School of Minerals & Energy Resources Engineering

UNSW Engineering

MINE5020

Geotechnical Assessment for Underground Mining

Term 1, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Ismet Canbulat	i.canbulat@unsw.edu.au	Appointment or emails	School of Minerals and Energy Resources Engineering OMB 164	0432003064

School Contact Information

School of Minerals and Energy Resources
Old Main Building, Level 1, 159 (K15)
UNSW SYDNEY NSW 2052 AUSTRALIA

Engineering Student Services
E: mere.teaching@unsw.edu.au
W: www.engineering.unsw.edu.au/minerals-energy-resources

Course Details

Units of Credit 6

Summary of the Course

Geotechnical components of exploration programs - requirements, technologies, integration, management. Geotechnical assessment and logging; geophysical methods for geotechnical determinations, in both exploration and operating mine environments; integration of geotechnical data; rock mass characterisation; geotechnical hazard/condition mapping.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Knowledge of geotechnical components of exploration programs	PE1.1
2. Knowledge of geotechnical and geophysical assessment and logging	PE1.5
3. Integration of geotechnical data and rock mass characterisation;	PE1.2
4. Knowledge of geotechnical hazard and condition mapping.	PE1.3

It is intended that students will also be able to:

1. Understand the principles of engineering designs and how these are applied to analyse problems in mining geomechanics.
2. Have a sound working knowledge of fundamental mechanisms and geotechnical principles within the context of practical coal mining applications;
3. Recognise the role and importance of these principles in a comprehensive range of coal mining applications, both from a technical perspective, and from the risk and operational management perspective.
4. Have a knowledge of rock mass classification techniques used in mining rock mechanics
5. Have a knowledge of risk-based designs in underground and open cut mining.

Teaching Strategies

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

1. The skills involved in scholarly enquiry

2. An in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context

3. The ability to engage in independent and reflective learning

4. The skills required for collaborative and multidisciplinary work

5. The skills of effective communication

Additional Course Information

This course is designed to introduce engineers and geologists to the major geomechanics components associated with coal mining operations, from resource evaluation and mine design to daily operations. It is, therefore, ideally suited to open cut and underground coal engineers or geologists who have an understanding and experience in the coal mining industry but are seeking to develop more specialist skills in the geomechanics field.

This course covers the following aspects:

- Geotechnical components of exploration programs - requirements, technologies, integration, management.
- Geotechnical assessment and logging.
- Geophysical methods for geotechnical determinations, in both exploration and operating mine environments.
- Basic statistics and integration of geotechnical data.
- Australian safety statistics and ground control management strategies.
- Rock mass characterisation
- Geotechnical hazard/condition mapping.
- Activities include course presentations and student presentations

The course is structured to provide an initial overview of basic principles and terminology plus the use of geotechnical tool in Australian mining industry.

An important component will be an emphasis on the interdependencies between geotechnical parameters and coal mine design/operational decisions and requirements. The link between geological and engineering disciplines is an important component in successfully managing these dependencies.

This course is an Intensive, four-day workshop program conducted at UNSW from 6 to 9 April 2020.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Individual report on stress mapping	25%	10/04/2022 11:59 PM	1, 2
2. Individual report – Geotechnical hazard plan	35%	24/04/2022 11:59 PM	1, 2, 3, 4
3. Individual report – Calculation of CMRR and one another rock mass technique from your site	40%	08/05/2022 11:59 PM	2, 3, 4

Assessment 1: Individual report on stress mapping

Assessment length: 10 pages
Due date: 10/04/2022 11:59 PM

This assignment is a written assignment that should not exceed 10 pages in total; including the figures, drawings etc. It should address the following points:

1. Illustrate the stress map of your operation;
2. Discuss the methods used in developing the stress map;
3. Discuss the variation of horizontal stress obtained from measurement in your operation;
4. Discuss the potential implications of the stress orientation in relation to the mine layout using drawings, text etc;
5. Provide and discuss some of the conditions observed in your operation caused by horizontal stress;
6. Discuss potential solutions to minimise the stress special effects in your operation.

