
**MACQUARIE UNIVERSITY
DEPARTMENT OF EARTH AND PLANETARY SCIENCES**

**GEOS 309
Liquid Fuels and Energy Security
Unit Outline – Semester 2: D2**

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Credit Points:	3		
Contact hours:	Laboratory Exercises and Lectures – 3 hours per week (Friday morning/afternoon) Lectures – 1 hour per week		
Pre-requisites:	(GEOS205 or GEOS268) and (GEOS260 or GEOS206)		

INTRODUCTION

Fossil fuels—especially oil and gas—are a major and key component of Australia's energy supply, but have significant negative impacts on our environment. To refine the balance between fossil fuel exploitation and negative environmental impacts, it is important to understand 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 geophysical approaches to investigate exploration and production methods for crude oil, natural gas and coal bed methane with a major focus on basin analysis- the key to understanding these processes. Similar technologies are also utilised for geosequestration of CO₂ from burning coal ('clean coal'), and the opportunities for this in Australia are assessed. Note this is a new unit and we are interested in your feedback.

KEY LEARNING OBJECTIVES

At the completion of this unit, you will have developed:

- Understanding of the tools and methods that are used in the petroleum industry.
 - Capacity to employ appropriate computer tools to solve problems related to basin analysis.
 - Understand seismic exploration processes.
 - Competence in accessing, using and synthesising appropriate information through writing.
 - Application of knowledge to solving problems and evaluating ideas and information.
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STUDY PROGRAM

This unit is a 3rd year course and as a result will expect background in geology, petrology and geophysics.

This unit concentrates on 3 major themes that will be explored and revisited in various ways throughout the unit. These themes include:

- Petroleum and its origin
- Basin analysis and rheology of the continental lithosphere
- Seismic exploration processes

We will also have experts from the industry giving presentations, in addition to special lectures and these will cover:

- Inside the petroleum industry
- “Clean Coal”
- Coal Bed Methane

STUDENT LEARNING EXPERIENCES

This unit can be seen as an interconnected stream between lectures and practicals; thus the “mixed format”. We may choose to have a short lecture or two within the 3 - hour mixed period. The lecture stream will give a broad overview of the topic, provide background information and introduce new ideas and concepts that link in with the practical stream.

Time Allocation

According to Macquarie University guidelines, you are required to spend 39 hours of study per credit point. All courses are now 3 credits, so for GEOS 309 this works out to approximately one hour per week at lectures, approximately three hours per week at the practical session and approximately four to five hours per week doing at home study. Conscientious use of this time, particularly if it is spread over the whole semester will provide its reward.

ASSESSMENT

The assessment consists of several components, listed below. A satisfactory standard is required in all components.

<i>The Petroleum System</i>	20%
<i>MATLAB basin analyses workshops</i>	15%
<i>Exploration practical</i>	5%
<i>End of class essay</i>	10%
<i>Practical test</i>	10%
<i>Final examination</i>	40%

Assignments

You will be given specific details of what is expected for both these components when you begin each section of the class. Generally, the assignments will involve a written report, in which your use of English and referencing the source of your ideas is important.

Final examination

The final exam will cover material from the lectures, text-book readings, class exercises and case studies. Questions will draw on information and ideas from different modules to give an integrated view of the unit. The exam will include questions that ask you to apply your knowledge to interpret and solve problems.

Your grade

The marks you are given for assessment tasks are totalled by the percentages given above. According to Macquarie University guidelines, your total mark may be scaled at the end of semester in order for the class to fit a grade distribution outlined by the University.

ASSESSMENT TASKS

The dates for submission of assessment tasks are listed on the last page of the unit outline.

Feedback

Feedback on assessment tasks is given in this unit in the following ways:

- 1) Our primary mode of assessment feedback: the assessment marker will present overall feedback to the class, at either a lecture or in a tutorial, on what aspects of the assignment were done best and where improvement is needed in general.
- 2) Students are strongly encouraged to seek further feedback (at the time it is given or by making an appointment with the assessment marker) if they are unsure of any aspect of the feedback or if they want further feedback.
- 3) On the information about each assessment task we will provide you with a checklist of what is asked in the assignment and a detailed breakdown of the marks awarded for each component. Scoring full marks for a given component indicates that you did exceptionally well. Alternatively, scoring poorly in a component strongly suggests it required further work.
- 4) In the instance of scoring very poorly overall, you will be provided with written feedback on the assignment indicating where you could improve.

