



PTRL3030

Reservoir Characterisation

Term Two // 2021

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Christoph Arns	c.arns@unsw.edu.au		TETB 220	0434797239

Lecturers

Name	Email	Availability	Location	Phone
Christoph Arns	c.arns@unsw.edu.au		TETB 220	0434797239
Igor Shikhov	igor.shikhov@unsw.edu.au		TETB 220	

Tutors

Name	Email	Availability	Location	Phone
Ivan Rybin	i.rybin@unsw.edu.au		tbc	

School Contact Information

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Course Details

Credit Points 6

Summary of the Course

The course will introduce the student to the background knowledge in reservoir characterisation and modelling and guide the student in integrating extra-ordinarily sparse data spatially, across properties, and scales by application of geostatistical techniques.

Course Aims

Reservoir characterisation aims:

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

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Demonstrate knowledge and skills needed to cross-correlate petrophysical properties.	PE1.2, PE1.3, PE1.1
2. Design and populate continuum 3D grids for the purpose of reservoir simulation.	PE1.2, PE1.3, PE2.1, PE2.3, PE1.1
3. Upscale simulation grids for real and categorical variables.	PE1.2, PE1.3, PE2.1
4. Effective group work and communication skills for professional practice.	PE3.6, PE3.2, PE3.5

Teaching Strategies

The teaching strategy in this course is composed of three main parts: (i) lectures, (ii) individual assignments, and (iii) team work in groups of 5-6 students. Through the lectures the students gain a fundamental understanding of reservoir characterization. The material delivered through the lectures will be fortified and discussed during the tutorials via example problems and case studies. An individual assignment is given to enforce the acquisition of basic skills. The team project afterwards and proceeds throughout the course.

Students are expected to become actively involved in the learning process. Of particular importance is the work in groups of peers to assimilate knowledge and discuss progress. Groups are formed in the first weeks of the course despite the group work starting later and utilizes team channels. This way students should be aware of their cultural & timezone differences early enough to devise a strategy to work together remotely (where required). Group work is an important aspect of an highly interdisciplinary subject, and forms a significant part of the assessment scheme.

Regular quizzes (one per week), without time constraint and which can be repeated, are provided to enforce continuous engagement with the material as well as ensuring that all students are able to contribute to the group project once it starts. Recorded lectures will allow students to revise material as required.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Individual assignment	15%	02/07/2021 05:00 PM	1, 2
Quizzes	15%	Not Applicable	1, 2, 3
Group assignment	30%	05/08/2021 05:00 PM	1, 2, 3, 4
Exam	40%	Not Applicable	1, 2, 3

Assessment Details

Assessment 1: Individual assignment

Start date: 31/05/2021 09:00 AM

Details: This assignment targets individual skills and prepares for the group work component of the course. It should be completed at an individual level with a separate submission by each student in the first four weeks of the course. Each student will have a somewhat different task and/or datasets. Common to all is the application of univariate statistics, basic programming in MATLAB including generation of random numbers, and the correlation of data either for multiple physical properties at the same location, or the same physical property at different locations, as well as spatial interpolation.

Turnitin setting: This is not a Turnitin assignment

Assessment 2: Quizzes

Start date: Not Applicable

Details: The quizzes are online and designed to enforce the revision of weekly material. There is one quiz each week for weeks 1-7; each quiz is due at the end of the respective week and can be repeated as many times as desired. A minimum pass mark of 75 is required.

Assessment 3: Group assignment

Start date: 28/06/2021 01:00 PM

Length: 6000 words

Details: Students will perform team work in groups of ~5 students. For the team projects, groups will be formed by the lecturer randomly. Each group will then be assigned a project topic. The teams will meet once a week to discuss the topic as soon as the projects start. At the first meeting, they will elect a team leader and a secretary. Minutes of all meetings must be written and will be assessed. The assessment will be made based on teamwork skills, a technical report of 6000 words (max) and an oral presentation of 20 minutes. Weighting of the marks is 60% technical report, 40% presentation, and up to 20% bonus for individual effort. Individual effort can be a negative entry and is based on presentation and peer assessment. In the unlikely case of no contribution the peer assessment can result in a zero mark for the

assignment.

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 4: Exam

Start date: Not Applicable

Details: The final exam tests the learning outcomes of the course in an exam setting.

Submission notes: to be scheduled online during the exam period

Turnitin setting: This is not a Turnitin assignment

Attendance Requirements

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

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
O Week: 25 May - 28 May		
Week 1: 31 May - 4 June	Blended	Introduction to reservoir characterisation and input data, grids, and properties.
	Tutorial	MATLAB recap
Week 2: 7 June - 11 June	Blended	Data quality control
	Tutorial	Basic distributions and their analysis, data quality control
Week 3: 14 June - 18 June	Blended	Petrophysical cross-correlations
	Tutorial	Functions, weights, surface plots
Week 4: 21 June - 25 June	Blended	Spatial modelling I
	Tutorial	Interpolation, experimental variograms, trends & residual variables
Week 5: 28 June - 2 July	Blended	Spatial modelling II
	Tutorial	Simple & ordinary Kriging
Week 6: 5 July - 9 July	Homework	Flexibility week
Week 7: 12 July - 16 July	Blended	Stochastic modelling I
	Group Work	Group projects
Week 8: 19 July - 23 July	Blended	Stochastic modelling II
	Group Work	Group projects
Week 9: 26 July - 30 July	Blended	Upscaling
	Group Work	Group projects
Week 10: 2 August - 6 August	Presentation	Group presentations for the reservoir characterisation case study

