

# MINE8140

Mining Geomechanics

Term 2, 2023



## Course Overview

### Staff Contact Details

#### Convenors

Name	Email	Availability	Location	Phone
Chengguo Zhang	<a href="mailto:chengguo.zhang@unsw.edu.au">chengguo.zhang@unsw.edu.au</a>		R159, Old main building K15, UNSW Sydney	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](#)

## Course Details

### Units of Credit 6

### Summary of the Course

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

The course content will include the following components:

- Site investigation
- Rock mass classification
- Rock fragmentation
- Mine Design issues
- Caving prediction and control
- Role and application of reinforcement systems
- Geotechnical instrumentation, stress analysis and stability evaluation around complex excavations
- Ground control management and environmental geomechanics.

The course is structured to provide an initial overview of basic principles and terminology plus the major geomechanical properties and behavioural characteristics of rock material.

This then leads into the application of these principles to the practical issues of site investigation, excavation design and ground reinforcement.

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

The course will be presented through a series of lectures, facilitated discussion sessions and case studies, but will also include practical tutorial sessions and laboratory exercises.

### Course Aims

This course aims to equip the student with knowledge and skills to design and select appropriate geomechanics techniques for different mining applications.

### Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Understand the basic mechanical properties of rock and how these are applied to analyse problems in mining geomechanics.	PE1.1, PE1.3
2. Have a sound working knowledge of fundamental mechanisms and geotechnical principles within the context of practical mining	PE1.5, PE2.1

Learning Outcome	EA Stage 1 Competencies
applications.	
3. Recognise the role and importance of these principles in a comprehensive range of mining applications, both from a technical perspective, and from the risk and operational management perspective.	PE1.3, PE2.1, PE2.4
4. Have a broad knowledge of key numerical methods used in mining rock mechanics.	PE1.2, PE1.3

## Teaching Strategies

Completion of this course usually requires around 150 hrs of work. Course delivery accounts for around 40 hrs, hence 110 hrs of additional online and assessment work is required. The formal lectures and laboratory classes are delivered in a Short Course at UNSW (see course overview for schedule). Attendance at all Short Course sessions is compulsory. Prior to the short course you should log into Moodle where teaching and related material is available.

There will be no hard copy notes provided.

## Additional Course Information

This course assumes a student has knowledge of:

- basic mining and geological terms and descriptions;
- as this is a technical course in a postgraduate program, a fundamental understanding of mathematics and physics is required.

## Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Rock mechanics laboratory work	20%	29/07/2023 11:59 PM	1, 4
2. Rock mass classification & hard rock design study	30%	11/08/2023 11:59 PM	2, 3
3. Major Assignment	50%	23/08/2023 11:59 PM	1, 2, 3, 4

### Assessment 1: Rock mechanics laboratory work

**Due date:** 29/07/2023 11:59 PM

Determine rock sample properties and analyse its behaviour under different loading conditions.

Specific assessment information will be provided in course Moodle.

### Assessment 2: Rock mass classification & hard rock design study

**Due date:** 11/08/2023 11:59 PM

This assignment will assess the support requirements for the access decline and the stability of open stopes.

Specific assessment information will be provided in course Moodle.

### Assessment 3: Major Assignment

**Due date:** 23/08/2023 11:59 PM

This assignment will focus on general geomechanics and underground coal geomechanics.

Specific assessment information will be provided in course Moodle.

## Attendance Requirements

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

## Course Schedule

This is a five day block course, and the course schedule is provided in the course program in Moodle.

[View class timetable](#)

### Timetable

Date	Type	Content
Week 7: 10 July - 14 July		<b>Day 1: Fundamentals of Mining Geomechanics – Rock Testing</b>  <b>Day 2: Rock Mechanics and Numerical Analysis</b>  <b>Day 3: General Geomechanics and Coal Geomechanics</b>  <b>Day 4: Hard Rock Geomechanics</b>  <b>Day 5: Hard Rock and Coal Geomechanics</b>

## Resources

### Recommended Resources

- Rock Mechanics for Underground Mining GHG Brady & ET Brown, 3rd edition, Kluwer Academic Press, 2004.
  - 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 Fracture Mechanics. BN Whittaker, RN Singh & G Sun, Elsevier (1992).
  - 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).
  - ISRM Online Journals
- (Note: This is not intended to be a complete list, but a guide only.)

### Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussions with students inside and outside of class. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

### Laboratory Workshop Information

An induction will be required for the lab testing session. It is scheduled Day 1, with more information provided in Moodle.

## 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](http://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](http://www.library.unsw.edu.au)
- Academic Skills Support - <https://www.student.unsw.edu.au/skills>
- Psychology and Wellness - [www.counselling.unsw.edu.au](http://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](http://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](http://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](http://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](http://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](http://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	