NOTE: This assignment will require additional reading beyond the lecture material provided.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment criteria

A detailed assessment criteria is included in Moodle to provide a framework for students when preparing assignments in the course as well as a guideline for assessors when marking an assignment. The student is advised to review the relevant framework before undertaking their assignment.

The criteria listed for each item of assessment and the descriptions contained therein are not intended to be prescriptive nor is it an exhaustive list. Rather it should be viewed as a framework to guide the student as to the type of information and depth of coverage that is expected to be evident in a submission for assessment; the framework illustrates for example what would distinguish an excellent achievement from a poor achievement.

The student should be cognisant that a range of factors is often being assessed in any one assignment; not just whether the final results are numerically correct. Consideration is given to other relevant elements that contribute to the *Learning Outcomes* of the course as well as the *Graduate Attributes* of the overall degree program.

The student is cautioned against merely using the assessment criteria as a checklist. When assessing an assignment, elements in the framework will be examined in terms of quality and creativity. Hence ensuring all the listed elements are merely covered in an assignment is often not sufficient in itself and will not automatically lead to full marks being awarded. Other factors such as how the student went about presenting information, how an argument was structured and/or the elements supporting a particular recommendation or outcome are also important.

Finally the framework can also be used to provide feedback to a student on their performance in an assignment.

Assessment 2: Individual report – Geotechnical hazard plan

Due date: 24/04/2022 11:59 PM

Assignment A02 is a written assignment that should not exceed 10 pages in total, including figures, drawings etc. This assignment should address the following issues:

1. Illustrate an example(s) of a typical hazard plan;
2. Discuss the hazard identification procedures;
3. Discuss the methods of displaying the hazards (and hazard level changes) on the plan;
4. Discuss the appropriateness of, and confidence in the “triggers” available to identify changes in hazard level (both elevated and reduced hazard levels);
5. Discuss the implications of the hazards identified to mining;
6. Identify appropriate procedures for communicating the findings to operating and management personnel at the mine.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment criteria

A detailed assessment criteria is included in Moodle to provide a framework for students when preparing assignments in the course as well as a guideline for assessors when marking an assignment. The student is advised to review the relevant framework before undertaking their assignment.

The criteria listed for each item of assessment and the descriptions contained therein are not intended to be prescriptive nor is it an exhaustive list. Rather it should be viewed as a framework to guide the student as to the type of information and depth of coverage that is expected to be evident in a submission for assessment; the framework illustrates for example what would distinguish an excellent achievement from a poor achievement.

The student should be cognisant that a range of factors is often being assessed in any one assignment; not just whether the final results are numerically correct. Consideration is given to other relevant elements that contribute to the *Learning Outcomes* of the course as well as the *Graduate Attributes* of the overall degree program.

The student is cautioned against merely using the assessment criteria as a checklist. When assessing

an assignment, elements in the framework will be examined in terms of quality and creativity. Hence ensuring all the listed elements are merely covered in an assignment is often not sufficient in itself and will not automatically lead to full marks being awarded. Other factors such as how the student went about presenting information, how an argument was structured and/or the elements supporting a particular recommendation or outcome are also important.

Finally the framework can also be used to provide feedback to a student on their performance in an assignment.

Assessment 3: Individual report – Calculation of CMRR and one another rock mass technique from your site

Due date: 08/05/2022 11:59 PM

Assignment 3 should comprise a written report (maximum of 10 pages in total). It should address the following:

1. Demonstrate the calculation of at least 5 CMRR in your mine site (possible in different geotechnical domains);
2. Demonstrate the calculation of at least 5 rock mass roof competencies using one of the another rock mass classification techniques (e.g., RMR, MRMR, Q etc) in your mine site (again possible in different geotechnical domains);
3. Discuss calculation process with at least one had calculation for both CMRR and other technique;
4. Describe the critical features related to CMRR and the other technique in your mine site;
5. Discuss the implications of the CMRR.

