UNSW Course Outline

MERE6002 Seismic Imaging - 2024

Published on the 23 May 2024

General Course Information

Course Code : MERE6002
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 : Online
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

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 various postgraduate open learning degrees in Engineering. The course helps develop skills in mapping and imaging the subsurface and understanding how subsurface reservoirs 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.	• Topic quizzes • Final course exam covering all course content. • Application Exercises
CLO2 : Interpret and analyse geological features in seismic images.	• Topic quizzes • Final course exam covering all course content. • Application Exercises
CLO3 : Enhance seismic images with computer algorithms and industry software.	• Application Exercises
CLO4 : Demonstrate strong oral and written communication skills through clear explanations of geophysical concepts appropriate for an interdisciplinary industry audience.	• Application Exercises

Learning and Teaching Technologies

Moodle - Learning Management System | Intedashboard (for online assessments)

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Topic quizzes Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Week 2: 03 June - 09 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
Final course exam covering all course content. Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Not Applicable
Application Exercises Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: Week 2: 03 June - 09 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

Assessment Details

Topic quizzes

Assessment Overview

Individual multiple-choice quizzes covering each of the modules for the course. Feedback will be given via lecture recordings 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.

Detailed Assessment Description

5 Topic Quizzes.

Quiz 1 is due Week 2

Quiz 2 is due Week 3

Quiz 3 is due Week 5

Quiz 4 is due Week 8

Quiz 5 is due Week 10

Assignment submission Turnitin type

Not Applicable

Final course exam covering all course content.

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

Application Exercises

Assessment Overview

Students undertake application exercises consisting of submitting written material, computer code or online presentations. 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.

Detailed Assessment Description

Application exercise 1 is due Week 2

Application exercise 1 is due Week 3

Application exercise 1 is due Week 5

Application exercise 1 is due Week 8

Application exercise 1 is due Week 10

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Modules

Each module has several phases:

- A Preparation Phase
- Readiness Assurance Tests (RAT) Phase
- Application Exercise (AE) Phase

Relationship to Major Assessments

Each module is tested in individual assignments and the exam. Take-home assignment covers Module 1-2 and Take-home 2 covers Modules 3-5. The exam covers all course content.

Preparation Phase

This is a self-study phase. There are a number of online learning activities in this phase, including:

- An pre-recorded lecture and read lecture notes (via Microsoft Teams)
- Course readings (via Leganto)
- A self-preparation quiz (via Microsoft Teams)

These are intended to make the class time as effective as possible and to focus class time on feedback.

Readiness Assurance Test (RAT) Phase

The RAT phase is designed to test your readings and learnings from the preparation phase and identify any gaps. We will discuss the results in the weekly lectures and I will use the opportunity to give you feedback on the material that you might have problems with. For in-class students, the RAT has an individual component and a team component, but only the individual component is graded (2% per quiz). The RAT typically consists of 10 unique multiple-choice questions with 3-5 possible answers taken in ~10 minutes.

Application Exercise (AE) Phase

In this phase, you will start doing some more applied work on the module. These have been designed to facilitate engagement and discussion and provide you with some industry-like problems that you will solve. For in-class students, this phase is conducted in teams.

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

Not Applicable - as no class attendance is required

General Schedule Information

This is a distance course with recorded lectures. Students can request online sessions to help with course content. The general pace expected is below:

- **Week 1: Module 1 - Introduction to Seismic Data and Acquisition**
- Weeks 2-3: Module 2 - Seismic Interpretation
- **Weeks 4-5: Module 3 - Seismic Interpretation**
- Weels 7-8: Module 4: Seismic Migration and Data Processing
- **Weeks 9-10: Module 5: Seismic Inversion**

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 is gathered twice during term (Week 5 and Week 10) as well as through MyExperience. A number of elements have been improved due to this feedback: scheduling, reduced assessment, worked examples, more group work during class time, improved lecture notes etc.

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
	Patrick Makuluni					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 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