



Faculty of Engineering

School of Minerals and Energy Resources Engineering

Undergraduate Course Outline

MINE4310

Mine Geotechnical Engineering

Dr Chengguo Zhang

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1. INFORMATION ABOUT THE COURSE

Course Code:	MINE4310	Term:	T1, 2021	Level:	UG	Units/Credits	6 UOC
Course Name:	Mine Geotechnical Engineering						
Course Convenor:	Dr Chengguo Zhang						
Contact Details	School of Minerals and Energy Resources Engineering OMB, 159E	EMAIL:	Chengguo.zhang@unsw.edu.au				
		Phone:	+61 2 9385 4035				
Contact times	Lecture time schedule Monday, 11:00AM - 01:00PM, Online Tuesday, 03:00PM - 05:00PM, Online						

1.1. Course Description

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 opencut mining systems.

The course is intended to develop the capability and requisite skills of an engineer to build the foundation of knowledge related to the mining and tunnelling industry geotechnical problems. This foundation provides a basis on which to design a solution that is robust and safe, cost effective and appropriate to the end-user. 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.

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 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.

1.4. Attendance

To pass this course it is expected that you will attend at least 80% of tutorials and lectures. *Failure to meet the specified attendance requirements of the course may result in the award of an Unsatisfactory Failure (UF) grade for the Course.*

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

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.

2.2. Learning Outcomes

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

1. Recognise the major geotechnical applications and their significance within the mainstream mining systems and conditions
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

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 <http://moodle.telt.unsw.edu.au/>.

3.2. Text

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)

3.3. Other Resources

Links to websites etc.

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/>
- OnePetro – (<http://www.onepetro.org>)

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

- Introduction to Mine Geotechnical Engineering
- Rock mass reinforcement and support
- Mining methods selection criteria and geotechnical risks
- Application of numerical methods to mine design
- Caving mechanics & excavation stability
- Longwall Geomechanics
- Hard rock / coal pillar mechanics and design
- Mine subsidence and backfill
- Dynamic rock failures
- Instrumentation and monitoring (surface and underground)
- Slope stability
- Geotechnical considerations in tailing dam design
- Smart sensing in mines

4.2. Learning Activities Summary

Week	Date	Time (hours)	Content
1a	15 Feb	11:00 - 13:00	Course introduction Geotechnical exploration, data collection and analysis
1b	16 Feb	15:00 - 17:00	Mining methods criteria and geotechnical selection risks
2a	22 Feb	11:00 - 13:00	Excavation stability and spans
2b	23 Feb	15:00 - 17:00	Tutorial – Rock mass classification
3a	1 Mar	11:00 - 13:00	Application of numerical methods to mine design
3b	2 Mar	15:00 - 17:00	Rock reinforcement and support
4a	8 Mar	11:00 - 13:00	Ground reaction curve/ Tunnel behaviour
4b	9 Mar	15:00 - 17:00	Hard Rock Pillar Design
5a	15 Mar	11:00 - 13:00	Coal pillar mechanics
5b	16 Mar	15:00 - 17:00	Tutorial - Pillar
6a	22 Mar	11:00 - 13:00	Feedback on previous sessions
6b	23 Mar	15:00 - 17:00	Feedback on previous sessions
7a	29 Mar	11:00 - 13:00	Subsidence, mine fill design and application
7b	30 Mar	15:00 - 17:00	Hard Rock Caving Mechanics
8a	5 Apr	11:00 - 13:00	Longwall Geomechanics
8b	6 Apr	15:00 - 17:00	Tutorial - Stope design
9a	12 Apr	11:00 - 13:00	Tailing dam design principle Slope stability
9b	13 Apr	15:00 - 17:00	Dynamic rock failures
10a	19 Apr	11:00 - 13:00	Instrumentation and monitoring
10b	20 Apr	15:00 - 17:00	Smart sensing in mines Course review

Notes: The learning activity summary (Section 4.2) is a guide only and the indicated week and course content is subject to change without notice.

Other UNSW Key dates: <https://student.unsw.edu.au/calendar>

5. COURSE ASSESSMENT

5.1. Assessment Summary

Assessment task	Due date / week	Weight	Assessment
1	Week 8	15%	Individual report – pillar stability
2	Week 9	15%	Individual report – longwall geomechanics
3	Week 10	20%	Individual report – excavation stability and application of numerical methods
4	TBA	50%	Final exam

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.

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 conveners may need to contact you about your course or your enrolment. Your course conveners 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 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.

7.7. Special Consideration

You can apply for special consideration through [UNSW Student Central](http://www.unsw.edu.au/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 Convener 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: <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.