School of Civil and Environmental Engineering

Term 1, 2020

CVEN9512 GEOMECHANICS

COURSE DETAILS

Units of Credit	6	
Contact hours	35 hours per week (4th -10th March 2020)	
Lecturers	Wed - Tue, 9:00 – 11:00	CIVENG109
	Wed - Tue, 14:00 – 16:00	CIVENG109
Workshops	Wed - Tue, 11:00 – 12:00	CIVENG109
	Wed - Tue, 16:00 – 17:00	CIVENG109

Course Coordinator and Lecturer

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INFORMATION ABOUT THE COURSE

This is a stand-alone course on the fundamentals soil mechanics as well as the advanced theories of continuum mechanics.

HANDBOOK DESCRIPTION

See: **https://www.handbook.unsw.edu.au/postgraduate/courses/2020/CVEN9512/**

OBJECTIVES

The objective of the course is to gain a fundamental understanding of:

- The effective stress concept, phase interaction and shear strength in soils
- Advanced theories of consolidation, including nonlinearity, staged loading, preloading, radial consolidation and numerical approximation.
- Soil liquefaction
- Critical state soil mechanics
- Fundamentals of continuum mechanics
- Theory of elasticity and constitutive relationships
- Soil plasticity and Cam-clay model
- Fundamentals of unsaturated soils mechanics

TEACHING STRATEGIES

The course will involve formal lectures and workshops delivered in a short course mode.

Lecturers and Private Study	• Review lecture material and textbook • Do set problems and assignments • Join discussions in the class • Reflect on class problems and assignments • Review material covered in each day on the same night.
Workshops	• Be guided by Lecturer • Review worked problems • Ask questions

Assessments (Final exam and hand-in assignments)	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES		**EA Stage 1 Competencies**
1.	An in-depth knowledge of geomechanics in its inter-disciplinary context	*PE1.1, PE1.2 PE1.5, PE2.3*
2.	Improved capacity for analytical and critical thinking and for creative problem solving	*PE1.2, PE2.2, PE2.3*
3.	Ability to engage independent and reflective learning	*PE1.2, PE2.2, PE2.3*
4.	Skills for collaborative and multi-disciplinary work	*PE2.2, PE2.3, PE3.3*
5.	A respect for ethical practice and social responsibility	*PE3.1, PE1.5, PE3.3*
6.	Skills for effective engineering decision making	*PE2.1, PE2.2, PE2.3*

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

ASSESSMENT

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Final Examination is worth 50% of the Final Mark if hand-in tutorials are included and 100% if hand-in tutorials are not included. The hand-in tutorials are worth 50% of the Final Mark if included. A mark of at least 40% in the final examination is required before hand-in tutorials are included in the final mark. The formal exam scripts will not be returned.

All hand-in tutorials will be marked and returned to students. The aim is to provide feedback on the correctness of the approaches and the solutions presented, and re-enforce independent learning. The tutorials are a core component of the course and represent individual work. They will be assessed on the basis of technical accuracy of calculations and evidence of engineering judgment with assumptions and problem simplification. The tutorials will cover all aspects of the material covered in the course.

The final examination is included as the course leaning outcomes include a significant level of technical learning that can be effectively and objectively assessed in an exam environment. The examination is designed to align with the learning outcomes and competencies derived from the course. The final examination is open book and is of two-hour duration.

Item	**Length**	**Weighting**	**Learning outcomes assessed**	**Assessment Criteria**	**Due date and submission requirements**	**Deadline for absolute fail**	**Marks returned**
1. Hand-in tutorials		*50%*	*PE1.1, 1.2, 1.3, 2.1, 2.3*	*Appropriate engineering solution*	*Four weeks before the final exam*	*Two weeks before the final exam*	*Two weeks after submission of the tutorials*
2. Final Exam		50%	*PE1.1, 1.2, 1.3, 2.1, 2,2 2.3, 3.3*	*Appropriate engineering solution*	As scheduled		

All Distance/Short course mode students are expected to sit their final examination on Kensington campus (Sydney). If you reside further than 40 Km from the Kensington campus, and you wish to sit your exam externally (by distance), you must register for an external exam by the UNIVERSITY CENSUS DATE (Term 1: 15th March; Term 2: 28th June, Term 3: 11th October) more information found **here**.

Supplementary Examinations for Term 1 2020 will be held on Monday 25th May – Friday 29th May (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

Hand-in Assignments

All hand-in assignments are due two weeks before the scheduled date for the final exam. A penalty of 10% will apply for each day of late submission. Assignments handed in more than 10 days late will not be considered in the assessment. There will be a total of eight (8) assignments. All hand-in assignments will be marked and returned to students. The aim is to provide feedback on the correctness of the approaches and the solutions presented, and re-enforce independent learning. The assignments are a core component of the course and represent individual work. They will be assessed on the basis of technical accuracy of calculations and evidence of good engineering judgment with assumptions and problem simplification. The assignments will cover all aspects of the material covered in the course.

COURSE PROGRAM

TERM 1, 2020

Day	Topic	Assessments Due
1	Brief revision on elementary soil mechanics: phase relationships, effective stress concept, Mohr-Coulomb failure criterion, Mohr diagram, p-q diagram and stress path technique.	N/A
2	Direct shear and triaxial tests, strength parameter determination for field applications. Oedometer test, Terzaghi's consolidation theory, analytical solution and numerical approximation of one dimensional model.	N/A
3	Creep, pre-loading, stage-construction, radial consolidation. Liquefaction, post liquefaction analysis.	N/A
4	Critical state soil mechanics.	N/A
5	Constitutive relationships for soils including theory of plasticity, Cam clay model, unsaturated soil mechanics.	N/A

RELEVANT RESOURCES

- Das, "Advanced soil mechanics", McGraw-Hill, 1985.
- Muir Wood, D. “Soil Behaviour and Critical State Soil Mechanic”, Cambridge University Press, 1992.
- Lambe and R.V. Whitman, "Soil mechanics", John Wiley & Sons, 1969.
- Atkinson and P.L. Bransby, "The mechanics of soils: An introduction to critical state soil mechanics", McDraw-Hill, 1978.
- Holtz and W.D. Kovacs, "An introduction to geotechnical engineering", Prentice Hall, 1981.
- W.F. Chen and G.Y. Baladi, "Soil plasticity: Theory and implementation", Elseveir, 1985.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

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

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

(Formerly known as Common School Information)
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:
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