



## UNSW Course Outline

# PTRL5004 Numerical Reservoir Simulation - 2024

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## General Course Information

**Course Code :** PTRL5004

**Year :** 2024

**Term :** Term 3

**Teaching Period :** T3

**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 :** Postgraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

This course aims to introduce the student to the background knowledge in numerical reservoir simulation which is a widely used tool in petroleum industry and research and guide the student to learn how to solve reservoir engineering problems through the professional use of numerical

reservoir simulation.

This course also a part of the mathematics requirement of the stream. These courses involve development of flow models (partial differential equation), analytical and numerical solution. The knowledge and skills in these courses include: partial differential equations, boundary conditions, numerical differentiation and integration, matrix operations, solution of matrices using exact and iterative methods, errors associated with numerical solutions.

## Course Aims

The course introduces the students to the background knowledge in numerical reservoir simulation which is a widely used tool in petroleum industry and research. Specifically, the course aims to guide the students to learn how to solve reservoir engineering problems through the professional use of numerical reservoir simulation.

## Course Learning Outcomes

Course Learning Outcomes
CLO1 : Develop knowledge and skills needed to solve reservoir engineering problems by means of numerical techniques
CLO2 : Apply integrated knowledge of math and basic sciences including geosciences to the solution of problems related to fluid flow in porous media and reservoir performance predictions
CLO3 : Practise reservoir simulators for forecasting future oil and gas production from hydrocarbon reservoirs.

Course Learning Outcomes	Assessment Item
CLO1 : Develop knowledge and skills needed to solve reservoir engineering problems by means of numerical techniques	<ul style="list-style-type: none"><li>• Quiz</li><li>• Final Exam</li><li>• Project</li></ul>
CLO2 : Apply integrated knowledge of math and basic sciences including geosciences to the solution of problems related to fluid flow in porous media and reservoir performance predictions	<ul style="list-style-type: none"><li>• Quiz</li><li>• Final Exam</li><li>• Project</li></ul>
CLO3 : Practise reservoir simulators for forecasting future oil and gas production from hydrocarbon reservoirs.	<ul style="list-style-type: none"><li>• Final Exam</li><li>• Project</li></ul>

## Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

# Other Professional Outcomes

<https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>

## Additional Course Information

Reservoir Engineering B

# Assessments

## Assessment Structure

Assessment Item	Weight	Relevant Dates
Quiz Assessment Format: Individual	25%	Due Date: Week 7: 21 October - 27 October
Final Exam Assessment Format: Individual	50%	Due Date: UNSW Timetable
Project Assessment Format: Individual	25%	Due Date: Week 3: 23 September - 29 September, Week 9: 04 November - 10 November

## Assessment Details

### Quiz

#### Assessment Overview

Quiz in week-7 based on Lab tutorials and class lectures.

Marking will be against a rubric and feedback will be provided within a week.

#### Course Learning Outcomes

- CLO1 : Develop knowledge and skills needed to solve reservoir engineering problems by means of numerical techniques
- CLO2 : Apply integrated knowledge of math and basic sciences including geosciences to the solution of problems related to fluid flow in porous media and reservoir performance predictions

#### Generative AI Permission Level

### No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

## Final Exam

### Assessment Overview

Final exam based on UNSW timetable

### Course Learning Outcomes

- CLO1 : Develop knowledge and skills needed to solve reservoir engineering problems by means of numerical techniques
- CLO2 : Apply integrated knowledge of math and basic sciences including geosciences to the solution of problems related to fluid flow in porous media and reservoir performance predictions
- CLO3 : Practise reservoir simulators for forecasting future oil and gas production from hydrocarbon reservoirs.

### Generative AI Permission Level

#### No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

## Project

### Assessment Overview

Students will need to predict the performance of a reservoir.

The assignment will be marked against assessment criteria and feedback will be provided within a week after the marking is finalised.

### Course Learning Outcomes

- CLO1 : Develop knowledge and skills needed to solve reservoir engineering problems by means of numerical techniques
- CLO2 : Apply integrated knowledge of math and basic sciences including geosciences to the solution of problems related to fluid flow in porous media and reservoir performance predictions
- CLO3 : Practise reservoir simulators for forecasting future oil and gas production from hydrocarbon reservoirs.

### Detailed Assessment Description

Submission will occur in two parts. One is due in week-3 worth 10% and rest due in week-9 worth 15%

Students will need to predict the performance of a reservoir.

The assignment will be marked against assessment criteria and class exercises. Feedback given feedback will be provided within a week after the marking is finalised.

### Generative AI Permission Level

#### **Simple Editing Assistance**

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see [here](#).

## **General Assessment Information**

### Grading Basis

Standard

# Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Introduction to a simulation study
Week 2 : 16 September - 22 September	Lecture	Simulator Equations Practical reservoir simulation
Week 3 : 23 September - 29 September	Lecture	Simulation Equations Practical reservoir simulation
Week 4 : 30 September - 6 October	Lecture	Numerical Solutions Practical reservoir simulation
	Assessment	Project (part 1)
Week 5 : 7 October - 13 October	Lecture	Numerical Solutions/ Practical reservoir simulation
Week 6 : 14 October - 20 October	Reading	Revision week
Week 7 : 21 October - 27 October	Lecture	Model initialization
	Assessment	Quiz
Week 8 : 28 October - 3 November	Lecture	Treatment of wells
Week 9 : 4 November - 10 November	Lecture	Pseudo-functions
Week 10 : 11 November - 17 November	Lecture	CO2 Sequestration
	Assessment	Project (final submission)

## Attendance Requirements

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

## Course Resources

### Prescribed Resources

Not available

### Recommended Resources

Not available

## Course Evaluation and Development

At the end of each course, all students will have the opportunity to complete a course evaluation form. These anonymous surveys help us understand your views of the course, your lecturers and the course materials. We are continuously improving our courses based on student feedback, and your perspective is valuable.

Feedback is given via <https://student.unsw.edu.au/myexperience> and you will be notified when this is available for you to complete.

We also encourage all students to share any feedback they have any time during the course – if you have a concern, please contact us immediately.

# Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Furqan Le-Hussain		TETB 219		online (Teams)	No	Yes
Head lecturer	Hang Yin		TETB		online	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 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](http://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:  
<https://www.student.unsw.edu.au/transitioning-online-learning>

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](http://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](http://www.moodle.telt.unsw.edu.au)

### School Contact Information

School of Minerals and Energy Resources  
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](#)