



UNSW Course Outline

PTRL6021 Reservoir Characterisation - 2024

Published on the 12 May 2024

General Course Information

Course Code : PTRL6021

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

This course enables students with the skills to develop static reservoir models capturing heterogeneity at multiple scales and across different physical properties, central for accurate fluid flow simulations in reservoir engineering. Central to this is the integration of diverse data

sources, like seismic surveys, well logging, and core analysis. The course places a strong emphasis on the application of geostatistical methods including data quality control, multivariate analysis, Kriging, and stochastic simulation. These techniques are applied to the spatial assignment of reservoir properties, the handling of dependent variables, and change of scales.

Course Aims

Reservoir characterisation uses geological data to describe, quantify, and model the heterogeneous elements in a reservoir and provides a spatial continuous assignment of physical properties relevant for reservoir modelling including their uncertainty. The determination of reservoir uncertainty is a crucial aspect of reservoir modelling in addition to the estimation of basic quantities like fluid volumes, fluid flow, and reservoir performance and/or recovery factors.

This course integrates the various data sources required to generate a static reservoir model suitable for reservoir engineering purposes. It builds on knowledge from geology and geophysics as well as formation evaluation and prepares the ground for reservoir modelling. A key concept is the correlation between different physical properties at different scales, their spatial distribution, and combining those measurements to generate a 3D reservoir model continuous in space, suitable for fluid transport calculations.

Specifically, reservoir characterisation aims to:

1. Introduce the student to the background knowledge in reservoir characterisation and modelling.
2. Guide the student in integrating extra-ordinarily sparse data spatially, across properties, and scales by application of geostatistical techniques.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Demonstrate knowledge and skills needed to cross-correlate petrophysical properties.
CL02 : Design and populate continuum 3D grids for the purpose of reservoir simulation using geostatistical interpolation techniques (Kriging) and stochastic simulation.
CL03 : Upscale simulation grids for real and categorical variables.

Course Learning Outcomes	Assessment Item
CL01 : Demonstrate knowledge and skills needed to cross-correlate petrophysical properties.	<ul style="list-style-type: none">• Assignment 1• Quizzes• Assignment 2• Final Exam
CL02 : Design and populate continuum 3D grids for the purpose of reservoir simulation using geostatistical interpolation techniques (Kriging) and stochastic simulation.	<ul style="list-style-type: none">• Assignment 1• Quizzes• Assignment 2• Final Exam
CL03 : Upscale simulation grids for real and categorical variables.	<ul style="list-style-type: none">• Assignment 1• Quizzes• Assignment 2• Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Learning and Teaching in this course

Since this is a distance learning course, arrangements for learning and teaching are flexible and to be negotiated with the lecturer. If feasible and desired, students can join the postgraduate on-campus cohort for some of the activities. Mileage may vary due to possible off-on roastering, .e.g, due to off-shore work.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment 1 Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Week 10: 29 July - 04 August
Quizzes Assessment Format: Individual	10%	Start Date: Not Applicable Due Date: Week 1: 27 May - 02 June, Week 2: 03 June - 09 June, Week 3: 10 June - 16 June, Week 4: 17 June - 23 June, Week 5: 24 June - 30 June, Week 7: 08 July - 14 July
Assignment 2 Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Week 6: 01 July - 07 July
Final Exam Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Assignment 1

Assessment Overview

- data quality
- cross-correlations
- interpolation

Course Learning Outcomes

- CL01 : Demonstrate knowledge and skills needed to cross-correlate petrophysical properties.
- CL02 : Design and populate continuum 3D grids for the purpose of reservoir simulation using geostatistical interpolation techniques (Kriging) and stochastic simulation.
- CL03 : Upscale simulation grids for real and categorical variables.

Detailed Assessment Description

This assessment tests individual skills of data quality control, physical cross-correlations and geostatistics. Students are presented with randomized scenarios for most of the questions.

Assignment submission Turnitin type

This is not a Turnitin assignment

Quizzes

Assessment Overview

Individual online quizzes to reflect on lecture material - infinite repetition allowed - minimum pass mark 75

Course Learning Outcomes

- CL01 : Demonstrate knowledge and skills needed to cross-correlate petrophysical properties.
- CL02 : Design and populate continuum 3D grids for the purpose of reservoir simulation using geostatistical interpolation techniques (Kriging) and stochastic simulation.
- CL03 : Upscale simulation grids for real and categorical variables.

Detailed Assessment Description

Individual multiple choice weekly online quizzes to reflect on lecture material over the first 7 weeks of the course. Each quiz has to be completed within a week of the corresponding lectures and tutorials. Unlimited repetitions are allowed and the minimum pass mark for each quiz is 75. Feedback is immediate (automatic).

Students are presented with randomised questions from question banks including both multiple choice questions for concepts and randomised scenarios where they will need to provide short answers explaining their response and the mathematical working required.

Assignment submission Turnitin type

Not Applicable

Assignment 2

Assessment Overview

- Kriging and stochastic simulation
- upscaling

Course Learning Outcomes

- CL01 : Demonstrate knowledge and skills needed to cross-correlate petrophysical properties.
- CL02 : Design and populate continuum 3D grids for the purpose of reservoir simulation using geostatistical interpolation techniques (Kriging) and stochastic simulation.
- CL03 : Upscale simulation grids for real and categorical variables.

Detailed Assessment Description

This assessment tests individual skills stochastic simulation to generate a static 3D reservoir model and the underlying spatial interpolation techniques. Students are presented with

randomized scenarios for most of the questions.

Assignment submission Turnitin type

This is not a Turnitin assignment

Final Exam

Assessment Overview

The final 2h exam is a summative assessment testing the knowledge acquired over the course. It is held during the exam period. The exam is structured into a series of categories and questions pertaining to each of these are randomized. The exam consists of a combination of multiple choice questions, tasks where calculations need to be performed, and essay questions.

Course Learning Outcomes

- CL01 : Demonstrate knowledge and skills needed to cross-correlate petrophysical properties.
- CL02 : Design and populate continuum 3D grids for the purpose of reservoir simulation using geostatistical interpolation techniques (Kriging) and stochastic simulation.
- CL03 : Upscale simulation grids for real and categorical variables.

Submission notes

Online exam during the exam period.

Assignment submission Turnitin type

Not Applicable

Hurdle rules

Students need to achieve a pass mark.

General Assessment Information

Grading Basis

Standard

Requirements to pass course

A pass mark in the exam and a total mark > 50%.

Course Schedule

Attendance Requirements

Not Applicable - as no class attendance is required

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Christoph Arn s			0434797239		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 / Submit rule, which means that if you sit an exam or submit a piece of assessment, 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 convenor 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.

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](#)