MINE8140

Mining Geomechanics

Term 2, 2022
Course Overview

Staff Contact Details

Convenors

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Availability</th>
<th>Location</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chengguo Zhang</td>
<td><a href="mailto:chengguo.zhang@unsw.edu.au">chengguo.zhang@unsw.edu.au</a></td>
<td></td>
<td>R159, Old main building K15, UNSW Sydney</td>
<td>9385 4035</td>
</tr>
</tbody>
</table>

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 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, as well as 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:

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

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>EA Stage 1 Competencies</th>
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<tbody>
<tr>
<td>applications.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>PE1.3, PE2.1, PE2.4</td>
</tr>
<tr>
<td>4. Have a broad knowledge of key numerical methods used in mining rock mechanics.</td>
<td>PE1.2, PE1.3</td>
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### 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

<table>
<thead>
<tr>
<th>Assessment task</th>
<th>Weight</th>
<th>Due Date</th>
<th>Course Learning Outcomes Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rock mechanics laboratory work</td>
<td>20%</td>
<td>20/06/2022 10:00 AM</td>
<td>1</td>
</tr>
<tr>
<td>2. Rock mass classification &amp; hard rock design study</td>
<td>30%</td>
<td>04/07/2022 10:00 AM</td>
<td>2, 3, 4</td>
</tr>
<tr>
<td>3. Major Assignment</td>
<td>50%</td>
<td>25/07/2022 10:00 AM</td>
<td>2, 3, 4</td>
</tr>
</tbody>
</table>

Assessment 1: Rock mechanics laboratory work

**Due date:** 20/06/2022 10:00 AM

This assignment will focus on the analysis of a range of lab testing data, to understand of the behaviour of rock in different loading conditions.

Assessment 2: Rock mass classification & hard rock design study

**Due date:** 04/07/2022 10:00 AM

The assessment will focus on the examination of the stope and excavation stability for geotechnical design.

Assessment 3: Major Assignment

**Due date:** 25/07/2022 10:00 AM

The major assignment will cover the general geomechanics.
Attendance Requirements

Attendance at all Short Course sessions is compulsory. Students are strongly encouraged to attend all lectures or review lecture recordings.

Course Schedule

View class timetable

Timetable

<table>
<thead>
<tr>
<th>Date</th>
<th>Type</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1: 30 May - 3</td>
<td>Lecture</td>
<td>Day 1: Fundamentals of Mining Geomechanics – Rock Testing</td>
</tr>
<tr>
<td>June</td>
<td></td>
<td>Day 2: Rock Mechanics and Numerical Analysis</td>
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<tr>
<td></td>
<td></td>
<td>Day 3: General Geomechanics and Coal Geomechanics</td>
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<td></td>
<td></td>
<td>Day 4: Coal and Hard Rock Geomechanics</td>
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<td></td>
<td></td>
<td>Day 5: Hard Rock Geomechanics</td>
</tr>
<tr>
<td>Week 4: 20 June - 2</td>
<td>Assessment</td>
<td>Rock mechanics laboratory work</td>
</tr>
<tr>
<td>4 June</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 6: 4 July - 8</td>
<td>Assessment</td>
<td>Rock mass classification &amp; hard rock design study</td>
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<tr>
<td>July</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week 9: 25 July - 2</td>
<td>Assessment</td>
<td>Major Assignment</td>
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<tr>
<td>9 July</td>
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Resources

Recommended Resources

- 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 Assessment

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

<table>
<thead>
<tr>
<th>Program Intended Learning Outcomes</th>
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<tbody>
<tr>
<td>Knowledge and skill base</td>
</tr>
<tr>
<td>PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline</td>
</tr>
<tr>
<td>PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline</td>
</tr>
<tr>
<td>PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline</td>
</tr>
<tr>
<td>PE1.4 Discernment of knowledge development and research directions within the engineering discipline</td>
</tr>
<tr>
<td>PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline</td>
</tr>
<tr>
<td>PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline</td>
</tr>
<tr>
<td>Engineering application ability</td>
</tr>
<tr>
<td>PE2.1 Application of established engineering methods to complex engineering problem solving</td>
</tr>
<tr>
<td>PE2.2 Fluent application of engineering techniques, tools and resources</td>
</tr>
<tr>
<td>PE2.3 Application of systematic engineering synthesis and design processes</td>
</tr>
<tr>
<td>PE2.4 Application of systematic approaches to the conduct and management of engineering projects</td>
</tr>
<tr>
<td>Professional and personal attributes</td>
</tr>
<tr>
<td>PE3.1 Ethical conduct and professional accountability</td>
</tr>
<tr>
<td>PE3.2 Effective oral and written communication in professional and lay domains</td>
</tr>
<tr>
<td>PE3.3 Creative, innovative and pro-active demeanour</td>
</tr>
<tr>
<td>PE3.4 Professional use and management of information</td>
</tr>
<tr>
<td>PE3.5 Orderly management of self, and professional conduct</td>
</tr>
<tr>
<td>PE3.6 Effective team membership and team leadership</td>
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</table>