MINE5050

Ground Control Principles and Practice in Underground Coal Mining

Term 1, 2023

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Ismet Canbulat	i.canbulat@unsw.edu.au	By appointment	159G	93820721

School Contact Information

School of Minerals and Energy Resources
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UNSW SYDNEY NSW 2052 AUSTRALIA

For current students, all enquiries and assistance relating to enrolment, class registration, progression checks and other administrative matters, please see The Nucleus: Student Hub.

Web & Important Links:
School of Minerals and Energy Resources
The Nucleus Student Hub
Moodle
UNSW Handbook
UNSW Timetable
Student Wellbeing
Urgent Mental Health & Support
Equitable Learning Services
Faculty Transitional Arrangements for COVID-19

Course Details

Units of Credit 6

Summary of the Course

Welcome to MINE/MNNG5050, ground control principles and practice in underground coal mining.

This course looks at the principles of rock reinforcement; active/passive support; support requirements for different excavation types and mining methods; ground reaction curves; load and displacement controlled support response; types of ground support/reinforcement hardware and related systems; design of support systems; interaction of mining method, layout and reinforcement systems; ground support installation and quality assurance; time effects on ground support systems and remedial options. Risk-based ground support systems and the integration of these systems into ground control management also form a major component of this course. An underground visit will also take place as part of this course.

Course Aims

This course aims to equip the student with knowledge and skills in ground control principles, processes and systems for all stages of mining operations. It will also cover the major ground control design methodologies in use and new developments in leading practice, with the aim of safe and efficient mining operations.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Knowledge of principles of rock reinforcement	PE1.2, PE1.3
2. Knowledge of support requirements for different excavation types and mining methods	PE1.2, PE1.3
3. Knowledge of types of ground support/reinforcement hardware and related systems	PE2.1
4. Knowledge of interaction of mining method, layout and reinforcement systems	PE1.5, PE2.1
5. Practice of ground support installation and quality assurance	PE1.5, PE3.4

Teaching Strategies

This course is worth 6 UOC. It will be presented in a block mode. It is recommended that approximately 150 hours is required for this course, for satisfactory performance in this program, 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.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Factor of Safety Concept	35%	Not Applicable	1, 4
2. Design Methodology and Support System	35%	Not Applicable	1, 2, 3, 4, 5
3. Ground support Design	30%	Not Applicable	1, 2, 3, 4

Assessment 1: Factor of Safety Concept

Describe the empirical, analytical, and numerical modelling techniques in ground support design with examples for each methodology.

What are the fundamental difference these methods?

Advantages and disadvantages of different design methodologies.

Please refer to Moodle for further details of this assessment

Assessment 2: Design Methodology and Support System

Prepare a report-style write-up on ground support design exercise that you have undertaken, or been associated with. Comment on the:

- design planning,
- design outcomes required,
- input data used,
- the robustness of the design to deal with variability and uncertainty in conditions,
- the assessment methodology used and how the outcomes were evaluated for credibility prior to being implemented,
- provide comments on the residual risks inherent in the design outcomes (i.e., those existing when the design is implemented) and how they can be managed during operations if required.

For further information on this assessment, please refer to Moodle.

Assessment 3: Ground support Design

Prepare a report-style write-up discussing the following issues:

1. What do you understand as the fundamental geotechnical differences between soft and stiff support/reinforcement regimes?
2. Discuss the potential applications and merits/deficiencies for both soft and stiff support systems.
3. What are the fundamental differences, in terms of geotechnical driving mechanisms and behaviour – between rib and roof mechanics/behaviour?
4. How would you decide on the support design methodology (e.g., empirical, numerical, analytical etc).

For further information on this assessment please refer to Moodle.

Attendance Requirements

To pass this course it is expected that you will attend 100% of lectures. If you have misadventure or ill-health, please contact your course coordinator as 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.

Course Schedule

This s a block course that will run from 6th to 9th March 2023.

Resources

Prescribed Resources

- Galvin, J.M. (2016). Ground Engineering Principles and Practices for Underground Coal Mining. Springer International Publishing. ISBN 978-3-319-25003-8. DOI 10.1007/978-3-319-25005-2.
- Bieniawski, Z.T. (1984). Rock mechanics design in mining and tunnelling, A.A. Balkema, Rotterdam.
- Bieniawski, Z.T. (1987). Strata control in mineral engineering, John Wiley and Sons. pp. 29-37.
- Bieniawski, Z.T. (1989). Engineering rock mass classifications. Wiley, NY, 251 pp.
- Brady, B. H. G., and Brown, E. T. (2006). Rock Mechanics for Underground Mining. (Third ed.). Cordrecht: Springer.
- Deep Mines Coal Industry Advisory Committee (DMCIDC), (1996). Guidance on the use of rockbolts to support roadways in coal mines. HSE Books, UK.
- Deep Mines Coal Industry Advisory Committee, Health and Safety Commission. (1996). Guidance on the use of rockbolts to support roadways in coal mines.
- Hoek, E. (2007). Practical Rock Engineering. Rocscience Hoek's corner. http://www.rocscience.com/hoek/Hoek.asp.
- Hoek, E. and Brown, E. T. (1980). Underground excavations in rock. Institution of Mining and Metallurgy.
- Hoek, E., Kaiser, P. K., and Bawden, W. F. (1995). Support of Underground Excavations in Hard Rock. Rotterdam: A.A. Balkema.
- Hutchinson, D. J., and Diederichs, M. S. (1996). Cablebolting in Underground Mines. Richmond, BC: BiTech Publishers.
- Jaeger, J. C., and Cook, N. G. W. (1979). Fundamentals of Rock Mechanics (Third ed.). London: Chapman and Hall.
- Peng, S.S. (1986). Coal mine ground control, 2nd edition, John Wiley and Sons, Inc. U.S.A.
- Van der Merwe, J.N. and Madden, B.J. (2002). Rock engineering for coal mining. Safety in Mines Research Advisory Committee (SIMRAC). SAIMM Special Publications Series 7. April.

Recommended 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.

Laboratory Workshop Information

The ALTS training will be delivered in the computer laboratry.

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 may be eligible for special consideration, when an illness or other short-term events beyond your control (exceptional circumstances) affect your assessment performance. More details on special consideration can be found at: www.student.unsw.edu.au/special-consideration

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.

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
- Academic Skills Support - https://www.student.unsw.edu.au/skills
- Psychology and Wellness - 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 academic skills, please contact the Academic Skills Support or view some of the resources on their website: https://www.student.unsw.edu.au/skills. The Academic Skills Team can provide resources, support and assistance to help you improve your academic 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

Student Resources

This engineering student resources section collates useful advice and information to ensure you're able to focus on your studies.

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

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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	