Presentation of Written Reports

You are required to research, prepare and write the case study reports at the standard expected at 300 level. Since most of what you learn is tested in written form, it is essential that you learn to write effectively. Organisation is the key to achieving this, and the following steps should assist you.

Preparation

- (i) Determine what is required in the case study report. Make sure you understand each word used to ensure that you are writing to the topic set, not to one of your own invention.
- (ii) Read the relevant unit material and generate a list of key words, which will help you locate other references in the Library. Do this early. Remember that reference books may be hard to find if you leave your library research too late.
- (iii) When taking notes from a reference always note the bibliographical information and Call Number. If you write down a quotation, take a note of the page it was on. There is nothing more frustrating than having to look back through a book for one sentence.

The Outline

- (i) Introduction. Define terms and outline your approach to the topic.
- (ii) Discussion. This section is for explanation and discussion of the topic. It may help to write down a list of major points that will become your paragraphs, so that you can arrange your notes under each point.
- (iii) Conclusion. This is not a reiteration of the discussion, but a summary statement that rounds off the report.

The Drafts (at least one — more probably two or three)

- (i) Keep referring back to the question — have you strayed from the topic?
- (ii) Single sentences or paragraphs should not express too many ideas. A logical development of your theme should be the aim throughout the essay.
- (iii) In your initial draft, do not worry too much about the word limit. It is a simple matter to cut extraneous or repetitive material in subsequent rewrites — in fact this should be your aim.
- (iv) Support your statements with facts and references.
- (v) References: quotations should be used only if the point being made is vital to your argument and if you could not express it better yourself.

The Final Product

- (i) If possible, allow a few days between writing your final draft and the finished report, to allow you to critically read and edit it. There is a danger that if it is too fresh in your mind, you will read what you think is there, rather than what you have actually written. Read your final draft through several times — once for fluency and clarity of ideas, once for punctuation and once for spelling. For clarification of problems, refer to an authority such as the Australian Government Publishing Service Style Manual.
- (ii) Type your assignment for submission, and then check it again. Is there a title, your name on each page, page numbers, etc.?
- (iii) Submit your case study report on or before the due date to us by the beginning of the lecture in the week nominated.

Formatting

- (i) All typed text submitted for case studies is to be 12 point font at 1.5 line spacing. Margins should be approximately 2cm. Place your name and student number in the header and number each page.
- (ii) Page limits should be strictly adhered to.
- (iii) In all that you hand in, marks will be given for “communication”; that is how effectively you communicate your ideas. This will include how well your text/maps/profiles/sketches convey your concepts, and how well written your report is (including correct use of English and of referencing procedures).

Extensions

Extensions for reports and workshop submissions will be given only for illness or misadventure, which must be supported by documentation and a written request. This request should also indicate the extension period required. Work submitted late without approval may be penalised 5% of the potential total mark per day late. Students must keep a copy of their reports.

Queries and appeals

In the first instance, contact us if there are any questions about the assessment tasks themselves, or about the comments and grades that you receive for your assignments or reports. You are permitted to appeal against your final grade in any of your units. Before initiating an appeal, discuss your unit grade fully with the Unit convenor. More details of the Faculty of Science appeals procedures are available in the Science Centre, ground floor E7A (phone: 9850 6000).

The Dangers of Plagiarism and how to avoid it

The integrity of learning and scholarship depends on a code of conduct governing good practice and acceptable academic behaviour. One of the most important elements of good practice involves acknowledging carefully the people whose ideas we have used, borrowed, or developed. All students and scholars are bound by these rules because all scholarly work depends in one way or another on the work of others.

Therefore, there is nothing wrong in using the work of others as a basis for your own work, nor is it evidence of inadequacy on your part, provided you do not attempt to pass off someone else's work as your own.

To maintain good academic practice, so that you may be given credit for your own efforts, and so that your own contribution can be properly appreciated and evaluated, you should acknowledge your sources and you should ALWAYS:

1. State clearly in the appropriate form where you found the material on which you have based your work.
2. Acknowledge the people whose concepts, experiments, or results you have extracted, developed, or summarised, even if you put these ideas into your own words.
3. Avoid excessive copying of passages by another author, even where the source is acknowledged. Find another form of words to show that you have thought about the material and understood it, but remember to state clearly where you found the ideas.