Resources

Prescribed Resources

UNSW Minerals and Energy Resources Engineering provides blended learning using the on-line Moodle LMS (Learning Management System). It is essential that you have access to a PC or notebook computer. Mobile devices such as smart phones and tablets may compliment learning, but access to a PC or notebook computer is also required. It is recommended that you have regular internet access to participate in forum discussion and group work. To run Moodle most effectively, you should have:

- broadband connection (256 kbit/sec or faster)
- ability to view streaming video (high or low definition UNSW TV options)

More information about system requirements is available at www.student.unsw.edu.au/moodle-system-requirements.

Recommended Resources

Recommended Books:

1. J.L. Jensen, L.W. Lake, P.W.M. Corbett, D.J. Goggin, *Statistics for Petroleum Engineers and Geoscientists*, 2nd ed., Elsevier 2007.
2. Lake, L. W. and Carroll, H. B. *Reservoir Characterization*: Academic Press 1986.
3. Jef Caers, *Petroleum Geostatistics*, SPE.
4. E.H. Isaaks and R.M. Srivastava, *Applied Geostatistics*: Oxford University Press 1989.

Discipline-specific WWW Resources:

www.appea.com.au	(The Australian Petroleum Production and Exploration Association)
www.pesa.com.au	(The Petroleum Exploration Society of Australia)
www.spwla.org	(Society of Petrophysicists & Well Log Analysts)
www.spe.org	(Society of Petroleum Engineers)
www.api.org	(American Petroleum Institute – For Petroleum Standards)

Course Evaluation and Development

Student feedback is considered immediately where possible, e.g. through online interaction with the course being setup on teams including channels for each group. This allows tutors and lecturers to monitor progress and provide feedback. E.g., last year we quickly moved from zoom to teams due to its higher flexibility. We will this year again use teams and moodle.

As summary method we further utilize the 'myExperience' results. The last year was the first time the course was run in full online mode. Student comments included issues that connection was sometimes poor, leading to difficulties in facing each other in group discussions as well as preventing the lecturer from forcing students online with camera on, thus somewhat enforcing attendance. Furthermore, group

projects were combining students from different time zones - this in our eyes is a design feature, as it develops the capability of students to work with students of different cultural background. On the positive side students liked the online programming with tutors monitoring and being able to answer questions at any time as well as the availability of lecture recordings for revision, as well as the group assignment. Also, the online quizzes were highly appreciated as review technique and will be further expanded this year.

Submission of Assessment Tasks

The School has developed a guideline to help you when submitting a course assignment.

We encourage you to retain a copy of every assignment submitted for assessment for your own record either in hardcopy or electronic form.

All assessments must have an assessment cover sheet attached.

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. Please note, a competency hurdle of 50% is applied to the final assessment.

Late Submission of an Assignment

Full marks for an assignment are only possible when an assignment is received by the due date.

We understand that at times you may not be able to submit an assignment on time, and the School will accommodate any fair and reasonable extension. We would recommend you review the UNSW Special Consideration guidelines – see section below.

Late submission will not be accepted and will be considered as no submission.

Special Consideration

You can apply for special consideration through [The Nucleus Student Hub](#) when illness or other circumstances interfere with your assessment performance. Sickness, misadventure or other circumstances beyond your control may:

- Prevent you from completing a course requirement
- Keep you from attending an assessable activity
- Stop you submitting assessable work for a course
- Significantly affect your performance in assessable work, be it a formal end-of-semester examination, a class test, a laboratory test, a seminar presentation or any other form of assessment

We ask that you please contact the Course Convenor immediately once you have completed the special consideration application, no later than one week from submission.

More details on special consideration can be found at: www.student.unsw.edu.au/special-consideration

Student Support

The University and the Faculty provide a wide range of support services for students, including:

- Library training and support services - www.library.unsw.edu.au

- UNSW Learning Centre - www.lc.unsw.edu.au
- Counselling support - www.counselling.unsw.edu.au

Equitable Learning Services aims to provide all students with a free and confidential service that provides practical support to ensure that your health condition doesn't adversely affect your studies.
<https://student.unsw.edu.au/els>

Academic Honesty and Plagiarism

Your lecturer and the University will expect your submitted assignments are truly your own work. UNSW has very clear guidelines on what plagiarism is and how to avoid it. Plagiarism is using the words or ideas of others and presenting them 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. The University has adopted an educative approach to plagiarism and has developed a range of resources to support students. All the details on plagiarism, including some useful resources, can be found at www.student.unsw.edu.au/plagiarism.

