School of Minerals & Energy Resources Engineering

UNSW Engineering

MINE8930

Uranium mining fundamentals

Term 2, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
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School Contact Information

School of Minerals and Energy Resources
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Engineering Student Services
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Course Details

Units of Credit 6

Summary of the Course

Uranium mining fundamentals will cover all stages of mining from exploration of ore geology, to mine feasibility and design, mine operation, mine closure, and rehabilitation. Global and Australian uranium potential and leading practices for mining uranium will be evaluated and critiqued. Mining methods considered for efficient and safe extraction of uranium will include open cut, underground, and In Situ Recovery (ISR) leach methods. The fundamentals of mine geomechanics, including slope stability and ground support requirements will be presented as part of mining method selection, along with consideration of grade control and ventilation for safe underground mining. Fundamentals of milling and chemical processing of uranium ore will be presented, focusing mostly on production to the yellowcake stage (uranium oxide powders). Technical aspects of mining and milling operations are complemented with consideration of health and safety, economic, community, environmental, and regulatory issues associated with uranium mining, presented within a risk management framework. For example, water and waste management issues at uranium mines will be introduced in the context of safe and efficient operations and environmental sustainability.

Course Aims

The course aims to provide an introduction to uranium mining for engineers, geologists and other industry professionals.

The uranium mining part of the 'nuclear cycle' is essential to energy production that is safe, efficient and minimises environmental affects.

The course aims to cover geology of uranium deposits, uranium mining practices, milling and processing, and management of mining wastes and mine closure from an Australian and international perspective.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Demonstrate knowledge of uranium mining practices from feasibility assessment, operations to closure, including associated exploration and milling practices. This knowledge is to demonstrate ethical practice and social responsibility in an international context.	PE1.3, PE2.3, PE3.1

Learning Outcome	EA Stage 1 Competencies
2. Identify and assess information requirements for designing a uranium mine as an open cut, underground or ISR (in situ recovery leach), and for safe and efficient mining and milling operatons including consideration of ground support and ventilation. Skills to locate, critically evaluate and use information are to be developed in an interdisciplinary context that draws on geology, minerals processing, and many aspects of engineering practice.	PE1.4, PE2.1
3. Undertake presentations that develop essential communications skills and collaborative team work. Team work skills are to recognise diversity and the importance of working within an international community.	PE3.2, PE3.6
4. Apply this knowledge to critically review uranium mining practices and to creatively solve problems in a manner that is responsive to change.	PE2.4

Teaching Strategies

Strategies and rationale in this course will ensure that learning outcomes develop UNSW graduate attributes.

Additional Course Information

Course Completion

Course completion requires submission of **all assessment items**; failure to submit all assessment items will result in the award of an Unsatisfactory Failure (UF) grade for the Course.

Assumed Knowledge

This course assumes a student has knowledge of basic technical principles. A background in engineering, chemistry, and physics would be an advantage but is not essential for the course. As a fundamental course, basic concepts in mining engineering and related disciplines will be introduced.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Technical exercise	25%	4 July 2022	1, 2
2. Group Presentation	15%	10 June 2022	1, 2, 3
3. Major Project	40%	25 July 2022	1, 2, 3, 4
4. Participation in discussion forum	10%	20 June 2022	1, 2
5. Participation in blogs and general discussion boards	10%	Not Applicable	2, 4

Assessment 1: Technical exercise

Start date: 6 June 2022
Assessment length: max 2000 words
Due date: 4 July 2022

Select **a company that mines uranium** with publically available resource data. This could be a company with reports on their website, or reports submitted to stock exchanges (eg. New York, ASX Sydney).

- Briefly describe the uranium deposit(s) and mining methods of this company (max 500 words)
- Compile and evaluate trends in selected company uranium resources and reserves over at least 3 years and preferably longer. Include tables and graphs of uranium resources with appropriate JORC and/or IAEA classifications. An .xls file is available for you to modify and enhance.
- Express the total resources and reserves both as U3O8 and as total uranium metal, and in reported cut-off grade and/or cost of production categories.
- Briefly discuss the significance of any trends in reports for the selected uranium mining company relative to supply and demand factors in a national and/or international context. (max 1000 words)

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

Assessment criteria

will be provoided in the course Moodle

Assessment 2: Group Presentation

Start date: 6 June 2022
Due date: 10 June 2022

A review of uranium operation and presentation

Assessment criteria

Will be provided in tne course Moodle

Assessment 3: Major Project

Start date: 10/06/2022 12:00 AM
Due date: 25 July 2022

A critical review of current and leading practices for **uranium mining** operations including at least three case study examples. Focus on the operational stage of mining and present a case for improving risk management of the operation with regard to productivity, safety and environment.

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

Assessment criteria

Will be available in the course Moodle

Assessment 4: Participation in discussion forum

Start date: 10 June 2022
Due date: 20 June 2022

Assessment of group presentations

Assessment criteria

Will be povided in the course outline

Assessment 5: Participation in blogs and general discussion boards

Participation in blogs and general discussion boards

Assessment criteria

Will be provided in the course Moodle

Attendance Requirements

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

Resources

Prescribed Resources

Selected readings as well as other supporting material (e.g. course outline and lecture material etc) will be made available on LTMS.

Recommended Resources

- OECD, 2020. Uranium 2020: Resources, Production and Demand. Nuclear Energy Agency, OECD, International Atomic Energy Agency (IAEA). PDF available free on-line through UNSW library.
- Hore-Lacy, I., The World Nuclear University Primer. Nuclear Energy in the 21st Century, 3rd Edition, World Nuclear University Press, ISBN: 978-0-9550784-5-3. Order online (currently GBP25)
- hhttps://world-nuclear.org/
- Australia (MEA) ISBN 978 0 7334 3032 9. Available on-line: https://www.unsw.edu.au/engineering/sites/default/files/documents/Report_Writing_Guide_for_Engineers_2018ed.pdf
- *Guide to Authors,* 2008. (Australasian Institute of Mining and Metallurgy; Melbourne).

Course Evaluation and Development

MyExperience will be used to get feedback from students.

Laboratory Workshop Information

N/A

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

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	✓