Faculty of Engineering

School of Minerals and Energy Resources Engineering

Undergraduate Course Outline

MINE3310

Mining Geomechanics

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1. INFORMATION ABOUT THE COURSE

Course Code:	MINE3310	Term:	T1, 2020	Level:	UG	Units/Credits	6 UOC
Course Name:	**Mining Geomechanics**						

Course Convenor:	***Course Convenor: Dr Joung Oh*** The responsible academics for delivery of the course includes: • *Soil Mechanics Module* ○ **Joung Oh**. Rm 159K, OMB; Tel: 9385 5002; email: joung.oh@unsw.edu.au • *Rock Mechanics Module*. ○ **Guangyao Si**, Rm 159B, OMB; Tel: 9385 5727; email: g.si@unsw.edu.au		
Contact Details	School of Minerals and Energy Resources Engineering OMB 159k	EMAIL:	joung.oh@unsw.edu.au
		Phone:	+61 2 9385 5002
Contact times	Contact times are scheduled for: • **Wednesday 15:00pm – 18:00pm, Goldstein G07** • **Thursday 12:00pm – 14:00pm, Goldstein G07**		

1.1. Course Description

The course provides students with the fundamental knowledge required to undertake geomechanical investigations and design tasks. This course consists of Soil and Rock Mechanics Modules including the basics of rock and soil behaviours. Soil Mechanics Module comprises of basic soil mechanics, soil classification, phase relationships, effective stress, seepage and flow, compaction and shallow foundations. Rock Mechanics Module consists of rock material and rock mass behaviours, rock mass strength and deformability, strength of discontinuities, basic rock testing, rock mass classification systems, response of rock mass to underground excavation, stress measurement, time dependant and dynamic behaviour of rocks and rock slope stability (optional).

1.2. Course Completion

Course completion requires submission of all assessment items; failure to submit all assessment items can result in the award of an Unsatisfactory Failure (UF) grade for the Course.

1.3. Assumed Knowledge

CVEN2301 – Mechanics of Solids or equivalent

1.4. Attendance

To pass this course it is expected that you will attend at least 80% of tutorials and lectures. *If your attendance is below 80% you will not be admitted to the final exam.* Attendance will be recorded when applicable. Normally, there is no make-up work for poor attendance. If you have misadventure or ill-health, please contact your course coordinator soon as possible. The attendance requirement is not meant to be punitive. It is included because participation is an important part of achieving the course outcomes.

2. AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

2.1. Course Aims

The purpose of the course is to introduce the student to methods of testing, analysis and design appropriate to structures which consist of soil and rock, rather than steel and concrete.

2.2. Learning Outcomes

At the conclusion of this course, students should be able to:

1. have a working knowledge of the engineering properties of soil and rock,
2. be able to select and use appropriate methods for the design of soil slopes, retaining walls and simple foundations on soil,
3. have the necessary grounding in rock mechanics to embark upon a study of the principles of rock engineering,
4. recognise the evolving nature of the discipline and develop skills to access, evaluate and integrate new knowledge and processes.

2.3. Graduate Attributes

This course will contribute to the development of the following Graduate Attributes:

1. appropriate technical knowledge
2. having advanced problem solving, analysis and synthesis skills with the ability to tolerate ambiguity
3. ability for engineering design and creativity
4. awareness of opportunities to add value through engineering and the need for continuous improvement
5. being able to work and communicate effectively across discipline boundaries
6. having HSEC consciousness
7. being active life-long learners

3. REFERENCE RESOURCES

3.1. Reference Materials

Support material for this course including, whenever available, copies of lecture notes, recommended readings, etc. can be found on Moodle.

The lecture note may be viewed and downloaded from the UNSW-Moodle.