Assessment criteria

A detailed assessment criteria is included in Moodle to provide a framework for students when preparing assignments in the course as well as a guideline for assessors when marking an assignment. The student is advised to review the relevant framework before undertaking their assignment.

The criteria listed for each item of assessment and the descriptions contained therein are not intended to be prescriptive nor is it an exhaustive list. Rather it should be viewed as a framework to guide the student as to the type of information and depth of coverage that is expected to be evident in a submission for assessment; the framework illustrates for example what would distinguish an excellent achievement from a poor achievement.

The student should be cognisant that a range of factors is often being assessed in any one assignment; not just whether the final results are numerically correct. Consideration is given to other relevant elements that contribute to the *Learning Outcomes* of the course as well as the *Graduate Attributes* of the overall degree program.

The student is cautioned against merely using the assessment criteria as a checklist. When assessing an assignment, elements in the framework will be examined in terms of quality and creativity. Hence ensuring all the listed elements are merely covered in an assignment is often not sufficient in itself and will not automatically lead to full marks being awarded. Other factors such as how the student went about presenting information, how an argument was structured and/or the elements supporting a particular recommendation or outcome are also important.

Finally the framework can also be used to provide feedback to a student on their performance in an assignment.

Attendance Requirements

The course will be delivered face-to-face and onlince. All students (i.e., face-to-face and online) will be required to attend the course during the dedicated week.

Course Schedule

UNSW Days	Day	Hrs.	Topic	Content/Activities	Presenter
1	14 March	8	Introduction to the Course and the Geotechnical Assessment	Course introduction	IC
				Overview of ground control management in Australian mines	
				Safety in the mining industry; how does it compare to other industries	
				Basic statistics for geotechnical applications	
				Principles of engineering and strata control design	
2	15 March	8	Geotechnical Assessments and risk-based designs	Geotechnical assessment	IC
				Group discussions on hazard mapping and design issues	
				Use of risk-based design examples	
3	16 March	8	Rock mass classification and monitoring in UG mines	Geotechnical logging and rock mass classification CMRR & GSR	IC
				Instrumentation and Monitoring in underground mines	
4	17 March	8	Rock mass classification and monitoring in open cut mines and practical geotechnical management	Other rock mass classification techniques in open cut mining	(Alison McQuillan) Dan Payne

Submission of Assessment Tasks

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 an assessment cover sheet attached.

Course completion

Course completion requires submission of all assessment items. Failure to submit all assessment items may result in the award of an Unsatisfactory Failure (UF) grade for the Course unless special consideration has been submitted and approved. Please note, a competency hurdle of 50% is applied to the final assessment.

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 section below.

Late submission will not be accepted and will be considered as no submission.

Special Consideration

You can apply for special consideration through The Nucleus Student Hub 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

Student Support

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

- Library training and support services - www.library.unsw.edu.au

- UNSW Learning Centre - www.lc.unsw.edu.au
- Counselling support - www.counselling.unsw.edu.au

Equitable Learning Services aims to provide all students with a free and confidential service that provides practical support to ensure that your health condition doesn't adversely affect your studies. https://student.unsw.edu.au/els

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.

Academic Information

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:

- LE – indicates you have not completed one or more items of assessment; or
- WD – indicates 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.

Studying a course in the School of Minerals and Energy Resources Engineering at UNSW

Report writing guide

The School has a Report Writing Guide (RWG) available. A copy of this is available on the course Moodle site.

Computing Resources and Internet Access Requirements

UNSW Minerals and Energy Resources Engineering provides blended learning using the on-line Moodle LMS (Learning Management System). Also see - Transitioning to Online Learning: www.covid19studyonline.unsw.edu.au

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
- Petroleum Engineering Students: TETB LG34 & LG 35

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

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

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 instructions on how to redirect your UNSW emails: "How can I forward my emails to another account?"

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 should be directed to the Course Convenor

Image Credit

Synergies in Sound 2016

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	