



UNSW

UNSW Course Outline

MINE5040 Coal Mining Methods, Mine Planning and Applied Geomechanics - 2024

Published on the 27 May 2024

General Course Information

Course Code : MINE5040

Year : 2024

Term : Term 2

Teaching Period : T2

Is a multi-term course? : No

Faculty : Faculty of Engineering

Academic Unit : School of Minerals & Energy Resources Engineering

Delivery Mode : In Person

Delivery Format : Standard

Delivery Location : Kensington

Campus : Sydney

Study Level : Postgraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

In this course, a range of mining methods used in underground coal mining and the core

geotechnical parameters and criteria that affect the choice or application of the methods are presented. Mine entry systems; pillar mechanics and design procedures; geomechanics of longwall mining; caving mechanics, periodic weighting, windblasts; outbursts and rock bursts/bumps; pillar extraction; highwall mining; mine subsidence mechanics and design; geotechnical equipment considerations; mine planning considerations; geotechnical design methodologies (methods, excavations, pillars etc.). A range of case studies will supplement this course content. Activities include course presentations and student assignments.

Course Aims

This course aims to equip the student with knowledge and skills to design and select appropriate engineering techniques for different mining applications.

Relationship to Other Courses

MINE5010, MINE5020 and MINE5030.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Examine mining methods used in underground coal mining and the core geotechnical parameters in different mining methods.
CLO2 : Apply the principles of coal pillar mechanics and design procedures
CLO3 : Develop knowledge of longwall mining and caving mechanics and associated risks.
CLO4 : Recognise mine subsidence mechanics and design for subsidence control.
CLO5 : Review mine planning considerations and design methodologies.

Course Learning Outcomes	Assessment Item
CLO1 : Examine mining methods used in underground coal mining and the core geotechnical parameters in different mining methods.	<ul style="list-style-type: none">• Individual Report: Dynamic Failure and Longwall periodic weighting• Pillar design exercise• Individual Report: Crandall Canyon
CLO2 : Apply the principles of coal pillar mechanics and design procedures	<ul style="list-style-type: none">• Individual Report: Dynamic Failure and Longwall periodic weighting• Pillar design exercise• Individual Report: Crandall Canyon
CLO3 : Develop knowledge of longwall mining and caving mechanics and associated risks.	<ul style="list-style-type: none">• Individual Report: Dynamic Failure and Longwall periodic weighting• Individual Report: Crandall Canyon
CLO4 : Recognise mine subsidence mechanics and design for subsidence control.	<ul style="list-style-type: none">• Pillar design exercise• Individual Report: Crandall Canyon
CLO5 : Review mine planning considerations and design methodologies.	<ul style="list-style-type: none">• Pillar design exercise• Individual Report: Crandall Canyon

Learning and Teaching Technologies

Moodle - Learning Management System

Additional Course Information

This course covers the following aspects:

- Pillar design
 - Pillar loading
 - Pillar strength
- Longwall geomechanics
- Periodic weighting
- Pillar extraction

- Windblast and airblast mechanisms and controls
- Mine subsidence
- Other mine design applications
 - Thick seam mining issues and
 - Top coal caving,
- Practical case studies in longwall geomechanics

The course is structured to provide an initial overview of basic principles and terminology plus the use of geotechnical tools in Australian mining industry.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Individual Report: Dynamic Failure and Longwall periodic weighting Assessment Format: Individual	30%	
Pillar design exercise Assessment Format: Individual	35%	
Individual Report: Crandall Canyon Assessment Format: Individual	35%	

Assessment Details

Individual Report: Dynamic Failure and Longwall periodic weighting

Assessment Overview

1. Dynamic Geotechnical Events

Provide a succinct definition and/or description; summary of the range of conditions (parameters) required; plus the geotechnical mechanisms involved in each of the following dynamic events that can occur in underground coal mines:

- rock burst or coal burst
- dynamic (sudden) pillar system collapse

Discuss the above events types and for each of the two event types, identify the prevention and/or control strategies available to mitigate against such events.

This should be a maximum 5-page assignment and will require additional reading beyond the lecture material provided.

2. Longwall Periodic Weighting

What is meant by periodic weighting? Explain in terms of geotechnical conditions and mechanisms, with the aid of sketches.

Obtain some face monitoring data from your own mine (or any other documented or available site) that illustrates the phenomenon of periodic weighting and the associated mechanisms. What prevention/control strategies are available to mitigate against varying levels of periodic weighting severity?

This should be a maximum 5-page assignment and will require additional reading beyond the lecture material provided.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports. Assessment criteria (rubric) will be provided under assessment on Moodle.

Course Learning Outcomes

- CLO1 : Examine mining methods used in underground coal mining and the core geotechnical parameters in different mining methods.
- CLO2 : Apply the principles of coal pillar mechanics and design procedures
- CLO3 : Develop knowledge of longwall mining and caving mechanics and associated risks.

Detailed Assessment Description

Further course assessment information will be provided on Moodle.

Assignment submission Turnitin type

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

Pillar design exercise

Assessment Overview

You are to design a system of longwall chain pillars for the first 10 adjacent LW panels of a mine (with respect to geotechnical design criteria).

The following parameters exist at the mine:

- The following parameters exist at the mine:
- Longwalls 1 – 3, depths range from 200m to 300m, variable across the panels.
- Longwalls 4 – 10, outbye depths, variable in the 200m – 300m range, inbye depths up to 375m.
- Seam dip <5° toward the inbye end of the panels.
- Longwalls 1 – 3 are located under prime rural/partial residential land, with subsidence

restrictions applied, such that face length is limited to 120m, such that long term surface subsidence is restricted to below a certain limiting value.

- Longwalls 4 – 10 will have a face length of 300m.
- Seam thickness is 4m, all potentially minable by the longwall.
- Gateroads are to be mined at 3.2m height and 5.2m width – maingate in the bottom of the seam; tailgate in the top of the seam.
- On the tailgate end of the face, it is planned to cut the floor of the tailgate out at full seam thickness.

Geological conditions:

- Assume an immediate strong siltstone floor, from 1m to 2.0m in thickness, overlying 3.0m thick claystone, overlying a competent, massive sandstone floor for 5m – 10m below the seam.
- Assume a weak laminated mudstone/shale roof for 5m, overlain by interbedded massive sandstones and shales.
- Other geological detail – make your own assumptions, as you deem necessary.

Stress conditions:

- Assume a 2.5:1 ratio of major horizontal to vertical stress (with intermediate stress equal to vertical stress). Major principal stress oriented at right angles to gateroad direction.
1. Carry out a chain pillar design exercise, for each set of gateroad pillars for the first 10 LW blocks using ALTS design methodology.
 2. Conduct the calculations using another design methodology (e.g., ALPS or UNSW), providing a clear explanation of (i) how you have carried out the designs, and (ii) where any assumptions have been made and why
 3. Compare and discuss the results of the two design methodologies, their applicability and limitations of them.

Assignment should be ~15 pages long, plus plans, sketches etc where necessary.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports. Assessment criteria (rubric) will be provided under assessment on Moodle.

Course Learning Outcomes

- CLO1 : Examine mining methods used in underground coal mining and the core geotechnical parameters in different mining methods.
- CLO2 : Apply the principles of coal pillar mechanics and design procedures
- CLO4 : Recognise mine subsidence mechanics and design for subsidence control.
- CLO5 : Review mine planning considerations and design methodologies.

Detailed Assessment Description

Further course assessment information will be provided on Moodle.

Assignment submission Turnitin type

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

Individual Report: Crandall Canyon

Assessment Overview

Use the UNSW Pillar Design Procedures to calculate the strength and likely stability conditions for the pillars in the panel associated with the Crandall Canyon disaster. Consider the pillar loading both on development and on extraction. Make assumptions, as appropriate, and justify them.

