

CVEN4204

Ground Improvement and Monitoring Techniques

Term 3, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Asal Bidarmaghz	a.bidarmaghz@unsw.edu.au	Email to make an appointment	Civil Engineering Building (H20) Level 5, Room CE502	

School Contact Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

Course Details

Units of Credit 6

Summary of the Course

Prerequisites: CVEN3202 and CVEN3203 or equivalent. Assessment of the suitability and design of stabilisation techniques for difficult foundation soils including instrumentation and application 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, vibrofloatation, lime stabilisation, reinforced earth and soil nailing.

Course Aims

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

By the end of the course successful students should:

- 1· have an in-depth engagement with the problems of soft soils and methods of improving their behaviour;
- 2· be able to recommend a suitable ground improvement method for a range of problematic soils;
- 3· be able to analyse and design selected problems in soft grounds;
- 4· be able to perform research into the problems independently;
- 5· be able to design and analyse reinforced earth structures;
- 6· be able to explain the role of the observational method in geotechnical engineering;
- 7· be able to list various types of instrumentation used in geotechnical engineering, explain how they function, contrast their advantages;
- 8· in the context of a geotechnical engineering problem be able to plan and describe the observations and instruments you would use to monitor ground behaviour.

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

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Explain the problems of soft soils and the methods of improving their strength and serviceability.	PE1.1, PE1.2, PE1.3
2. Identify suitable ground improvement methods and their critical parameters and control measures for a range of problematic soils.	PE1.2, PE2.2, PE2.3
3. Analyse the performance of ground improvement designs	PE1.1, PE2.2, PE2.3
4. Describe the types and functions of instrumentation used in geotechnical engineering and their advantages.	PE1.5, PE1.6, PE2.1
5. Be able to design and analyse reinforced earth structures	PE1.4, PE3.2, PE3.6

Learning Outcome	EA Stage 1 Competencies
6. Be able to perform research into the problems independently	PE1.3, PE2.2, PE2.4

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 Demonstrate your knowledge and skills Research assignments)

Demonstrate higher understanding and problem solving

Demonstrate your ability to research on new topics Demonstrate your ability on oral presentation

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quiz 1	40%	Week 5	1, 2
2. Quiz 2	40%	Week 10	1, 2
3. Online Test	5%	05/10/2022 12:00 AM	1, 2
4. Presentation	15%	Week 8	

Assessment 1: Quiz 1

Due date: Week 5

Marks returned: Week 9

1.5-2hr open-book quiz. Similar to the examples solved in the workshops.

Assessment criteria

Length	Weighting	Learning outcomes assessed	Criteria	Due date and submission requirements	for absolute fail	Marks returned
1.5-2 h	40%	1-3, 5-6	Weeks 2, 3 and 4	Week 5	Week 5	Week 9

Assessment 2: Quiz 2

Due date: Week 10

Marks returned: End of the term

1.5-2hr open-book quiz. Similar to the examples solved in the workshops.

Assessment criteria

Length	Weighting	Learning outcomes assessed	Criteria	Due date and submission requirements	for absolute fail	Marks returned
1.5-2 h	40%	1-3, 5-6	Weeks 7, 9, 10	Week 10	Week 10	End of Term

Assessment 3: Online Test

Due date: 05/10/2022 12:00 AM

Marks returned: before the census date

This is an online assessment to be marked and returned before the T3 census date.

Assessment criteria

Weighting	Learning outcomes assessed	Criteria	Due date and submission requirements	for absolute fail	Marks returned
5%	1-3, 5-6	Weeks 1 and 2, 3	05/10/2022	NA	08/10/2022

Assessment 4: Presentation

Due date: Week 8

Marks returned: End of the term

A group presentation on selected ground improvement topics to improve students understanding in this field and teamwork.

Assessment criteria

Item	Length	Weighting	Learning outcomes assessed	Criteria	Due date and submission requirements	for absolute fail	Marks returned
3. Project presentation	10 min each	15%	1-3, 5-6	NA	02/11/2022	Week 8	End of Term

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

Lectures will be held in hybrid mode. Students are encouraged to attend the class unless they are unwell (isolating) or not in Sydney.

Workshops are in person.

The quizzes are invigilated.

[View class timetable](#)

Timetable

Date	Type	Content
O-Week: 5 September - 9 September		
Week 1: 12 September - 16 September	Lecture	Introduction to ground improvement techniques and Review of geotechnical engineering principles
Week 2: 19 September - 23 September	Lecture	Compaction and Dynamic compaction
	Workshop	Workshop #1, Thursday 1100-1300
Week 3: 26 September - 30 September	Lecture	In-situ testing, measurement and Pre-loading with and without drains
	Workshop	Workshop #2, Thursday 1100-1300
Week 4: 3 October - 7 October	Lecture	Vibro compaction and Vibro replacement
	Workshop	Workshop #3, Thursday 1100-1300
	Assessment	Online Test
Week 5: 10 October - 14 October	Workshop	Quiz 1 Q and A
	Assessment	Quiz #1, Thursday 1100-1300

	Assessment	Quiz 1
Week 7: 24 October - 28 October	Lecture	Deep soil mixing techniques
	Workshop	Workshop #4, Thursday 1100-1300
Week 8: 31 October - 4 November	Presentation	Project presentation
	Assessment	Presentation
Week 9: 7 November - 11 November	Lecture	Dewatering techniques and Reinforced earth walls
	Workshop	Workshop #5, Thursday 1100-1300
Week 10: 14 November - 18 November	Lecture	Dewatering techniques and Reinforced earth walls (continued)
	Assessment	Quiz #2, Thursday 1100-1300
	Assessment	Quiz 2

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

Academic Honesty and 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 Information

Final Examinations:

Final exams in T3 2022 will be held online between 25th November - 8th December 2022 inclusive, and supplementary exams between 9th - 13th January 2023 inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): <https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw>
- [Key UNSW Dates](#) - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): <https://intranet.civeng.unsw.edu.au/student-intranet>
- Student Life at CVEN, including Student Societies: <https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life>
- Special Consideration: <https://student.unsw.edu.au/special-consideration>
- General and Program-Specific Questions: [The Nucleus: Student Hub](#)
- Book an Academic Advising session: <https://app.acuityscheduling.com/schedule.php?owner=19024765>

Disclaimer

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering 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	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in 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	✓