

MINE4310

Mine Geotechnical Engineering

Term 1, 2023



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Chengguo Zhang	chengguo.zhang@unsw.edu.au		School of Minerals and Energy Resources Engineering OMB, 159E	+61 2 9385 4035

School Contact Information

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

For current students, all enquiries and assistance relating to enrolment, class registration, progression checks and other administrative matters, please see [The Nucleus: Student Hub](#).

Web & Important Links:

[School of Minerals and Energy Resources](#)

[The Nucleus Student Hub](#)

[Moodle](#)

[UNSW Handbook](#)

[UNSW Timetable](#)

[Student Wellbeing](#)

[Urgent Mental Health & Support](#)

[Equitable Learning Services](#)

[Faculty Transitional Arrangements for COVID-19](#)

Course Details

Units of Credit 6

Summary of the Course

This course provides students with a practical understanding of the application of geotechnical engineering principles in mining - from the perspective of planning, design and operations, covering both, soft and hard rock, as well as underground and open cut mining systems.

The course is intended to develop the capability and requisite skills of a mining engineer to build the foundation of knowledge related to the mining and underground excavation geotechnical problems. This foundation provides a basis on applying geomechanics in mining and tunnelling (design and operations), including mine safety, risk assessment and management systems, and impact of geological factors on geotechnical behaviour and design, tailing dam design considerations.

The course provides an opportunity for the student to bring together engineering principles learned over their previous years of study and apply these principles to innovatively solve problems such as the development of a specific design, process and/or the investigation of a hypothesis.

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.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Recognise the major geotechnical applications and their significance within the mainstream mining systems and conditions	PE1.3, PE2.1, PE3.4
2. Analyse large geotechnical datasets to enable appropriate rock mass characterisation and practical geotechnical design	PE1.2, PE1.3, PE2.1
3. Apply appropriate geotechnical principles and methodologies in a comprehensive range of mining and related applications, both from a technical risk and operational management perspective	PE1.3, PE2.1
4. Identify the innovative opportunities and technological trends in geotechnical engineering applications	PE1.1, PE2.3, PE3.3

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.

Teaching Strategies

This course will be delivered mainly through formal lectures with a combination of active learning tutorials.

Additional Course Information

This course assumes that a student:

- is currently enrolled in the Mining Engineering single degree program or a Mining Engineering double degree program at UNSW; and has satisfactorily completed all the courses in Stages 1 to 3 of the Mining Engineering single degree program or equivalent in the Mining Engineering double degree program and is in the Stage/Year of the program; and
- has successfully completed MINE3430 (Mining Systems) and MINE3310 (Mine Geomechanics); and
- has a sound knowledge of mining terms and systems and has had previous exposure to mining operations through industry employment and/or field trips.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Individual report	15%	09/03/2023 10:00 AM	1, 2, 3
2. Individual report	15%	06/04/2023 10:00 AM	1, 2, 3, 4
3. Individual report	20%	20/04/2023 10:00 AM	1, 2, 3, 4
4. Final Exam	50%	Not Applicable	1, 2, 3, 4

Assessment 1: Individual report

Due date: 09/03/2023 10:00 AM

Assignment 1 will cover the assessment of pillar stability.

Please refer to the assignment document in Moodle for more details.

Assessment 2: Individual report

Due date: 06/04/2023 10:00 AM

Assignment 2 will cover mining method and longwall geomechanics.

Please refer to the assignment document in Moodle for more details.

Assessment 3: Individual report

Due date: 20/04/2023 10:00 AM

The assessment will cover the excavation stability and application of numerical methods.

Please refer to the assignment document in Moodle for more details.

Assessment 4: Final Exam

Final exam

Attendance Requirements

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

Course Schedule

The learning activity summary is a guide only and the indicated week and course content is subject to change.

