School of Civil and Environmental Engineering

Term 3, 2020

CVEN4204
GROUND IMPROVEMENT AND MONITORING TECHNIQUES

COURSE DETAILS

Units of Credit	6	
Contact hours	5 hours per week	
Lecture	Mondays 11:00 – 14:00	Online
Workshop	Thursday 12:00 – 14:00	Online

Course Coordinator and Lecturer	Asal Bidarmaghz email: a.bidarmaghz@unsw.edu.au office: CE 502, Civil Engineering Building phone: 9358 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 the 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.

Problems relevant to the lectures will be solved each week in the workshops.

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

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/CVEN4204/

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

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

TEACHING STRATEGIES

The contents of this subject will be presented in a series of lectures, followed by examples/exercises. 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
Exercises	• Be guided by Lecturer • Practice solving set problems • Ask questions
Private Study	• Review lecture material and textbook • Participate in solving examples 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 new topics

EXPECTED LEARNING OUTCOMES

By the end of the course successful students should:

Learning Outcome		**EA Stage 1 Competencies**
1.	*Have an in-depth engagement with the problems of soft soils and methods of improving their behaviour.*	*PE1.1, PE1.2, PE1.3*
2.	*Be able to recommend a suitable ground improvement method for a range of problematic soils.*	*PE1.2, PE2.2, PE2.3*
3.	*Be able to analyse and design selected problems in soft grounds.*	*PE1.1, PE2.2, PE2.3*
4.	*Be able to perform research into the problems independently.*	*PE1.4, PE3.2, PE3.6*
5.	*Be able to design and analyse reinforced earth structures.*	*PE1.3, PE2.2, PE2.4*
6.	*Be able to list various types of instrumentation used in geotechnical engineering, explain how they function, contrast their advantages.*	*PE1.5, PE1.6, PE2.1*

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

The table below shows the course program.

Term 3, 2020

Date	Week	Lecture Topic
14/09/2020	1	Introduction to ground improvement techniques and Review of geotechnical engineering principles
21/09/2020	2	In-situ testing, measurement and Pre-loading with and without drains (Workshop #1, Thursday 12-14)
28/09/2020	3	Compaction and Dynamic compaction (Workshop #2, Thursday 12-14)
05/10/2020	4	Vibro compaction and Vibro replacement (pre-recorded lecture due to public holiday) (Workshop #3, Thursday 12-14)
12/10/2020	5	Quiz #1
19/10/2020	6	Non-teaching week
26/10/2020	7	Deep soil mixing techniques (Workshop #4, Thursday 12-14)
03/11/2020	8	Project presentation
10/11/2020	9	Dewatering techniques and Reinforced earth walls (Workshop #5, Thursday 12-14)
17/11/2020	10	Quiz #2

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 2 quizzes (open book) each takes 1.5-2 hrs, one online test, covering all the different topics covered in the first 2 weeks of the course and one project presentation. **There is no final examination for this course**.

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

Online test:	Week 3	10%
Quiz #1:	Week 5	35%
Presentation	Week 8	20%
Quiz #2:	Week 10	35%

A 24-hour window will be given for the quizzes. Students are expected to start and finish each quiz within 2 hours.

There will not be any alternative quiz for those who miss one.

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

PENALTIES

Late work will be penalised at the rate of 10% per day after the due time and date have expired. This penalty rate is applicable to the online test.

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
1. Online test	~ 1 h	10%	1-3, 5-6	Weeks 1 and 2	04/10/2020	NA	08/10/2020
2. Quiz #1	1.5-2 h	35%	1-3, 5-6	Weeks 2, 3 and 4	Week 5	Week 5	Week 8
3. Project presentation	10 min each	20%	1-3, 5-6	NA	02/11/2020	Week 8	Week 10
3. Quiz #2	1.5-2 h	35%	1-3, 5-6	Weeks 7, 9	Week 10	Week 10	End of Term

Note 1: *Attendance in all quizzes is compulsory.*

Note 2: *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, 2nd edition, Spon Press.
- Dunnicliff, 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://student.unsw.edu.au/dates

PLAGIARISM

Beware! An assignment that includes plagiarized 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;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

Refer to Academic Advice on the School website available at: https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership