Faculty of Engineering

School of Minerals and Energy Resources Engineering

Postgraduate Course Outline

PTRL6107
Petrophysics
Dr Hamid Roshan
1. INFORMATION ABOUT THE COURSE

<table>
<thead>
<tr>
<th>Course Code:</th>
<th>PTRL6107</th>
<th>Term:</th>
<th>T2</th>
<th>Level:</th>
<th>PG</th>
<th>Units/Credits</th>
<th>6 UOC</th>
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<tbody>
<tr>
<td>Course Name:</td>
<td>Petrophysics</td>
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</table>

Course Convenor: Dr Hamid Roshan

Contact Details
- School of Minerals and Energy Resources Engineering
- TETB 221
- EMAIL: h.roshan@unsw.edu.au
- Phone: +61 2 9385 5535

Contact times
- Lecture and tutorial time schedule
- Lectures will be available on moodle and all communications will be taken place in moodle forum

Course Tutor
- Mr. Asad Pirzada (m.pirzada@unsw.edu.au)

1.1. Course Description

Physics and Principle of Well-logging
Well-logging Tools
Well-log interpretation (lithology)
Well-log interpretation (Petrophysical Properties) and Interactive Petrophysics software

1.2. Course Completion

Course completion requires submission of all assessment items; failure to submit all assessment items can result in the award of an Unsatisfactory Failure (UF) grade for the Course.

1.3. Assumed Knowledge

Prerequisite: N/A

1.4. Attendance

N/A
2. AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

2.1. Course Aims

In this course, students are introduced to reservoir rock and fluid properties and learn the fundamental of well logging and log interpretation. The integration of fluid-rock properties through core analysis along with well-log interpretation forms the foundation of reservoir evaluation. As part of the course, students are also introduced to real well-log data for quality control, analysis and interpretation e.g. Interactive Petrophysics (IP) Software is additionally used in the course (if time allows) in order to interpret the well-log data from several formations around the world within the standard industry practice.

2.2. Learning Outcomes

a) Understanding the petrophysical properties of the reservoirs and the ways they are measured in routine and special core analysis workflow
b) Obtaining knowledge of physical principles of well logging and the tools used to measure petrophysical properties
c) Fundamentals of quantitative and qualitative interpretation of well-log data
d) Analyze a set of real well-log data using gained knowledge and available software.
3. REFERENCE RESOURCES

3.1. Reference Materials

Ellis, D, Well Logging for Earth Scientists, 1987.

3.2. Other Resources (if applicable)


3.3. Online Resources

Society of Petroleum Engineers: http://www.spe.org Australian
Association of Petroleum Geologists: http://www.geobyte.com
American Petroleum Institute – For Petroleum Standards www.api.org
Society of Petrophysicists & Well Log Analysts www.spwla.org
European Association of Geoscientists & Engineers www.eage.org
The Society of Exploration Geophysicists www.seg.org

3.4. Report Writing Guide

The School has a report writing guide (RWG) available. A copy of this is available on the course Moodle site.
4. COURSE CONTENT AND LEARNING ACTIVITIES

4.1. Course content

- Acquisition of Petrophysical Data
- Routine and special core analysis
- Open and cased hole logging
- Log interpretation (lithology)
- Log interpretation (quantitative)

4.2. Learning Activities Summary

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture</th>
<th>Tutorial</th>
</tr>
</thead>
</table>
| 1    | • Measurements used in Oil Industry  
       • Acquisition of Petrophysical Data | • Analysis of the scaling factor |
| 2    | • Routine and special core analysis | • Analyse the experimental data to extract petrophysical properties |
| 3    | • Open hole logging:  
       Resistivity | • Fundamental and applications of resistivity logging |
| 4    | • Open hole logging:  
       nuclear and acoustic | • Fundamental and applications of nuclear logging |
| 5    | • Mid-term exam | • Fundamental and applications of acoustic logging |
| 6    | • Cased hole and other logs | • Fundamental and applications of cased hole logging |
| 7    | • Lithology identification | • Lithology identification using real data |
| 8    | • Shale volume calculation  
       • Porosity estimation | • Calculation of shale volume and porosity from real data |
| 9    | • Water saturation | • Calculation of water saturation from real data |
| 10   | • Permeability estimation  
       • Quick look methods  
       • Miscellaneous | • Work on real data of different reservoirs |

Other UNSW Key dates: [https://student.unsw.edu.au/new-calendar-dates](https://student.unsw.edu.au/new-calendar-dates)
The tutorial questions and their solutions will be provided during the course.
4.3. Course Flowchart

5. COURSE ASSESSMENT
5.1. **Assessment Summary**

The course will have one assignment on overall log interpretation of a real dataset, project, mid-term and final exam.

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Due date</th>
<th>Weight (%)</th>
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<tbody>
<tr>
<td>Assignment 1</td>
<td>End of week 5</td>
<td>25</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>End of week 10</td>
<td>25</td>
</tr>
<tr>
<td>Final exam</td>
<td>As per University schedule</td>
<td>50</td>
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Assignments related details/submission-box will be available online through Moodle. Access to the Moodle site is via the Moodle icon on the MyUNSW homepage.

6. **ASSESSMENT CRITERIA**

The assessment criteria provide a framework for you to assess your own work before formally submitting major assignments to your course convenor. Your course convenor will be using this framework to assess your work and as a way to assess whether you have met the listed learning outcomes and the graduate attributes for your program. We ask that you don’t use the assessment criteria guidelines as a checklist, but as a tool to assess the quality of your work. Your course convenor will also be looking at the quality, creativity and the presentation of your written assignment as they review the framework. Rubrics, wherever applicable, will be provided at the time of the assignment release.

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

7.1. **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 these instructions on how to redirect your UNSW emails: [https://www.it.unsw.edu.au/students/email/index.html](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.microsoftcrmportals.com/webforms/](https://unswinsight.microsoftcrmportals.com/webforms/)

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)

### 7.5. Assignment Submissions

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.

### 7.6. Late Submission of an Assignment

Each project task should be completed within a specified time period and by the due date. There will be no extension for the submissions and the late submission will attract a penalty up to 10% of the assessment task value per day. The submission due dates and instructions are given in appropriate section of this document.

### 7.7. Special Consideration

You can apply for special consideration through UNSW Student Central 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](http://www.student.unsw.edu.au/special-consideration)

### 7.8. Course Results

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

- WD – which usually indicates you have not completed one or more items of assessment or 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.

7.9. Students Needing Additional Support

The Student Equity and Disabilities Unit (SEADU) aims to provide all students with support and professional advice when circumstances may prevent students from achieving a successful university education. Take a look at their webpage: www.studentequity.unsw.edu.au/

7.10. 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.

7.11. Continual Course Improvement

At the end of each course, all students will have the opportunity to complete a course evaluation form. These anonymous surveys help us understand your views of the course, your lecturers and the course materials. We are continuously improving our courses based on student feedback, and your perspective is valuable.

Feedback is given via https://student.unsw.edu.au/myexperience and you will be notified when this is available for you to complete.

We also encourage all students to share any feedback they have any time during the course – if you have a concern, please contact us immediately.
## 8. SCHOOL ASSESSMENT COVER SHEET

### School of Minerals and Energy Resources Engineering

**Assessment Cover Sheet**

<table>
<thead>
<tr>
<th>Course Convenor:</th>
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<tbody>
<tr>
<td>Course Code:</td>
<td></td>
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<tr>
<td>Course Title:</td>
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<tr>
<td>Assignment:</td>
<td></td>
</tr>
<tr>
<td>Due Date:</td>
<td></td>
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<tr>
<td>Student Name:</td>
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<td>Student ID:</td>
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### 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](http://www.lc.unsw.edu.au/plagiarism/pintro.html) website 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).

**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.**