This should be a ~10-page assignment and will require additional reading beyond the lecture material provided.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports. Assessment criteria (rubric) will be provided under assessment on Moodle.

Course Learning Outcomes

- CLO1 : Examine mining methods used in underground coal mining and the core geotechnical parameters in different mining methods.
- CLO2 : Apply the principles of coal pillar mechanics and design procedures
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- CLO5 : Review mine planning considerations and design methodologies.

Detailed Assessment Description

Further course assessment information will be provided on Moodle.

Assignment submission Turnitin type

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

General Assessment Information

The assessment criteria provide a framework for students when preparing assignments in the course as well as a guideline for assessors when marking an assignment. The student is advised to review the relevant framework before undertaking their assignment.

The criteria listed for each item of assessment and the descriptions contained therein are not

intended to be prescriptive nor is it an exhaustive list. Rather it should be viewed as a framework to guide the student as to the type of information and depth of coverage that is expected to be evident in a submission for assessment; the framework illustrates for example what would distinguish an excellent achievement from a poor achievement.

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.

The student is cautioned against merely using the assessment criteria as a checklist. When assessing an assignment, elements in the framework will be examined in terms of quality and creativity. Hence ensuring all the listed elements are merely covered in an assignment is often not sufficient in itself and will not automatically lead to full marks being awarded. Other factors such as how the student went about presenting information, how an argument was structured and/or the elements supporting a particular recommendation or outcome are also important.

Finally the framework can also be used to provide feedback to a student on their performance in an assignment.

Grading Basis

Standard

Course Schedule

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.

General Schedule Information

General schedule will be provided on Moodle.

Course Resources

Recommended Resources

- MEA Report Writing Guide for Mining Engineers. P Hagan and P Mort (Mining Education

Australia (MEA)). (Latest edition available for download from the School website or a hardcopy version is available from the UNSW Bookshop)

- Ground Engineering - Principles and Practices for Underground Coal Mining JM Galvin, Springer 2016.
- Rock Mechanics for Underground Mining GHG Brady & ET Brown, 3rd edition, Kluwer Academic Press, 2004.
- 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.
- Coal Mine Ground Control. SS Peng, John Wiley & Sons 1986.
- Longwall mining. SS Peng and HS Chiang. John Wiley and Sons Ltd. ISBN 10: 0978938305 ISBN 13: 9780978938307.
- 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.
- There are also a range of additional information uploaded on to Moodle.

Course Evaluation and Development

The student feedback will be collated through myExperience. The students are strongly encouraged to complete myExperience.

Students' honest, constructive feedback is valued. Results from this survey help enhance courses and teaching at UNSW. Your feedback makes a difference for the next group of students taking your courses, just as feedback from students taking courses you plan to take makes a difference for you.

myExperience is confidential, your identity is not included in reports. Results of the survey are not made available until your course results are released.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Ismet Canbulat		OMB 156	432003064	Appointment or emails	No	Yes

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Equitable Learning Services](#)

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: [https://www.unsw.edu.au/engineering/student-life/
student-resources/program-design](https://www.unsw.edu.au/engineering/student-life/student-resources/program-design).

Note: This course outline sets out the 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 or your primary learning management system (LMS) 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/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off 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. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

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, per calendar day.

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 clearly 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;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

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.

Submission of Assessment Tasks

We encourage you to retain a copy of every assignment submitted for your own record, either in hardcopy or electronic form. All assessments must have an assessment cover sheet attached (if required).

Student Resources

The School has [student resources](#) section, containing 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 online Moodle LMS (Learning Management System). Also see - Transitioning to Online Learning: www.covid19studyonline.unsw.edu.au

Note that some specialist engineering software is not available for Mac computers.

- Mining Engineering Students: OMB G48
- Petroleum Engineering Students: TETB LG34 & LG35

For 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

School Contact Information

School of Minerals and Energy Resources Engineering
Old Main Building, Level 1, 159 (K15)
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](#)