All Mining Engineering students are required to complete a student declaration for academic integrity which is outlined in the assignment cover sheets. By signing this declaration, you agree that your work is your own original work.

If you need some additional support with your writing skills, please contact the Learning Centre or view some of the resources on their website: www.lc.unsw.edu.au. The Learning Centre is designed to help you improve your academic writing and communication skills. Some students use the Centre services because they are finding their assignments a challenge, others because they want to improve an already successful academic performance.

Academic Information

Course Results

For details on UNSW assessment policy, please visit: www.student.unsw.edu.au/assessment

In some instances your final course result may be withheld and not released on the UNSW planned date. This is indicated by a course grade result of either:

- LE – indicates you have not completed one or more items of assessment; or
- WD – indicates there is an issue with one or more assignment; or
- WC – which indicates you have applied for Special Consideration due to illness or misadventure and the course results have not been finalised.

In either event it would be your responsibility to contact the Course Convener as soon as practicable but no later than five (5) days after release of the course result. If you don't contact the convener on time, you may be required to re-submit an assignment or re-sit the final exam and may result in you failing the course. You would also have a NC (course not completed) mark on your transcript and would need to re-enroll in the course.

Studying a course in the School of Minerals and Energy Resources Engineering at UNSW

Report writing guide

The School has a [Report Writing Guide \(RWG\)](#) available. A copy of this is available on the course Moodle site.

Computing Resources and Internet Access Requirements

UNSW Minerals and Energy Resources Engineering provides blended learning using the on-line Moodle LMS (Learning Management System). Also see - Transitioning to Online Learning: www.covid19studyonline.unsw.edu.au

It is essential that you have access to a PC or notebook computer. Mobile devices such as smart phones and tablets may compliment learning, but access to a PC or notebook computer is also required. Note that some specialist engineering software is not available for Mac computers.

- Mining Engineering Students: OMB G48
- Petroleum Engineering Students: TETB LG34 & LG 35

It is recommended that you have regular internet access to participate in forum discussion and group work. To run Moodle most effectively, you should have:

- broadband connection (256 kbit/sec or faster)
- ability to view streaming video (high or low definition UNSW TV options)

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

How We Contact You

At times, the School or your course convenors may need to contact you about your course or your enrolment. Your course convenors will use the email function within Moodle or we will contact you on your @student.unsw.edu.au email address.

We understand that you may have an existing email account and would prefer for your UNSW emails to be redirected to your preferred account. Please see instructions on how to redirect your UNSW emails: "[How can I forward my emails to another account?](#)"

How You Can Contact Us

We are always ready to assist you with your inquiries. To ensure your question is directed to the correct person, please use the email address below for:

- Enrolment or other admin questions regarding your program: <https://unswinsight.microsoftcrmportals.com/web-forms/>
- Course inquiries should be directed to the Course Convenor

Image Credit

PTRL3030 - Reservoir Characterisation

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	
PE3.5 Orderly management of self, and professional conduct	✓
PE3.6 Effective team membership and team leadership	✓



School of Minerals and Energy Resources Engineering

Assessment Cover Sheet

Course Convenor: _____
Course Code: _____ Course Title: _____
Assignment: _____
Due Date: _____
Student Name: _____ Student ID: _____

ACADEMIC REQUIREMENTS

Before submitting this assignment, the student is advised to review:

- the assessment requirements contained in the briefing document for the assignment;
- the various matters related to assessment in the relevant Course Outline; and
- the *Plagiarism and Academic Integrity* website at < <http://www.lc.unsw.edu.au/plagiarism/pintro.html> > to ensure they are familiar with the requirements to provide appropriate acknowledgement of source materials.

If after reviewing this material there is any doubt about assessment requirements, then in the first instance the student should consult with the Course Convenor and then if necessary with the Director – Undergraduate Studies.

While students are generally encouraged to work with other students to enhance learning, all assignments submitted for assessment must be their entire own work and duly acknowledge the use of other person's work or material. The student may be required to explain any or all parts of the assignment to the Course Convenor or other authorised persons. *Plagiarism* is using the work of others in whole or part without appropriate acknowledgement within the assignment in the required form. *Collusion* is where another person(s) assists in the preparation of a student's assignment without the consent or knowledge of the Course Convenor.

Plagiarism and *Collusion* are considered as Academic Misconduct and will be dealt with according to University Policy.

STUDENT DECLARATION OF ACADEMIC INTEGRITY

I declare that:

- This assessment item is entirely my own original work, except where I have acknowledged use of source material [such as books, journal articles, other published material, the Internet, and the work of other student/s or any other person/s].
- This assessment item has not been submitted for assessment for academic credit in this, or any other course, at UNSW or elsewhere.

I understand that:

- The assessor of this assessment item may, for the purpose of assessing this item, reproduce this assessment item and provide a copy to another member of the University.
- The assessor may communicate a copy of this assessment item to a plagiarism checking service (which may then retain a copy of the assessment item on its database for the purpose of future plagiarism checking).

Student Signature: _____

Date: _____

Students are advised to retain a copy of this assessment for their records and submission should be made in accordance to the assessment details available on the course Moodle site.