If you take and use the work of another person without clearly stating or acknowledging your source, you are falsely claiming that material as your own work and committing an act of PLAGIARISM. This is a very serious violation of good practice and an offence for which you will be penalised.

YOU WILL BE GUILTY OF PLAGIARISM if you do any of the following in an assignment, or in any piece of work which is to be assessed, without clearly acknowledging your source(s) for each quotation or piece of borrowed material:

1. Copy out part(s) of any document or audio-visual material, including computer-based material.
2. Use or extract someone else's concepts or experimental results or conclusions, even if you put them in your own words.
3. Copy out or take ideas from the work of another student, even if you put the borrowed material in your own words.
4. Submit substantially the same final version of any material as a fellow student. On occasions, you may be encouraged to prepare your work with someone else, but the final form of the assignment you hand in must be your own independent endeavour.

EVALUATION

We are interested in your ideas about how this new unit is progressing and how it can be improved. If you have any particular comments (good and bad) or ideas on how to make the unit better please let us know.

TEXT

Petroleum Geoscience From Sedimentary Environments to Rock Physics

[Knut Bjorlykke](#)

<http://www.springerlink.com/content/m255x1/#section=780498&page=1&locus=0>

- **Title:** Petroleum geoscience [electronic resource] : from sedimentary environments to rock physics
- **Author:** [Knut Bjørlykke 1938-](#)
- [Per Avseth 1970-](#) ; [SpringerLink \(Online service\)](#)
- **Subjects:** [Petroleum -- Geology](#) ; [Electronic books](#)
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1429920

Free for all at Mac Uni to download

IMPORTANT DATES/ASSESSMENT:

Week 5 (September 2nd) – Assignment 1 (20%)

Week 7 (September 16th) – Practicals 2 & 3 (10%)

Week 9 (October 14th) – Practical Test (10%)

Week 10 (October 21st) – Exploration Practical (10 %)

Week 13 (November 8th) – (End of class) Essay - Assignment 4 (10%)

Final exam (date to be determined) (40%)

**GEOS 309: LIQUID FUELS AND ENGERGY SECURITY:
LECTURE AND PRACTICAL SCHEDULE (Fridays Semester 2)**

WEEK	LECTURE E6A 133 12 noon to 1 pm	PRACTICALS E7A 123 (Either 9-12 noon or 2-5 pm)	
1 5/08	The petroleum system: source rocks and thermal maturity and generation [SG]	Introduction to the unit. Crude video Assign.1	The Petroleum System: <ul style="list-style-type: none"> - Source rock characterisation - Oil and gas expulsion - Oil source correlations (fluids) - Geochemistry
2 12/08	The petroleum system: reservoir rocks [SG]	Source rocks: TOC/Rock Eval/thermal maturity	
3 19/08	The petroleum system: biomarkers and oil biodegradation [SG]	Reservoir rocks: thin section microscopy, porosity and permeability	
4 26/08	The petroleum system: Oil and gas generation and expulsion, migration, seals, timing [SG]	Oil-source correlation using biomarkers	Assignment 1: petroleum system
5 2/09	Physical Principles of Basin Analysis 1: Back to Basics [JCA/TR]		Computer basin-modelling (MATLAB): Practical 1
6 9/09	Physical Principles of Basin Analysis 2: Basins in the Context of Plate Tectonics [JCA/TR]		Computer basin-modelling (MATLAB): Practical 2
7 16/09	Exploration Geophysics [ML/YY]		Exploration Seismology: Practical 3
8 7/10	Exploration Geophysics [ML/YY]		Practical Test
9 14/10	Exploration Geophysics [ML/YY]		Case History guest lecture
10 21/10	-Coal Bed Methane -“Tight Gas”	Guest speakers	Production guest lecture
11 28/10	Peak Oil [SG/guest]		Assignment 4 (essay): Choose topic -Coal Bed Methane -Tight Gas -CO ₂ Sequestration -Geothermal Energy
12 4/11	-Appraisal (4-D) -Production [C O’N]		
13 11/11	-CO ₂ Sequestration - Geothermal Energy	Neil Williams	