3.2. Text

The recommended textbooks are

- R D Holtz, WD Kovacs and T C Sheahan, *An Introduction to Geotechncial Engineering*, Pearson
- M Budhu, *Soil Mechanics and Foundations*, Wiley.
- B H G Brady and E T Brown, *Rock Mechanics for Underground Mining*, Wiley.
- J C Jaeger, N G Cook, R Zimmerman, Fundamentals of rock mechanics, John Wiley & Sons, 2009

3.3. Other Resources

The University and the Faculty provide a wide range of support services for students, including:

- UNSW Learning Centre (http://www.lc.unsw.edu.au)
- Counselling support - http://www.counselling.unsw.edu.au
- Library training and support services - http://www.library.unsw.edu.au/

3.4. Online Resources

There are numerous articles / information sources on reservoir engineering on the web. Many of them are sound, but many are either very lightweight or contain errors. Be very careful in your choice of web sources. Remember, UNSW librarians are usually happy to help you locate articles or make suggestions regarding possible material to help you in your academic work. You can also access basic online help at http://www.library.unsw.edu.au/

3.5. Report Writing Guide

The School has a report writing guide (RWG) available. A copy of this is available on the course moodle site.

4. COURSE CONTENT AND LEARNING ACTIVITIES

4.1. Course content

1. Introduction to Mining Geomechanics – Soil Mechanics/Rock Mechanics
2. Soil Classification / Soil Phase Relationships and Compaction
3. Effective Stresses and Flow of Water through Soils
4. Shear Strength and Testing of Soils
5. Foundation Design on Soils
6. Rock Mass Behaviour – Intact Rock Strength/Discontinuity Strength
7. Rock Mass Strength
8. Rock Mass Classification
9. Rock Testing and In-situ Stress Measurement
10. Response of Rock Mass to Underground Excavation
11. Time Dependent and Dynamic Behaviour of Rock

4.2. Learning Activities Summary

UNSW Wk	Activity	Content	Presenter (optional)
1	**Lecture + Tutorial**	• Introduction to Mining Geomechanics – Soil Mechanics • Soil Classification • Soil Phase Relationships and Compaction	**JO**
2	**Lecture + Tutorial**	• Effective Stresses and Flow of Water through Soils	**JO**
3	**Lecture + Tutorial**	• Shear Strength and Testing of Soils	**JO**
4	**Lecture + Tutorial**	• Foundation Design on Soils	**JO**
5	**Mid-Term Exam** **Lecture + Tutorial**	• Mid-Term Exam for Soil Mechanics • Introduction to Mining Geomechanics – Rock Mechanics • Rock Mass Behaviour – Intact Rock Strength	**JO** **GS**
6	**Lecture + Tutorial**	• Rock Mass Behaviour – Intact Rock Strength • Rock Mass Behaviour – Discontinuity Strength	**GS**
7	**Lecture + Tutorial**	• Rock Mass Strength • Rock Mass Classification	**GS**
8	**Lecture + Tutorial**	• Rock Testing and In-situ Stress Measurement	**GS**
9	**Lecture + Tutorial**	• Response of Rock Mass to Underground Excavation	**GS**
10	**Lecture + Tutorial**	• Time Dependent and Dynamic Behaviour of Rock	**GS**

Other UNSW Key dates: https://student.unsw.edu.au/new-calendar-dates

*** Lab sessions** will be held on 17th of April, Week 8, from 1:00pm to 5:00pm.

5. COURSE ASSESSMENT

5.1. Assessment Summary

Assessment task	Due date / week	Weight	Assessment	Learning outcomes assessed
1	8 March / w3 29 March / w6	5% 10%	**Soil Mechanics Group Assignment**	1, 2, 4
2	19 March / w5	30%	**Mid-Term Exam** Covering the Soil Mechanics module	1, 2, 3,4
3	30 April / w11	15%	**Rock Mechanics Group Assignment**	1, 3, 4
4	24 April / w10	10%	**Laboratory Work**	4
5	Formal Exam Period	30%	**Final Exam** Covering the Rock Mechanics module	1, 2, 3, 4

Assignments related details/submission-box will be available online through Moodle. Access to the Moodle site is via the Moodle icon on the MyUNSW homepage.

6. ASSESSMENT CRITERIA

The assessment criteria provide a framework for you to assess your own work before formally submitting major assignments to your course convenor. Your course convenor will be using this framework to assess your work and as a way to assess whether you have met the listed learning outcomes and the graduate attributes for your program. We ask that you don't use the assessment criteria guidelines as a checklist, but as a tool to assess the quality of your work. Your course convenor will also be looking at the quality, creativity and the presentation of your written assignment as they review the framework. Rubrics, wherever applicable, will be provided at the time of the assignment release.

Assignments and examination
Answers may be numerical, graphical or descriptive.

