahan, "An introduction to geotechnical engineering", Pearson, 2011.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://my.unsw.edu.au/student/resources/KeyDates.html

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person’s work or ideas as if they were your own. When it is necessary or desirable to use other people’s material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

https://student.unsw.edu.au/plagiarism

ACADEMIC ADVICE

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations,
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

Refer to Academic Advice on the School website available at:
http://www.engineering.unsw.edu.au/civil-engineering/resources/academic-advice