



GEOS309

Marine Sediments and Energy Resources

S2 Day 2018

Dept of Earth and Planetary Sciences

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General Information

Unit convenor and teaching staff

Convenor

Stefan Löhr

stefan.loehr@mq.edu.au

Contact via Email

12WW 3.34

By Appointment

Lecturer

Simon George

simon.george@mq.edu.au

Lecturer

Martin Kennedy

martin.j.kennedy@mq.edu.au

Lecturer

April Abbott

april.abbott@mq.edu.au

Credit points

3

Prerequisites

GEOS206 and GEOS226

Corequisites

Co-badged status

Unit description

This unit focuses on developing an advanced level of understanding of sedimentary rocks, oil and gas. The latter are major components of Australia's energy supply, but have significant negative impacts on our environment. To understand the balance between fossil fuel exploitation and negative environmental impacts, it is important to learn about how oil and gas are formed, how they are discovered and recovered, and how they can be utilised in less environmentally harmful ways. This unit combines geological and geochemical approaches to investigate the basinal formation of sediments, and exploration and production methods for crude oil, natural gas, coal bed methane and shale gas. The key components of conventional and unconventional petroleum systems are considered, from source rock formation through generation, expulsion, migration, accumulation and alteration in reservoirs, as are mechanisms for oil and gas production from conventional and unconventional reservoirs. Geothermal energy is also assessed. Similar technologies are also utilised for the geosequestration of CO₂, and the opportunities for this in Australia are assessed. This unit prepares students for careers in the energy and geosequestration industries.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

- Advanced skills in identification, petrographic characterisation and interpretation of sedimentary rocks
- Ability to apply stratigraphic principles to the correlation of sedimentary sequences
- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Understanding of the major biogeochemical cycles and their link to the climate system
- Understanding of the controls on diagenesis, and its impacts on biogeochemical cycling, rock properties and the proxy record
- Ability to integrate and interpret real-world physical, biological and chemical/isotopic records
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Understand scientific methodology
- Capacity to present ideas clearly with supporting evidence

General Assessment Information

All assessment tasks must be submitted electronically via the iLearn site. The exact submission deadline for each task will be published on the unit iLearn site.

Report & late penalties: 10% of your mark will be deducted for the first day that the assignment is received after the deadline, and 5% for each further day. Extensions for late assignments will be granted only if misadventure (including incapacitating sickness) can be demonstrated. If you need to apply for an extension, you must EMAIL THE UNIT CONVENOR BEFORE THE DUE DATE of the assignment and state the reason you are seeking an extension. This will not be granted automatically, but will be considered on a case-by-case basis.

Weekly quizzes: These will cover material from the lectures, practicals and weekly readings. Please note that these are designed to encourage you to keep up with the lecture material and set reading. Individual quiz questions are not time limited, if you are unsure about an answer you can take the time to go back to your textbook or lecture notes.

Lecture & practical participation: GEOS309 is taught as a four hour mixed lecture practical session each week, Tuesdays from 9 AM to 1 PM in E5A 210 (11WW 210). Please note that while practicals do not receive a mark, **participation is compulsory and students must satisfactorily participate in a minimum of 8 (eight) of the 12 (twelve) weekly practicals**. Also be aware that E5A210 is not set up for Echo 360 recordings so that **recordings of the lectures will not be provided**. Please contact the unit convenor as soon as possible if you have difficulty attending and participating in any classes.

Exams: If you receive [special consideration](#) for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the [policy](#) prior to submitting an application. You can check the supplementary exam information page on FSE101 in iLearn (bit.ly/FSESup) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Assessment Tasks

Name	Weighting	Hurdle	Due
iLearn Quizzes	10%	No	Weekly
Research report	20%	No	Week 6
Practical Test	10%	No	Week 7
Mid Semester Test	10%	No	Week 8

Name	Weighting	Hurdle	Due
Research presentation	20%	No	Weeks 12 & 13
Final Exam	30%	No	Exam Period
Practical participation	0%	Yes	NA

iLearn Quizzes

Due: **Weekly**

Weighting: **10%**

Weekly online quizzes on iLearn testing lecture and reading content

On successful completion you will be able to:

- Advanced skills in identification, petrographic characterisation and interpretation of sedimentary rocks
- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Understanding of the major biogeochemical cycles and their link to the climate system
- Understanding of the controls on diagenesis, and its impacts on biogeochemical cycling, rock properties and the proxy record
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information

Research report

Due: **Week 6**

Weighting: **20%**

Research report, due in Week 6. More details will be released in Week 1

On successful completion you will be able to:

- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Understand scientific methodology
- Capacity to present ideas clearly with supporting evidence

Practical Test

Due: **Week 7**

Weighting: **10%**

Practical test, completed during the practical class in Week 7

On successful completion you will be able to:

- Advanced skills in identification, petrographic characterisation and interpretation of sedimentary rocks
- Ability to apply stratigraphic principles to the correlation of sedimentary sequences
- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information

Mid Semester Test

Due: **Week 8**

Weighting: **10%**

In-class test, focussing on lecture and reading material content

On successful completion you will be able to:

- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Understanding of the major biogeochemical cycles and their link to the climate system
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information

Research presentation

Due: **Weeks 12 & 13**

Weighting: **20%**

Poster or oral presentations on range of predetermined topics

On successful completion you will be able to:

- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time

- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Understanding of the controls on diagenesis, and its impacts on biogeochemical cycling, rock properties and the proxy record
- Ability to integrate and interpret real-world physical, biological and chemical/isotopic records
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Understand scientific methodology
- Capacity to present ideas clearly with supporting evidence

Final Exam

Due: **Exam Period**

Weighting: **30%**

Final exam testing material covered in lectures, readings, assignments and pracs

On successful completion you will be able to:

- Ability to apply stratigraphic principles to the correlation of sedimentary sequences
- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Understanding of the major biogeochemical cycles and their link to the climate system
- Understanding of the controls on diagenesis, and its impacts on biogeochemical cycling, rock properties and the proxy record
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information

Practical participation

Due: **NA**

Weighting: **0%**

This is a hurdle assessment task (see [assessment policy](#) for more information on hurdle assessment tasks)

Practical attendance is compulsory and students must satisfactorily participate in at least eight (8) out of twelve (12) classes to pass the unit.

