



Faculty of Engineering

Course Outline

PTRL4012/5012

Enhanced Oil and Gas Recovery

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## 2. AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

### 2.1. Course Aims

The aim of this course is to provide insight on enhanced oil recovery; to introduce you to important rock and fluid characteristics; and to assist you to answer key questions related to enhanced oil recovery.

### 2.2. Learning Outcomes

At the conclusion of this course, students should be able to understand:

- A) Petrophysical Properties Related To EOR:** capillary pressure saturation curves, pore-scale displacement, relative permeability, capillary pressure desaturation curves and wettability.
- B) Phase Behavior Related to EOR:** fundamentals of phase-equilibrium, phase behavior of pure components, phase behavior of mixtures, ternary diagrams, quantitative representation of two-phase equilibrium.
- C) Displacement and Sweep Efficiency:** fractional flow theory, pore-scale multiphase flow, immiscible displacement, dissipation in immiscible displacement, ideal miscible displacements, dissipation in miscible displacements, generalization of fractional-flow theory, application to three-phase flow, modeling EOR processes with two-phase fractional-flow theory, areal sweep efficiency, measures of heterogeneity, displacements with no vertical communication, vertical equilibrium, special cases of vertical equilibrium, instability phenomena, gravity segregation in gas EOR.
- D) Solvent Methods:** solvent properties, solvent and crude-oil properties, solvent-water properties, solvent phase-



## 4. COURSE CONTENT AND LEARNING ACTIVITIES

### 4.1. Course content

1. Introduction to EOR
2. Petrophysics and Phase Behavior
3. Multi-Component and Multi-Phase Systems
4. Fractional Flow Theory
5. Displacement and Sweep Efficiency
6. Chemical EOR
7. Polymer EOR
8. Thermal EOR



## 5. COURSE ASSESSMENT

### 5.1. Assessment Summary

| Assessment task | Due date / week | Weight            | Assessment   |
|-----------------|-----------------|-------------------|--|
| 1               | Weeks 6 & 11    | 15%<br>(7.5% x 2) | Homework   |
| 2               | Any Week        | 5%                | Participation  |
| 3               | Week 5          | 20%               | QUIZ (EOR Basics )   |
| 4               | Weeks 7-9       | 10%               | PG Group Presentations<br>Group presentations on selected EOR technology |
| 5               | Week 10         | 10%               | UG Presentation Summary  |
| 6               | Exams Period    | 50%               | Final Exam<br>Administered by UNSW exam unit                             |



## 6. ASSESSMENT CRITERIA

### 6.1 Homework

Homework problems will be given every week. Each set of problems will cover the topics discussed during lecture/tutorial for that week. During Week 6, homework from Weeks 1 through 4 are due and should be uploaded to Moodle as a PDF. During Week 11, homework from Weeks 5 through 10 are due and should be uploaded to Moodle as a PDF.

Each marked homework will be worth 7.5% of your total marks.

### 6.2 Quizzes

One in-class quiz will be conducted during Week 6. The quiz will cover materials from Weeks 1-5.

### 6.3

## 7. STUDYING A COURSE IN UNSW MINERALS AND ENERGY RESOURCES ENGINEERING

### 7.1. How We Contact You

At times, the School or your course conveners may need to contact you about your course or your enrolment. Your course conveners 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 these instructions on how to redirect your UNSW emails: <https://www.it.unsw.edu.au/students/email/index.html>

### 7.2. 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.microsoftcrmpartals.com/web-forms/>

Course inquiries: these should be directed to the Course Convenor.

### 7.3. Computing Resources and Internet Access Requirements

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. Note that some specialist engineering software is not available for Mac computers.

Mining Engineering Students: OMB G48/49

Petroleum Engineering Students: TETB

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](http://www.student.unsw.edu.au/moodle-system-requirements)

### 7.4. 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 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 \_\_\_\_\_ 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. \_\_\_\_\_ is using the work of others in whole or part without appropriate acknowledgement within the assignment in the required form. \_\_\_\_\_ is where another person(s) assists in the preparation of a student's assignment without the consent or knowledge of the Course Convenor.

\_\_\_\_\_ and \_\_\_\_\_ 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.