MINE8710

Mine Slope Stability

Term 3, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Binghao Li	binghao.li@unsw.edu.au	by appointment	OMB163	93854236

Lecturers

Name	Email	Availability	Location	Phone
Mark Fowler	mere.teaching@unsw.edu.au	mark.fowler@psm.com.au	PSM Sydney office, G3 56 Delhi Road, North Ryde, NSW 2113 Australia	02 98125000
Felicia Weir	mere.teaching@unsw.edu.au	felicia.weir@psm.com.au	PSM Sydney office, G3 56 Delhi Road, North Ryde, NSW 2113 Australia	02 98125000
Richard Brehaut	mere.teaching@unsw.edu.au	richard.brehaut@psm.com.au	PSM Sydney office, G3 56 Delhi Road, North Ryde, NSW 2113 Australia	02 98125001
Gareth Swarbrick	mere.teaching@unsw.edu.au	gareth.swarbrick@psm.com.au	PSM Sydney office G3, 56 Delhi Road, North Ryde, NSW 2113 Australia	02 98125001
Alex Duran	mere.teaching@unsw.edu.au	alex.duran@psm.com.au	PSM Sydney office G3, 56 Delhi Road, North Ryde, NSW 2113 Australia	02 98125001

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

This course will deal with the major topics of engineering geology and groundwater controls on surface mining slope stability in the form of discontinuities, variable materials and pore pressures; effect of excavation method and scheduling in pit stability; the fundamental basis of stability analysis; advantages and disadvantages of a range of mathematical models; remedial measures that can be taken to stabilise slopes; pit slope design in the context of overall mine planning. In addition to dealing with the underlying principles, the course may involve workshops and field inspections so that the participants gain hands-on experience of practical cases.

Teaching Strategies

Please refer to the information in Moodle

Additional Course Information

This course assumes a student has knowledge of:

- basic geological terms and descriptions are assumed; a basic understanding of mining would be beneficial.
- as this is a technical course in a postgraduate program, a fundamental understanding of mining geomechanics; fundamental understanding of basic mathematics, physics would be beneficial.

Assessment

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.

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

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Geotechnical mapping & slope design	50%	11/11/2022 11:59 PM	
2. Mine Slope stability- Rock Mass	50%	11/11/2022 11:59 PM	

Assessment 1: Geotechnical mapping & slope design

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

This assignment comprises 50% of the total assessment. The assessment has two parts. The second part of the exercise will be explained once the first component is completed.

Details see Assignment 1 on Moodle/Teams

Assessment 2: Mine Slope stability- Rock Mass

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

The purpose of this assignment is to provide you experience with estimating rock mass strengths from real data. These strengths are then used to assess the stability of the slopes you have derived from assignment 1.

Details see assignment 2 on Moodle/Teams

Attendance Requirements

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

Course Schedule

This course is delivered in hybrid mode:

- Lecture Room: Old Main Builidng 158
- Online platform MS Teams

Day	Date	Theme(s)	Time	Topic	Presenter
1	Mon 26 Sep	Lectures and Assignment 1	09:30 – 10:30	Introduction & Course Description Remote access MERE Lab Computer	Binghao Li/ Mark Fowler
			10:30 – 11:00	**Morning Tea**	
			11:00 – 12:30	Philosophy of Investigations in Mining Developments Pit development styles and photos	Mark Fowler
			12:30 – 13:00	**Lunch Break**	
			13:00 – 15:00	Pit Slope Desig n-Principles	Mark Fowler
			15:00 – 15:30	**Afternoon tea**	
			15:30 – 16:30	Discontinuity in Soils and Rocks	Mark Fowler
			16:30 – 17:00	Intro Assignment 1	Mark Fowler/ Richard Brehaut
2	Tue 27 Sep	Lectures	09:00 – 10:30	Hard Rock Failure Modes	Felicia Weir
			10:30 – 11:00	**Morning Tea**	
			11:00 – 12:00	Probability of Undercutting	Alex Duran
			12:00 – 12:30	**Lunch Break**	
			12:30 – 14:30	Rock Mass Strength	Alex Duran
			14:30 – 15:00	**Afternoon tea**	
			15:00 – 17:00	Mapping Exercise	Richard Brehaut

3	Wed 28 Sep	Lectures and Assignment 2	08:30 – 10:30	Mapping Exercise	Richard Brehaut
			10:30 - 11:00	**Morning Tea**	
			11:00 – 12:30	Soil and Soft Rock	Gareth Swarbrick
			12:30 – 13:30	**Lunch Break**	
			13:30 – 15:00	Numerical Methods in Rock Slope Engineering	Gareth Swarbrick
			15:00 – 15:30	**Afternoon tea**	
			15:30 – 17:00	Assignment 2 Introduction	Mark Fowler
4	Thu 29 Sep	Lectures	08:30 – 10:30	Ground & surface water	Mark Fowler
			10:30 - 11:00	**Morning Tea**	
			11:00 – 12:30	Hydromechanical Coupling	Mark Fowler
			12:30 – 13:00	**Lunch Break**	
			13:00 – 15:00	Monitoring and Pit Slope Management	Mark Fowler
			15:00 – 15:30	**Afternoon tea**	
			15:30 – 17:00	Ground Based Radars	Hexagon Geosystems/ IDS Shan Naude
5	Fri 30 Sep	Lecturers	09:00 – 10:30	Lab testing	Alex Duran
			10:30 – 11:00	**Morning Tea**	
			11:00 – 12:30	Waste Dumps	Alex Duran
			12:30 – 13:30	**Lunch Break**	
			13:30 – 15:30	Managing Unstable Slopes Pit Slope Design Conclusions	Mark Fowler
			15:30 – 16:00	**Afternoon Tea**	
			16:00 –	Overflow – assignment time if needed	Mark Fowler/Richard Brehaut

Resources

Recommended Resources

There are no prescribed texts for this course. However, the following references may be of assistance, as are a range of industry and professional journals.

- Guidelines for Open Pit Slope Design. J Read & P Stacey CSIOR (2008)
- Guidelines for Evaluating Water in Pit Slope Stability. G Beale & J Read CSIRO (2013)
- 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).
- Geotechnical Instrumentation and Monitoring in Open Pit and Underground Mining. T Szwedzicki (ed.), AA Balkema (1993).
- Rock Slope Engineering. E Hoek & JW Bray, Inst. of Mining & Metallurgy, London (1994).
- ISRM Online Journals

(Note: This is not intended to be a complete list, but a guide only.)

Other resources

- *Report Writing Guide for Mining Engineers,* 2011. P Hagan & P Mort (Mining Education Australia (MEA) ISBN 978 0 7334 3032 9. Available on-line on course homepage.
- *Guide to Authors,* 2008. (Australasian Institute of Mining and Metallurgy; 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 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 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 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

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

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	

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.