UNSW Course Outline

MINE8870 Space Resources Engineering - 2024

Published on the 17 May 2024

General Course Information

Course Code : MINE8870
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 : Research, Postgraduate, Undergraduate
Units of Credit : 6

Useful Links

Class Timetable

Course Details & Outcomes

Course Description

In-situ space resources utilisation (ISRU) also means space mining is possibly one of the most world-changing ideas and the focus so far has been on solving the engineering challenges. Many scientists agree that, soon, opportunities will include the mining of off-earth bodies such as

asteroids, comets, the Moon, Mars and Mars' moons, which represent the most distant supplies of wealth that humankind has ever thought of recovering. Humans travelling to deep space for a permanent presence (colonisation) will need to generate their products with local materials, known as ISRU, therefore, space settlement will need to achieve ISRU first. Space Mining operations will have to operate autonomously or be teleoperated from a base space station, mother spacecraft in orbit or directly from the Earth. The uncertainties and challenges are significant and must be overcome to develop the required knowledge. Mining knowledge, therefore, will be essential to successfully achieve ISRU operations beyond Earth; and engineers will require different and/or new skills.

In this course, students will be taken through the engineering lifecycle of new technologies and encouraged to think about how their unique skills can be applied to these projects. The course aims to provide information on space resources, develop a knowledge of technical and business risks and develop a scoping study for space mining operations. The course will be in short course format (5 days) including a series of lectures from research and industry experts, tutorials, and individual and group projects.

Course Aims

This course aims to inform students of a new, mining engineering-centred, technology and systems design concept that will help transform our world.

The aim of this course is to introduce students to the potentials of extracting space resources and develop a sound understanding of technical and business risks and learn to develop scoping study level of financial models for possible space mining operations on asteroids, Moon, and Mars cases for different commodities. In this course, students should be able to develop skills for scaling a space mining operation, and identify risks and acquire risk management procedures for reducing potential investment opportunities.

Relationship to Other Courses

NA

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Review the current status of space resource utilisation
CLO2 : Analyse technical and financial risks of potential space mining operations
CLO3 : Apply systems engineering principles for feasibility of potential space mining operations
CLO4 : Employ team skills, and advanced written and oral communication skills
CLO5 : Develop a scoping study level of financial and technical models for space mining operations for different commodities

Course Learning Outcomes	Assessment Item
CLO1 : Review the current status of space resource utilisation	• Market and Technology Gap Analysis • Project Presentation • Major Assignment
CLO2 : Analyse technical and financial risks of potential space mining operations	• Market and Technology Gap Analysis • Project Presentation • Major Assignment
CLO3 : Apply systems engineering principles for feasibility of potential space mining operations	• Market and Technology Gap Analysis • Project Presentation • Major Assignment
CLO4 : Employ team skills, and advanced written and oral communication skills	• Market and Technology Gap Analysis • Project Presentation
CLO5 : Develop a scoping study level of financial and technical models for space mining operations for different commodities	• Major Assignment • Project Presentation

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Market and Technology Gap Analysis Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: 23/05/2024 08:00 AM
Project Presentation Assessment Format: Group	30%	Start Date: 20/05/2024 10:30 AM Due Date: 24/05/2024 11:30 AM
Major Assignment Assessment Format: Individual	50%	Start Date: 20/05/2024 08:30 AM Due Date: 24/06/2024 08:00 AM

Assessment Details

Market and Technology Gap Analysis

Assessment Overview

Students will be required to make an assessment of market analysis on potential commodities and technology gap analysis in the group project. Students will work in groups and a peer assessment will be conducted, and marking will be done individually based on specific assessment criteria. Students will receive feedback after the marking is finalised.

Course Learning Outcomes

- CLO1 : Review the current status of space resource utilisation
- CLO2 : Analyse technical and financial risks of potential space mining operations
- CLO3 : Apply systems engineering principles for feasibility of potential space mining operations
- CLO4 : Employ team skills, and advanced written and oral communication skills

Assignment submission Turnitin type

Not Applicable

Project Presentation

Assessment Overview

Students will be divided into small groups to undertake this project. The groups will select a hypothetical space resource target (asteroid, Moon or Mars) and design an operation. They will briefly outline the mining system and identify the potential risks and technology gaps. They will also calculate the return on investment.

Specific assessment information will be given closer to the assessment date, including relevant criteria. Feedback will be given after the marking is finalised.

Course Learning Outcomes

- CLO1 : Review the current status of space resource utilisation
- CLO2 : Analyse technical and financial risks of potential space mining operations
- CLO3 : Apply systems engineering principles for feasibility of potential space mining operations
- CLO4 : Employ team skills, and advanced written and oral communication skills
- CLO5 : Develop a scoping study level of financial and technical models for space mining operations for different commodities

Assignment submission Turnitin type

Not Applicable

Major Assignment

Assessment Overview

Students will select a hypothetical case for space resource utilisation operation in a target body (Mars, Moon or asteroids) for a commodity of their choice and conduct a conceptual (scoping) study.

Specific assessment information will be given closer to the assessment date, including relevant criteria. Feedback will be given after the marking is finalised.

Course Learning Outcomes

- CLO1 : Review the current status of space resource utilisation
- CLO2 : Analyse technical and financial risks of potential space mining operations
- CLO3 : Apply systems engineering principles for feasibility of potential space mining operations
- CLO5 : Develop a scoping study level of financial and technical models for space mining operations for different commodities

Assessment Length

4 weeks

Submission notes

submit report (pdf or word)

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

General Assessment Information

Grading Basis

Standard

Course Schedule

Attendance Requirements

Please note that lecture recordings are not available for this course. Students are strongly encouraged to attend all classes and contact the Course Authority to make alternative arrangements for classes missed.

General Schedule Information

Please refer to Moodle for course schedule.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Serkan Saydam					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.

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 Plagarism

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