Answer is correct and substantiated by complete mathematical working	100%
Deduct for incorrect or unspecified units	20%
Deduct for excessive roundoff error	10%
Answer is correct but not substantiated by complete, correct working	up to 30% depending upon how much of the correct working is given
Answer is incorrect but principles of mathematical working are correct	60%
Add if the answer is of reasonable Magnitude	20%
Add if incorrect only because of an error of transcription of numerical data	10%
Mathematical working is incomplete or incorrect	up to 50% depending upon how much of the correct working is given

Graphical answers

Accuracy with which the data are presented	60%
Layout	20%
Tidiness	20%

Descriptive answers

Completeness and accuracy of answer	70%
Clarity of expression	30%
Deduct for irrelevant material	up to 40%

7. STUDYING A UG COURSE IN UNSW MINERALS AND ENERGY RESOURCES ENGINEERING

7.1. How We Contact You

At times, the School or your course convenors may need to contact you about your course or your enrolment. Your course convenors will use the email function within Moodle or we will contact you on your @student.unsw.edu.au email address.

We understand that you may have an existing email account and would prefer for your UNSW emails to be redirected to your preferred account. Please see these instructions on how to redirect your UNSW emails: https://www.it.unsw.edu.au/students/email/index.html

7.2. How You Can Contact Us

We are always ready to assist you with your inquiries. To ensure your question is directed to the correct person, please use the email address below for:

Enrolment or other admin questions regarding your program:
https://unswinsight.microsoftcrmportals.com/web-forms/

Course inquiries: these should be directed to the Course Convenor.

7.3. Computing Resources and Internet Access Requirements

UNSW Minerals and Energy Resources Engineering provides blended learning using the on-line Moodle LMS (Learning Management System).

It is essential that you have access to a PC or notebook computer. Mobile devices such as smart phones and tablets may compliment learning, but access to a PC or notebook computer is also required. Note that some specialist engineering software is not available for Mac computers.

Mining Engineering Students: OMB G48/49
Petroleum Engineering Students: TETB

It is recommended that you have regular internet access to participate in forum discussion and group work. To run Moodle most effectively, you should have:

- broadband connection (256 kbit/sec or faster)
- ability to view streaming video (high or low definition UNSW TV options)

More information about system requirements is available at www.student.unsw.edu.au/moodle-system-requirements

7.4. Accessing Course Materials Through Moodle

Course outlines, support materials are uploaded to Moodle, the university standard Learning Management System (**LMS**). In addition, on-line assignment submissions are made using the assignment dropbox facility provided in Moodle. All enrolled students are automatically included in Moodle for each course. To access these documents and other course resources, please visit:
www.moodle.telt.unsw.edu.au

7.5. Assignment Submissions

The School has developed a guideline to help you when submitting a course assignment.

We encourage you to retain a copy of every assignment submitted for assessment for your own record either in hardcopy or electronic form.

All assessments must have a assessment cover sheet attached.

7.6. Late Submission of an Assignment

Full marks for an assignment are only possible when an assignment is received by the due date.

We understand that at times you may not be able to submit an assignment on time, and the School will accommodate any fair and reasonable extension. We would recommend you review the UNSW Special Consideration guidelines – see following section.

In the case of the Project Report, penalty marks will be applied at the following rate if submitted after the due date: five (5) percentile points of the maximum possible mark for each day or part thereof that the assessment is overdue.

For example if a student submitted the Project Report five days after the due date and the unadjusted mark was 68% then the final adjustment mark for the assignment would be 43%; that is the raw mark of 68% less 25 percentile points (5 days @ 5 percentile points per day).

7.7. Special Consideration

You can apply for special consideration through UNSW Student Central when illness or other circumstances interfere with your assessment performance. Sickness, misadventure or other circumstances beyond your control may:

- Prevent you from completing a course requirement,
- Keep you from attending an assessable activity,
- Stop you submitting assessable work for a course,
- Significantly affect your performance in assessable work, be it a formal end-of-semester examination, a class test, a laboratory test, a seminar presentation or any other form of assessment.

We ask that you please contact the Course Convenor immediately once you have completed the special consideration application, no later than one week from submission.

