



UNSW Course Outline

MERE2002 Seismic Imaging - 2024

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General Course Information

Course Code : MERE2002

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 : Undergraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

Seismic imaging is a key to determining the properties and structures in the Earth and important for mapping faults, the interface between bedrock and sediment and structures within rocks. In this course, you will engage in activities that align with what would be expected of a seismic geophysicist in industry. The topics covered take students from introductory seismology to

advanced concepts in seismic attributes and inversion. A number of the concepts are taught using python without requiring prerequisite knowledge: as a result you will also gain programming skills, which are of growing demand in industry. Finally, the course will focus on communicating geophysical methods and results to an interdisciplinary audience. The main topics are understanding seismic data and images, how waves propagate through the subsurface and how to do 3D seismic interpretation.

Course Aims

The aims are:

- To study how seismic data can be acquired and stored digitally and transformed into images
- To understand how seismic energy reflects off interfaces and how it relates to subsurface structures
- To calculate seismic processing steps that enhance seismic images and make them truer representations of the subsurface geology
- To focus on communicating geophysical results to an interdisciplinary audience.

The course is part of the Bachelor of Science major in Earth science as well as the Bachelor of Engineering. The course fits into the former program because it details how we can image Earth structures and build models of the Earth. For the latter, the course helps in mapping the subsurface and understand the subsurface reservoirs and how they evolve through time.

Course Learning Outcomes

| Course Learning Outcomes |
|--|
| CLO1 : Explain seismic wave propagation and image processing using wave theory |
| CLO2 : Interpret and analyse geological features in seismic images |
| CLO3 : Enhance seismic images with computer algorithms and industry software |
| CLO4 : Demonstrate strong oral and written communication skills through clear explanations of geophysical concepts appropriate for an interdisciplinary industry audience. |

| Course Learning Outcomes | Assessment Item |
|--|---|
| CLO1 : Explain seismic wave propagation and image processing using wave theory | <ul style="list-style-type: none">• Topic Quizzes• Application Exercises and Team Quizzes• Final Exam |
| CLO2 : Interpret and analyse geological features in seismic images | <ul style="list-style-type: none">• Take-home Assessments• Topic Quizzes• Application Exercises and Team Quizzes• Final Exam |
| CLO3 : Enhance seismic images with computer algorithms and industry software | <ul style="list-style-type: none">• Take-home Assessments• Application Exercises and Team Quizzes |
| CLO4 : Demonstrate strong oral and written communication skills through clear explanations of geophysical concepts appropriate for an interdisciplinary industry audience. | <ul style="list-style-type: none">• Take-home Assessments• Application Exercises and Team Quizzes |

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams | Intedashboard

Assessments

Assessment Structure

| Assessment Item | Weight | Relevant Dates |
|--|--------|---|
| Topic Quizzes Assessment Format: Individual | 10% | Start Date: Not Applicable Due Date: Week 1: 27 May - 02 June, Week 2: 03 June - 09 June, Week 4: 17 June - 23 June, Week 7: 08 July - 14 July, Week 9: 22 July - 28 July |
| Application Exercises and Team Quizzes Assessment Format: Group | 30% | Start Date: Not Applicable Due Date: Week 1: 27 May - 02 June, Week 3: 10 June - 16 June, Week 5: 24 June - 30 June, Week 8: 15 July - 21 July, Week 10: 29 July - 04 August |
| Take-home Assessments Assessment Format: Individual | 30% | Start Date: Not Applicable Due Date: Week 5: 24 June - 30 June, Week 10: 29 July - 04 August |
| Final Exam Assessment Format: Individual | 30% | Start Date: Not Applicable Due Date: Not Applicable |

Assessment Details

Topic Quizzes

Assessment Overview

Individual multiple-choice quizzes covering each of the modules for the course. Feedback will be given via lectures and through the quiz itself. A self-evaluation quiz is also provided prior to the topic quiz.

Course Learning Outcomes

- CLO1 : Explain seismic wave propagation and image processing using wave theory
- CLO2 : Interpret and analyse geological features in seismic images

Assignment submission Turnitin type

Not Applicable

Application Exercises and Team Quizzes

Assessment Overview

Students undertake application exercises consisting of submitting written material, computer code or online presentations. Students work in groups throughout the term. Written solutions and model answers will be given after the submission deadline and provided in lecture recordings.

Course Learning Outcomes

- CLO1 : Explain seismic wave propagation and image processing using wave theory
- CLO2 : Interpret and analyse geological features in seismic images
- CLO3 : Enhance seismic images with computer algorithms and industry software
- CLO4 : Demonstrate strong oral and written communication skills through clear explanations of geophysical concepts appropriate for an interdisciplinary industry audience.

Assignment submission Turnitin type

Not Applicable

Take-home Assessments

Assessment Overview

Two individual take-home assignments building upon each module, including group work, with comments feedback provided directly to the assignment.

Assignment 1 (due week 5) involves several short questions on material from the first 3 weeks of the course and submit responses with references and academic style.

Assignment 2 is ~5 pages and is in two parts that integrates the ideas behind the course from both the python programming components and the seismic interpretation.

Course Learning Outcomes

- CLO2 : Interpret and analyse geological features in seismic images
- CLO3 : Enhance seismic images with computer algorithms and industry software
- CLO4 : Demonstrate strong oral and written communication skills through clear explanations of geophysical concepts appropriate for an interdisciplinary industry audience.

Detailed Assessment Description

Assignment 1 is due in Week 5. Assignment 2 is due Week 10.

The use of AI is encouraged in helping you understand the material and in helping formulating your responses. However, you are responsible for the standard of the work submitted and must be able to explain your ideas in your own words. All work submitted must be correctly referenced and in line with the [UNSW plagiarism policy and student code of conduct](#).

Assignment submission Turnitin type

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

Final Exam

Assessment Overview

Final course exam covering all course content.

Course Learning Outcomes

- CLO1 : Explain seismic wave propagation and image processing using wave theory
- CLO2 : Interpret and analyse geological features in seismic images

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Grading Basis

Standard

Requirements to pass course

A composite mark of at least 50 out of 100 is required to pass this course.

Course Schedule

Attendance Requirements

Students are expected to attend all classes and workshops to participate in team work, class quizzes and discussions. Note that many assessments are conducted in-class, including individual quizzes, application exercises and team quizzes.

General Schedule Information

General Schedule Information

- **Week 1: Module 1 - Introduction to Seismic Data and Acquisition**
- Weeks 2-3: Module 2 - Seismic Interpretation
- **Weeks 4-5: Module 3 - Seismic Interpretation**
- Week 5: Assignment 1 due
- **Week 6: No lectures**
- Weeks 7-8: Module 4: Seismic Migration and Data Processing
- **Weeks 9-10: Module 5: Seismic Inversion**
- Week 10: Assignment 2 due

Course Resources

Prescribed Resources

The readings for each module are provided via [Leganto Online System](#)

The main reading for the course is [Gadallah and Fisher's Exploration Geophysics](#)

Course Evaluation and Development

Feedback from students is obtained after each module and used to improve future modules in the course as well as the course in later years. This year, many assessments have been streamlined and the modules reorganised for a more streamlined learning experience.

Staff Details

| Position | Name | Email | Location | Phone | Availability | Equitable Learning Services Contact | Primary Contact |
|----------|----------------|-------|----------------|-----------|--------------------|-------------------------------------|-----------------|
| Convenor | Stuart Clark | | Tyree K-H6 214 | 468332796 | Via Teams or Phone | No | Yes |
| Lecturer | Patrick Makulu | | | | | No | No |

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 policies. 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](#)