[View class timetable](#)

Timetable

Date	Type	Content
O-Week: 6 February - 10 February		
Week 1: 13 February - 17 February	Lecture	Wed: Course introduction, Geotechnical exploration, data collection, and analysis for mine design Thu: Ground reaction curve/ Tunnel behaviour
Week 2: 20 February - 24 February	Lecture	Wed: Excavation stability and spans Thu: Rock reinforcement and support
Week 3: 27 February - 3 March	Lecture	Wed: Mining methods selection criteria and geotechnical risks Thu: Mine subsidence, mine fill design and application
Week 4: 6 March - 10 March	Lecture	Wed: Hard Rock Pillar Design Thu: Coal pillar mechanics
	Assessment	Individual report
Week 5: 13 March - 17 March	Lecture	Wed: Longwall Geomechanics Thu: Tutorial - Pillar stability
Week 6: 20 March - 24 March		Feedback on previous sessions
Week 7: 27 March - 31 March	Lecture	Wed: Application of numerical methods to mine design

		Thu: Tutorial – Stope design using numerical modelling
Week 8: 3 April - 7 April	Lecture	Wed: Hard rock caving mechanics Thu: Dynamic rock failures
	Assessment	Individual report
Week 9: 10 April - 14 April	Lecture	Wed: Tailing dam design fundamental principle; Slope stability Thu: Tutorial - Rock mass classifications
	Assessment	Individual report
Week 10: 17 April - 21 April	Lecture	Wed: Instrumentation and monitoring Thu: Smart sensing in mines; Course review
	Assessment	Individual report

Resources

Recommended Resources

Followings are the recommended books for this course.

- MEA Report Writing Guide for Mining Engineers. P Hagan and P Mort (Mining Education Australia (MEA)).
- Rock Mechanics and the Design of Structures in Rock. L Obert & WI Duvall, John Wiley & Sons (1967)
- Fundamentals of Rock Mechanics. JC Jaeger & NGW Cook, Chapman & Hall (1979).
- Rock Mechanics for Underground Mining. GHG Brady & ET Brown, (3rd ed. 2005) published by Springer.
- Coal Mine Ground Control. SS Peng, John Wiley & Sons (1986).
- Geotechnical Instrumentation and Monitoring in Open Pit and Underground Mining. T Szwedzicki (ed.), AA Balkema (1993).
- Rock Support in Mining and Underground Construction. PK Kaiser & DR McCreath (eds.), AA Balkema (1992).
- Rock Slope Engineering. E Hoek & JW Bray, Inst. of Mining & Metallurgy, London (1994).
- Rockbursts in Coal Mines and their Prevention. G Brauner, AA Balkema (1994).
- Australian Coal Mining Practice - Monograph 12. AJ Hargraves, CH Martin (eds.), AusIMM (1975)
- Subsidence Engineers' Handbook. National Coal Board (1975).
- Rock Support and Reinforcement Practice in Mining. E Villaescusa, C Windsor & A Thompson (eds.), AA Balkema (1999).
- Cablebolting in Underground Mines. D Hutchinson & M Diederichs, BiTech Publishers (1996).
- Deep and high stress mining, 1st Int'l Seminar, ACG, Perth, 2002 (This is a series)
- Mass Mining Conf. Series Proceedings. AusIMM, Brisbane. (This is a 4-year series recent one in 2015 in Sydney)
- ISRM 2003 Proceedings - Technology roadmap for rock mechanics, South Africa (SAIMM)
- Ground control in mining - Technology and practice, Proc. Of 1st Aust. Ground control in Mining Conf., UNSW, ed. Hebblewhite, 2003. (This is a series – Recent one in 2014)
- Surface support in mining, ed. Potvin, Stacey & Hadjigeorgiou, ACG - WA, 2004.
- How to Write a Better Thesis, 2002. D Evans and P Gruba (Melbourne University Press: Melbourne)

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.

Late Submission of an Assignment

Full marks for an assessment are only possible when an assessment is received by the due date. Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item. The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date.

Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark, or
- Online quizzes where answers are released to students on completion, or Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or Pass/Fail assessment tasks.

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.

Special Consideration

You may be eligible for special consideration, when an illness or other short-term events beyond your control (exceptional circumstances) affect your assessment performance. More details on special consideration can be found at: www.student.unsw.edu.au/special-consideration

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.

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
- Academic Skills Support - <https://www.student.unsw.edu.au/skills>
- Psychology and Wellness - 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 MERE 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 academic skills, please contact the Academic Skills Support or view some of the resources on their website: <https://www.student.unsw.edu.au/skills>. The Academic Skills Team can provide resources, support and assistance to help you improve your academic 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

Student Resources

This engineering [student resources](#) section collates useful advice and information to ensure you're able to focus on your studies.

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

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.

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

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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	