



Faculty of Engineering

**School of Minerals and Energy Resources Engineering**

Postgraduate Course Outline

MINE8140

Mining Geomechanics

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## 1. INFORMATION ABOUT THE COURSE

Course Code:	MINE8140	Term:	T2, 2020	Level:	PG	Units/Credits	6 UOC
Course Name:	<b>Mining Geomechanics</b>						

Course Convenor:	<b>Dr Chengguo Zhang</b>		
Contact Details	School of Minerals and Energy Resources Engineering Old Main Building - Rm 163	EMAIL:	<a href="mailto:chengguo.zhang@unsw.edu.au">chengguo.zhang@unsw.edu.au</a>
		Phone:	+61 2 9385 4035
Contact times	<b>This course will be delivered online in T2.</b> Contact times are scheduled for: <ul style="list-style-type: none"><li>• <b>1 - 5 June as a Short Course</b></li></ul>		

### 1.1. Course Description

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 behavioral characteristics of rock material. This then leads to 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.

### 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

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.

## 2. AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

### 2.1. Course Aims

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

### 2.2. Learning Outcomes

It is intended that students will be able to:

1. Understand the basic mechanical properties of rock 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 mining 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.
4. Have a broad knowledge of key numerical methods used in mining rock mechanics

### 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

- Rock Mechanics for Underground Mining GHG Brady & ET Brown, 3<sup>rd</sup> 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.)

### 3.2. Other Resources

- *Guide to Authors*, 2008. (Australasian Institute of Mining and Metallurgy; Melbourne).
- *Style Manual for authors, editors and printers*. 6th edition, (John Wiley & Sons).

### 3.3. Online Resources

Selected readings as well as other supporting material (e.g. course outline and lecture notes will be made available on Moodle.

Videos are often provided to students as a web stream within the Moodle learning management system. Videos are not available for download by students, unless approved by the Course Convenor and either the Undergraduate or Postgraduate Coursework Director. Special consideration can be provided for students to access videos off-line (eg. working remotely). Please contact the Course Convenor for more information. Note that UNSW reserves the right to deliver videos as a web stream rather than off-line, and cannot provide videos that are copyright from other providers.

### 3.4. Software and Hardware

- Roclab

### 3.5. Report Writing Guide

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

## 4. COURSE CONTENT AND LEARNING ACTIVITIES

### 4.1. Learning Activities Summary

Day	Activity	Content	Presenter
1	Lecture + In class activity	Fundamentals of Mining Geomechanics – Rock Testing	Chengguo Zhang
2	Lecture + In class activity	Rock Mechanics and Numerical Analysis	Joung Oh/Chengguo Zhang
3	Lecture + In class activity	Hard Rock Geomechanics	Fernando Vieira
4	Lecture + In class activity	Coal Geomechanics plus General Geomechanics	Ismet Canbulat
5	Lecture + In class activity	Coal Geomechanics plus General Geomechanics	Chengguo Zhang

## 5. COURSE ASSESSMENT

Completion of this course usually requires around 150 hours of work. Course delivery accounts for around 40 hours, hence 110 hours 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.

### 5.1. Assessment Summary

The course will be assessed by take home and in class assignments as shown below.

<i>Item No.</i>	<i>Assessment</i>	<i>Due date/week</i>	<i>Weighting</i>	<i>Learning outcomes</i>
A01	<b>Rock mechanics laboratory work (Individual)</b> (max. 1000 words)	29 June	20%	1, 4
A02	<b>Rock mass classification &amp; hard rock design study (Individual)</b> (Max 1000 words)	14 July	30%	2, 3

A03	<b>Major assignment (Individual)</b> (Max 2000 words)	3 August	50%	1, 2, 3, 4
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## 6. ASSESSMENT CRITERIA

### Assignments and examination

Answers may be numerical, graphical or descriptive.

<i>Answer is correct and substantiated by complete mathematical working</i>	100%
<i>Deduct for incorrect or unspecified units</i>	20%
<i>Deduct for excessive roundoff error</i>	10%
<i>Answer is correct but not substantiated by complete, correct working</i>	up to 30% depending upon how much of the correct working is given
<i>Answer is incorrect but principles of mathematical working are correct</i>	60%
<i>Add if the answer is of reasonable Magnitude</i>	20%
<i>Add if incorrect only because of an error of transcription of numerical data</i>	10%
<i>Mathematical working is incomplete or incorrect</i>	up to 50% depending upon how much of the correct working is given
<i>Graphical answers</i>	
Accuracy with which the data are presented	60%
Layout	20%
Tidiness	20%
<i>Descriptive answers</i>	
Completeness and accuracy of answer	70%
Clarity of expression	30%
Deduct for irrelevant material	up to 40%.

## 7. STUDYING A PG 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 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

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)

## 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](http://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 an 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.

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

## 7.7. 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](http://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](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:

- 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 Convenor as soon as practicable but no later than five (5) days after release of the course result. If you don't contact the convenor 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

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>

## 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](http://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.

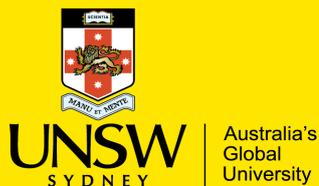
If you need some additional support with your writing skills, please contact the Learning Centre or view some of the resources on their website: [www.lc.unsw.edu.au/](http://www.lc.unsw.edu.au/). The Learning Centre is designed to help you improve your academic writing and communication skills. Some 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.



## 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.**