

MERE5001

Sedimentary and Energy Resources Geology

Term 2, 2023



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Stuart Clark	stuart.clark@unsw.edu.au	Via Teams/Mobile	Tyree Energy Building 214	0468332796

Lecturers

Name	Email	Availability	Location	Phone
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Tutors

Name	Email	Availability	Location	Phone
Harikrishnan Nalinakumar	h.nalinakumar@unsw.edu.au	via Teams or Appointment	Tyree Building Level 2	

School Contact Information

School of Minerals and Energy Resources
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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](#)

Course Details

Units of Credit 6

Summary of the Course

Sedimentary basins are an important energy and water resource around the world and many cities are built on sedimentary basins. Understanding the development of sedimentary basins and their dynamics through geological history are important for both calculating the resource potential as well as understanding geohazards. This course focuses on:

- The impact of the sedimentary environment and the dynamics on the basin for the development and storage of energy resources
- The accumulation and maturation of organic material in basins
- Depositional environments and resultant lithologies and structures
- Faulting in basins and basin evolution

Course Aims

At the end of this course, you will be able to:

- Identify key geological factors that lead to the development of sedimentary basins
- Calculate the impact on sediments during diagenesis
- Develop interpretations of the reservoir potential of basins including potential reservoir conditions for hydrothermal, CO₂, H₂ and hydrocarbon reservoirs.
- Communicate your geological results to an interdisciplinary audience.

The course is part of a Masters of Engineering program and is particularly important in subsurface engineering. The course details how we can model the formation of Earth structures over geological time and explain their evolution. The course also helps in quantifying the reservoir properties of aquifers, CO₂ geosequestration and H₂ storage sites.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Explain sedimentary basin formation and evolutionary processes through geological concepts	

Learning Outcome	EA Stage 1 Competencies
2. Identify and discuss key geological factors in the identification and development of energy resources in sedimentary basins	PE1.3, PE2.1, PE1.2
3. Demonstrate strong oral and written communication skills through clear explanations of geological concepts appropriate for an interdisciplinary industry audience.	PE3.2

Teaching Strategies

Teaching Strategies

The course uses the following main strategies:

- Team-based learning with small groups in a flipped classroom setting
- Just-in-time teaching based on real-time feedback from students in class
- Active learning - via online moodle activities and quizzes
- Project based-learning with take-home assignments encouraging industry-related thinking.
- Case studies looking at the use of techniques in real industry cases and the outcomes and benefits.

Rationale

The idea is to increase the alignment of the course with the UNSW Scientia Education Experience by enhancing the component of professional skills development, increased online activities and provide increased opportunities for feedback to students. In addition, to change the assessment structure for postgraduates to include an individual research project and team-based learning components which are more industry authentic assessments.

Assessment

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. Prior to coming to the first class of a module (**even the first lecture!**), you will need to have completed a number of online learning activities, 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 (In-class Quiz)

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.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Take-home Assessments	30%	Week 5, Week 10	2, 3
2. Final Exam	30%	Not Applicable	1, 2
3. Topic Quizzes	10%	Week 1, Week 2, Week 4, Week 7, Week 9	1, 2

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
4. Application Exercises and Team Quizzes 	30%	Week 1, Week 2, Week 3, Week 4, Week 5, Week 7, Week 8, Week 9, Week 10	1, 2, 3

Assessment 1: Take-home Assessments

Due date: Week 5, Week 10

Individual take-home assignments with comments feedback provided directly to the assignment.

Assessment 2: Final Exam

Final course exam covering all course content.

Assessment 3: Topic Quizzes

Assessment length: 10 multiple-choice questions

Due date: Week 1, Week 2, Week 4, Week 7, Week 9

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.

Assessment 4: Application Exercises and Team Quizzes (Group)

Due date: Week 1, Week 2, Week 3, Week 4, Week 5, Week 7, Week 8, Week 9, Week 10

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.

Attendance Requirements

Students are expected to attend all classes and tutorials 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.**

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
O-Week: 22 May - 26 May	Homework	Preparation work for Module 1 starting next week. Read the lecture notes and watch the introductory video accessible via the Microsoft Team (linked on the Moodle page for the course).
Week 1: 29 May - 2 June	Lecture	Module 1 Begins (M1. Introduction to Sedimentology) <ul style="list-style-type: none"> • In class quiz on pre-readings • Application Exercise 1 (AE1) starts
	Tutorial	Module 1 Ends (M1. Introduction to Sedimentology) <ul style="list-style-type: none"> • Application Exercise 1 (AE1) due • AE1 gallery walk and feedback
	Assessment	Topic Quizzes
	Assessment	Application Exercises and Team Quizzes
Week 2: 5 June - 9 June	Lecture	Module 2 Begins (M2. Organic Material in Basins) <ul style="list-style-type: none"> • There will be an in class quiz on pre-readings • Quiz feedback and discussion
	Tutorial	Module 2 Continues (M2. Organic Material in Basins) <ul style="list-style-type: none"> • Application Exercise 2 (AE2) starts
	Assessment	Topic Quizzes
	Assessment	Application Exercises and Team Quizzes
Week 3: 12 June - 16 June	Lecture	Module 2 Continues (M2. Organic Material in Basins)