On successful completion you will be able to:

- Advanced skills in identification, petrographic characterisation and interpretation of sedimentary rocks
- Ability to apply stratigraphic principles to the correlation of sedimentary sequences
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- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Understanding of the major biogeochemical cycles and their link to the climate system
- Understanding of the controls on diagenesis, and its impacts on biogeochemical cycling, rock properties and the proxy record
- Ability to integrate and interpret real-world physical, biological and chemical/isotopic records

Delivery and Resources

Updated course description GEOS309 has undergone major changes for 2018, with a new focus on the evolution of the Earth as a system. The thin layer of sediments and sedimentary rocks at the Earth's surface contains a unique record of the planet's long history. This record reveals the gradual and at times spectacular (co)evolution of the geological, ocean, atmosphere and biological components which make the planet the complex system that it is today. An understanding of this system is critical for predicting the consequences of future climate and environmental change, the origin and distribution of the resources that are critical to society, and allows us to place modern rates of extinction into a geological context. Lectures and case studies will highlight the fascinating ways in which conditions at the Earth's surface have changed over time. Examples will include the causes and consequences of the rise in atmospheric oxygen, the invasion of land by plants and animals, the fall of the dinosaurs, periods of increased volcanism, as well as episodes of global warming and cooling. Hands-on practicals will give you the skills to read and interpret the physical, chemical and biological clues to the Earth's past, and allow you to critically assess the ongoing scientific controversies in this area.

Delivery GEOS309 is taught as a four hour mixed lecture practical session each week, **Tuesdays from 9 AM to 1 PM in E5A 210 (11WW 210)**. In addition to completing compulsory weekly reading and a range of assessment tasks, you are required to attend each lecture/practical session starting in Week 1. E5A210 is not set up for Echo 360 recordings so that recordings of the lectures will not be provided. A pdf copy of the lecture slides, prac handouts and related material will be provided on the iLearn unit website.

Textbook There is no set textbook for GEOS309, although we do recommend Stanley and Luczaj's "Earth System History" as well as Kump, Kasting and Crane's "The Earth System". Journal articles and digital copies of relevant chapters from various textbooks will be posted each week on iLearn.

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway \(https://students.mq.edu.au/support/study/student-policy-gateway\)](https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit ask.mq.edu.au.

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)

- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Capacity to present ideas clearly with supporting evidence

Assessment tasks

- Research report
- Research presentation

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to

handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Ability to integrate and interpret real-world physical, biological and chemical/isotopic records
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Understand scientific methodology
- Capacity to present ideas clearly with supporting evidence

Assessment tasks

- Research report
- Practical Test
- Final Exam

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcome

- Capacity to present ideas clearly with supporting evidence

Assessment task

- Practical participation

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary

solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Advanced skills in identification, petrographic characterisation and interpretation of sedimentary rocks
- Ability to apply stratigraphic principles to the correlation of sedimentary sequences
- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
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- Ability to integrate and interpret real-world physical, biological and chemical/isotopic records
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Understand scientific methodology
- Capacity to present ideas clearly with supporting evidence

Assessment tasks

- iLearn Quizzes
- Research report
- Practical Test
- Mid Semester Test
- Research presentation
- Final Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Ability to apply stratigraphic principles to the correlation of sedimentary sequences
- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of theoretical and empirical basis of proxies
- Understanding of the controls on diagenesis, and its impacts on biogeochemical cycling, rock properties and the proxy record
- Ability to integrate and interpret real-world physical, biological and chemical/isotopic records
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Understand scientific methodology
- Capacity to present ideas clearly with supporting evidence

Assessment tasks

- iLearn Quizzes
- Research report
- Practical Test
- Research presentation
- Final Exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Advanced skills in identification, petrographic characterisation and interpretation of sedimentary rocks
- Ability to apply stratigraphic principles to the correlation of sedimentary sequences
- Understand the links and feedbacks between the geo-, bio-, hydro- and atmosphere and how these have evolved through time
- Ability to critically appraise palaeoenvironmental proxy records, and an understanding of

theoretical and empirical basis of proxies

- Understanding of the controls on diagenesis, and its impacts on biogeochemical cycling, rock properties and the proxy record
- Ability to integrate and interpret real-world physical, biological and chemical/isotopic records
- Application of discipline-specific knowledge to solving problems and evaluating ideas and information
- Capacity to present ideas clearly with supporting evidence

Assessment tasks

- Research report
- Practical Test
- Mid Semester Test
- Research presentation

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Capacity to present ideas clearly with supporting evidence

Assessment tasks

- Research report
- Practical Test
- Research presentation
- Final Exam

Changes from Previous Offering

GEOS309 has undergone major changes for 2018, with a new focus on the evolution of the Earth as a system. The petroleum geoscience contents that was formerly taught in GEOS309 is now partly taught in GEOS251.