



# CVEN4204 Ground Improvement and Monitoring Techniques

Semester 1, 2014

Never Stand Still

Faculty of Engineering

School of Civil and Environmental Engineering

## COURSE DETAILS

Units of Credit	6	
Contact hours	4 hours per week	
Class/ Tutorial	Fridays 9:00 – 13:00	Biomedical Theatre C
Course Coordinator and Lecturer	Hossein Taiebat <a href="mailto:h.taiebat@unsw.edu.au">h.taiebat@unsw.edu.au</a> Office: CE 502, Civil Engineering Building (2)9385 5942	

## INFORMATION ABOUT THE COURSE

This course is a final year elective offered to all undergraduate Civil and Environmental Engineering students. It forms part of the undergraduate specialisation in Geotechnical Engineering. The course introduces the need for ground improvements and brief descriptions of methods used. Detailed design procedures of ground improvement techniques such as compaction, vibro-floatation and stone column, preloading, soil nailing and reinforced earth, dewatering techniques, and deep soil mixing will be presented. Finally, an overview of the observational method and instrumentation used in Geotechnical Engineering will be given.

The assumed knowledge of the course is Soil Mechanics and Applied Geotechnical Engineering.

## HANDBOOK DESCRIPTION

Assessment of the suitability and design of stabilisation techniques for difficult foundation soils including instrumentation and application of observational techniques to geotechnical engineering. Topics covered will include: principles of the observational method, instrumentation, selected lectures on braced excavations, dewatering, grouting, underpinning, stone columns, vertical and horizontal drains, vacuum pumping, deep compaction, vibro floatation, lime stabilisation, reinforced earth and soil nailing.

## OBJECTIVES AND EXPECTED LEARNING OUTCOMES

To provide the fundamentals of soil improvement techniques and observational methods in Geotechnical Engineering.

By the end of the course successful students should:

- have an in-depth engagement with the problems of soft soils and methods of improving their behaviour;
- be able to recommend a suitable ground improvement method for a range of problematic soils;
- be able to analyse and design selected problems in soft grounds;
- be able to perform research into the problems independently;
- be able to design and analyse reinforced earth structures;
- be able to explain the role of the observational method in geotechnical engineering;
- be able to list various types of instrumentation used in geotechnical engineering, explain how they function, contrast their advantages;

- in the context of a geotechnical engineering problem be able to plan and describe the observations and instruments they would use to monitor ground behaviour.

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

## COURSE PROGRAM

Table below shows the course program.

Date	Week	Topics
07/03	1	Introduction to ground improvement techniques Review of geotechnical engineering principles
14/03	2	Surface and deep dynamic compaction
21/03	3	Vibro compaction & vibro replacement
28/03	4	Preloading with and without drain
04/04	5	Deep soil mixing and grouting techniques
11/04	6	Quiz 1 (30%), Site investigation
18/04	7	Public Holiday (work on project!)
25/04		Semester Recess
02/05	8	Project presentations (Reports due)
09/05	9	Reinforced soils
16/05	10	Quiz 2 (30%), Monitoring and instrumentation
23/05	11	Dewatering techniques
30/05	12	Observational method in Geotechnical Engineering
06/06	13	Quiz 3 (20%)

## TEACHING STRATEGIES

The contents of this subject will be presented in a series of lectures followed by tutorials. The lectures explain the theory and design recommendations. They tend to engage students in formal and informal discussions to broaden their understanding of different problems related to Geotechnical Engineering. Students are required to do extra research into the topics related to ground improvements not covered in the lecture.

An example of the approaches to learning is:

Lectures	Find out what you must learn Follow worked examples Hear announcements on course changes Research on topics not covered in the student notes
Tutorials	Be guided by tutors Practice solving set problems Ask questions
Private Study	Review lecture material and textbook Participate in tutorial and discussions Reflect on class problems and assignments Consult with the lecturer for their research topics
Assessments (examinations and Research assignments)	Demonstrate your knowledge and skills Demonstrate higher understanding and problem solving Demonstrate your ability to research on new topics Demonstrate your ability on oral presentation

## ASSESSMENT

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The assessment in this course consists of 3 quizzes (open book); each takes 1-1.5 hr, and one assignment task (project) and covers all the different topics covered in the course. There is no final examination for this course.

Details of each assessment component, the marks assigned to it set out below.

Quiz 1: Week 6	30%
Project: Week 8	20%
Quiz 2: Week 10	30%
Quiz 3: Week 13	20%

Attendance in all quizzes is compulsory. There will not be any alternative quiz for those who miss one.

## RELEVANT RESOURCES

No textbooks are required as the topics covered in this course can be found in many books on ground improvement techniques. The following reference books may be useful for additional reading.

- Xanthakos, P.P., Abramson, L.W., and Bruce, D.A. (1994) Ground Control and Improvement, John Wiley.
- Hausmann, M.P. (1990) Engineering principles of ground modification, McGraw Hill.
- Moseley, M.P. and Kirsch, K. (2004) Ground improvement, 2<sup>nd</sup> edition, Spon Press.
- Dunncliff, J. (1988) Geotechnical instrumentation for monitoring field performance. Wiley.
- Institution of Civil Engineers (Great Britain) (1996) The observational method in geotechnical engineering. Thomas Telford.

Additional materials will be provided during the lectures or via Moodle.

## 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>