		<ul style="list-style-type: none"> • Application Exercise 2 (AE2) Part 1 due • AE2 Part 1 gallery walk and feedback
	Tutorial	Module 2 Ends (M2. Organic Material in Basins) <ul style="list-style-type: none"> • AE2 Part 2 due • AE2 Part 2 gallery walk and feedback
	Assessment	Take-home 1 released (due Friday Week 5)
	Assessment	Application Exercises and Team Quizzes
Week 4: 19 June - 23 June	Lecture	Module 3 Begins (M3. Sequence Stratigraphy) <ul style="list-style-type: none"> • There will be an in class quiz on pre-readings • Quiz feedback and discussion
	Tutorial	Module 3 Continues (M3. Sequence Stratigraphy) <ul style="list-style-type: none"> • Application Exercise 3 (AE3) released
	Assessment	Topic Quizzes
	Assessment	Application Exercises and Team Quizzes
Week 5: 26 June - 30 June	Lecture	Module 3 Continues (M3. Sequence Stratigraphy and Reservoir Properties) <ul style="list-style-type: none"> • Application Exercise 3 (AE3) Part 1 due • AE3 Part 1 gallery walk and feedback
	Tutorial	Module 3 Ends (M3. Sequence Stratigraphy) <ul style="list-style-type: none"> • AE2 Part 2 due • AE2 Part 2 gallery walk and feedback
	Assessment	Take-home 1 (10%) due Friday
	Assessment	Take-home Assessments
	Assessment	Application Exercises and Team Quizzes
Week 7: 10 July - 14 July	Lecture	Module 4 Begins (M4. Basin Evolution) <ul style="list-style-type: none"> • There will be an in class quiz on pre-readings • Quiz feedback and discussion
	Tutorial	Module 4 Continues (M4. Basin Evolution) <ul style="list-style-type: none"> • Application Exercise 4 (AE4) starts

	Assessment	Take-home 2 released (due Friday Week 10)
	Assessment	Topic Quizzes
	Assessment	Application Exercises and Team Quizzes
Week 8: 17 July - 21 July	Lecture	Module 4 Continues (M4. Basin Evolution) <ul style="list-style-type: none"> • Application Exercise 4 (AE4) Part 1 due • AE4 Part 1 gallery walk and feedback
	Tutorial	Module 4 Ends (M4. Basin Evolution) <ul style="list-style-type: none"> • AE4 Part 2 due • AE4 Part 2 gallery walk and feedback
	Assessment	Application Exercises and Team Quizzes
Week 9: 24 July - 28 July	Lecture	Module 5 (Fluid Migration in Basins) <ul style="list-style-type: none"> • There will be an in class quiz on pre-readings • Quiz feedback and discussion
	Tutorial	Module 5 Continues (Fluid Migration in Basins) <ul style="list-style-type: none"> • Application Exercise 5 (AE5) starts
	Assessment	Topic Quizzes
	Assessment	Application Exercises and Team Quizzes
Week 10: 31 July - 4 August	Lecture	Module 5 Continues (Fluid Migration in Basins) <ul style="list-style-type: none"> • Application Exercise 5 (AE5) Part 1 due • AE5 Part 1 gallery walk and feedback
	Tutorial	Module 5 Ends (Fluid Migration in Basins) <ul style="list-style-type: none"> • AE5 Part 2 due • AE5 Part 2 gallery walk and feedback
	Assessment	Take-home 2 due Friday (20% of total grade)
	Assessment	Take-home Assessments
	Assessment	Application Exercises and Team Quizzes

Resources

Recommended Resources

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

Recommended texts for this course include (all available via UNSW library online):

- [Elements of Petroleum Geology by Selley and Sonnenberg, 3rd Edition \(2015\)](#)
- [Petroleum Geoscience from Sedimentary Environments to Rock Physics by Knut Bjørlykke \(2010\)](#)
- [Petroleum Geoscience by Gluyas and Swarbrick \(2004\)](#)

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.

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.

Late Submission of an Assignment

Full marks for an assessment are only possible when an assessment is received by the due date. 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. 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 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, or
- Online quizzes where answers are released to students on completion, or Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or Pass/Fail assessment tasks.

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.

Special Consideration

You may be eligible for special consideration, when an illness or other short-term events beyond your control (exceptional circumstances) affect your assessment performance. More details on special consideration can be found at: www.student.unsw.edu.au/special-consideration

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.

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
- Academic Skills Support - <https://www.student.unsw.edu.au/skills>
- Psychology and Wellness - 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 MERE 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 academic skills, please contact the Academic Skills Support or view some of the resources on their website: <https://www.student.unsw.edu.au/skills>. The Academic Skills Team can provide resources, support and assistance to help you improve your academic 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

Student Resources

This engineering [student resources](#) section collates 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 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

This course outline sets out 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 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 (as updated in Moodle), the description in the Course Outline/Moodle applies.

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

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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	