More details on special consideration can be found at: www.student.unsw.edu.au/special-consideration

7.8. Course Results

For details on UNSW assessment policy, please visit: www.student.unsw.edu.au/assessment

In some instances your final course result may be withheld and not released on the UNSW planned date. This is indicated by a course grade result of either:

- WD – which usually indicates you have not completed one or more items of assessment or there is an issue with one or more assignment; or

- WC – which indicates you have applied for Special Consideration due to illness or misadventure and the course results have not been finalised.

In either event it would be your responsibility to contact the Course Convener as soon as practicable but no later than five (5) days after release of the course result. If you don't contact the convener on time, you may be required to re-submit an assignment or re-sit the final exam and may result in you failing the course. You would also have a NC (course not completed) mark on your transcript and would need to re-enroll in the course.

7.9. Students Needing Additional Support

The Student Equity and Disabilities Unit (SEADU) aims to provide all students with support and professional advice when circumstances may prevent students from achieving a successful university education. Take a look at their webpage: www.studentequity.unsw.edu.au/

7.10. Academic Honesty and Plagiarism

Your lecturer and the University will expect your submitted assignments are truly your own work. UNSW has very clear guidelines on what plagiarism is and how to avoid it. Plagiarism is using the words or ideas of others and presenting them as your own. Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. The University has adopted an educative approach to plagiarism and has developed a range of resources to support students. All the details on plagiarism, including some useful resources, can be found at www.student.unsw.edu.au/plagiarism.

All Mining Engineering students are required to complete a student declaration for academic integrity which is outlined in the assignment cover sheets. By signing this declaration, you agree that your work is your own original work.

If you need some additional support with your writing skills, please contact the Learning Centre or view some of the resources on their website: www.lc.unsw.edu.au/. The Learning Centre is designed to help you improve your academic writing and communication skills. Some students use the Centre services because they are finding their assignments a challenge, others because they want to improve an already successful academic performance.

7.11. Continual Course Improvement

At the end of each course, all students will have the opportunity to complete a course evaluation form. These anonymous surveys help us understand your views of the course, your lecturers and the course materials. We are continuously improving our courses based on student feedback, and your perspective is valuable.

Feedback is given via https://student.unsw.edu.au/myexperience and you will be notified when this is available for you to complete.

We also encourage all students to share any feedback they have any time during the course – if you have a concern, please contact us immediately.

8. SCHOOL ASSESSMENT COVER SHEET

School of Minerals and Energy Resources Engineering

Assessment Cover Sheet

Course Convenor: _____

Course Code: _____ Course Title: _____

Assignment: _____

Due Date: _____

Student Name: _____ Student ID: _____

ACADEMIC REQUIREMENTS

Before submitting this assignment, the student is advised to review:

- the assessment requirements contained in the briefing document for the assignment;
- the various matters related to assessment in the relevant Course Outline; and
- the *Plagiarism and Academic Integrity* website at < http:/www.lc.unsw.edu.au/plagiarism/pintro.html > to ensure they are familiar with the requirements to provide appropriate acknowledgement of source materials.

If after reviewing this material there is any doubt about assessment requirements, then in the first instance the student should consult with the Course Convenor and then if necessary with the Director – Undergraduate Studies.

While students are generally encouraged to work with other students to enhance learning, all assignments submitted for assessment must be their entire own work and duly acknowledge the use of other person's work or material. The student may be required to explain any or all parts of the assignment to the Course Convenor or other authorised persons. *Plagiarism* is using the work of others in whole or part without appropriate acknowledgement within the assignment in the required form. *Collusion* is where another person(s) assists in the preparation of a student's assignment without the consent or knowledge of the Course Convenor.

Plagiarism and *Collusion* are considered as Academic Misconduct and will be dealt with according to University Policy.

STUDENT DECLARATION OF ACADEMIC INTEGRITY

I declare that:

- This assessment item is entirely my own original work, except where I have acknowledged use of source material [such as books, journal articles, other published material, the Internet, and the work of other student/s or any other person/s].
- This assessment item has not been submitted for assessment for academic credit in this, or any other course, at UNSW or elsewhere.

I understand that:

- The assessor of this assessment item may, for the purpose of assessing this item, reproduce this assessment item and provide a copy to another member of the University.
- The assessor may communicate a copy of this assessment item to a plagiarism checking service (which may then retain a copy of the assessment item on its database for the purpose of future plagiarism checking).

Student Signature: Date:

Students are advised to retain a copy of this assessment for their records and submission should be made in accordance to the assessment details available on the course Moodle site.