

MINE8760

Mine Geology and Geophysics for Mining Operations

Term 1, 2022



Course Overview

Staff Contact Details

Convenors

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School Contact Information

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W: www.engineering.unsw.edu.au/minerals-energy-resources

Course Details

Units of Credit 6

Summary of the Course

This course will focus on the essential interaction between the disciplines of geology and mining engineering, embracing engineering geology, structural geology, the geotechnical field and applied geophysics within the constraints of ongoing mining operations - the need to operate safely, the need to maintain production and the need to control costs. The impact of engineering geological rock mass properties and structural features on mining operations is evaluated. The likely variability of these parameters and the degree of confidence with which they can be predicted and projected ahead of open pit and underground mining processes and hence used in ongoing mine planning and scheduling will be discussed. Techniques of determining and monitoring the stress regime of the mine will be reviewed. In this context, a major task of the mine geologist is to continually update the technical data base, originally based on exploration data, with new data gathered as mining proceeds and by logging of strategically placed drill holes in advance of mining. Results of and lessons learnt from mining operations must also be incorporated in the data base to assist in reinterpretation of the data and improve prediction of future mining conditions. Modern geophysical techniques are essential aids in this process. These techniques, including 2D and 3D seismic, microseismics, tomography, electromagnetic imaging techniques, radar and downhole geophysical survey methods, will be reviewed in the context of their ability to provide reliable information to assist with mine planning and operational decision making.

This course will enable students to gain knowledge and skills needed for effective communication between disciplines at the geological-engineering interface. Effective exchange of data is of benefit to both. Case histories of mining operations, illustrating particular examples of mining operational problems and solutions, will be presented. As well, case studies of various mining situations will be presented for class and syndicate evaluation and identification of operational strategies.

Course Aims

This course aims to provide mine geologists and mining engineers an understanding of the essential interaction between the two disciplines in ongoing mining operations. The mine geologist must understand enough of the mining process to appreciate what data mining engineering needs and why it is needed. The mining engineer must understand enough about the mine geologist role to appreciate what support the mine geologist can provide and the data that must be gathered and interpreted to make that support possible.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Demonstrate knowledge of mine geology practices and modern geophysical techniques.	PE1.1, PE1.3
2. Identify and assess short and long term information requirements - for mine feasibility, planning, construction and mine operations.	PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE2.3, PE3.6

Learning Outcome	EA Stage 1 Competencies
3. Undertake presentations that develop essential communication skills.	PE3.2, PE3.4
4. Apply this knowledge to critically review mine geology & geophysics practices at a mine.	PE1.3, PE1.5, PE2.1, PE2.2, PE3.2, PE3.3, PE3.5

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.

Teaching Strategies

Presentations and reading material are provided to provide students with technical information and examples of how geology and geophysical information is used at various stages of mining. The presentations are delivered (recorded) by different lecturers who have expertise in that specific area.

Discussions will be used to encourage students to articulate and defend positions, consider different points of view and evaluate evidence.

Case studies will be used to provide practice in identifying potential problems and evaluating alternative course of actions.

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.

It is recommended that approximately 150 hours is required for satisfactory performance in this course, depending on background and experience. It is the students' responsibility to manage and plan workloads as much as possible to enable a minimum of 8 hours per week, plus time for assessments. Some weeks may require 20 to 50 hours.

Note: 150 hours is indicative only – It reflects the anticipated level of total student involvement with the course – either through accessing or participating in online materials and activities; private research; preparation of assignments. Individual students may find their level of involvement differs from this schedule.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online quizzes and participation weekly and general discussion forums	20%	Refer to Moodle	1, 2, 3
2. Geological information and mining requirements matrices	10%	Refer to Moodle	1, 2
3. Geophysical logs exercise	20%	Refer to Moodle	1, 2
4. Critical review of mine geology OR geophysics practices at a selected mine	50%	Refer to Moodle	1, 2, 3, 4

Assessment 1: Online quizzes and participation weekly and general discussion forums

Start date: Refer to Moodle

Due date: Refer to Moodle

Provided in the Moodle.

Assessment 2: Geological information and mining requirements matrices

Start date: Refer to Moodle

Due date: Refer to Moodle

Provided in the assignment.

Assessment 3: Geophysical logs exercise

Start date: Refer to Moodle

Due date: Refer to Moodle

Provided in the assignment.

Assessment 4: Critical review of mine geology OR geophysics practices at a selected mine

Start date: Refer to Moodle

Due date: Refer to Moodle

Provided in the Major project.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Attendance Requirements

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

Course Schedule

Webinars

There will be a live webinar every Tuesday from 17:30 to 18:30 AEST. Your participation in live webinars is preferable for learning outcomes, or you may miss opportunities for interactive queries and demonstrations of technical examples. However, if you are unable to join the live webinar or would like to view part of it again, webinars are generally recorded and are automatically available from the same online link, usually within about 24 hours of the webinar.

Note: International students will be required to attend the webinars.

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 14 February - 18 February	Lecture	Overview geoinformation & uncertainty Overviews of mining info requirements, types of geoinformation, geological materials and structures, mine geology, coal geology
	Online Activity	Discussions forum Quizzes
Week 2: 21 February - 25 February	Lecture	Geophysical & geological investigation I Geophysical investigations (indirect), petrophysics, geophysical bore logs, quantitative logs, drilling and coring (direct investigations)
	Online Activity	Discussions forum Quizzes
Week 3: 28 February - 4 March	Lecture	Geophysical & geological investigation II Geological mapping and stereographic projection techniques, geophysical strata rating, airborne geophysics, seismic surveying, micro-seismic methods
	Online Activity	Discussions forum Quizzes

Week 4: 7 March - 11 March	Lecture	Geotechnical information Seismicity and stresses, coal mining geomechanics
	Online Activity	Discussions forum Quizzes
Week 5: 14 March - 18 March	Lecture	Hydrogeology, ore geology Hydrogeology – flow & dewatering, ore geology and iron ore, the geology of gold, metalliferous deposits
	Online Activity	Discussions forum Quizzes
Week 6: 21 March - 25 March	Lecture	Resource estimation, JORC Techniques for resource estimation, JORC resource/reserve estimation code
	Online Activity	Discussions forum Quizzes
Week 7: 28 March - 1 April	Project	Complete major project

Resources

Prescribed Resources

Reference materials are provided in the Moodle.

Report Writing Guide for Mining Engineers, 2011. P Hagan & P Mort (Mining Education Australia (MEA)
ISBN 978 0 7334 3032 9.

Guide to Authors, 2008. (Australasian Institute of Mining and Metallurgy; Melbourne).

Style Manual for authors, editors and printers. 6th edition, (John Wiley & Sons).

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. Please note, a competency hurdle of 50% is applied to the final assessment.

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 section below.

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

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 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. 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

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

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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	✓