



Faculty of Engineering

**School of Minerals and Energy Resources Engineering**

Course Outline

PTRL4021/5011

Petroleum Production Engineering

Dr. Ryan T. Armstrong

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## 1. INFORMATION ABOUT THE COURSE

|              |   |       |    |        |      |               |       |
|--------------|---|-------|----|--------|------|---------------|-------|
| Course Code: | PTRL4021/5011                           | Term: | T2 | Level: | UG/G | Units/Credits | 6 UOC |
| Course Name: | <b>Petroleum Production Engineering</b> |       |    |        |      |               |       |

|                  |  |        |                            |  |  |  |  |
|------------------|--|--------|----------------------------|--|--|--|--|
| Course Convenor: | <b>Dr. Ryan Armstrong</b>  |        |                            |  |  |  |  |
| Contact Details  | School of Minerals and Energy Resources Engineering                          | EMAIL: | ryan.armstrong@unsw.edu.au |  |  |  |  |
|                  |  | Phone: | Email only                 |  |  |  |  |
| Contact times    | <b>Lecture and Tutorials (office hours will be announced during lecture)</b> |        |                            |  |  |  |  |

|                 |   |        |                         |  |  |  |  |
|-----------------|---|--------|-------------------------|--|--|--|--|
| Instructor:     | <b>Dr. Ying Da Wang</b>                             |        |                         |  |  |  |  |
| Contact Details | School of Minerals and Energy Resources Engineering | EMAIL: | yingda.wang@unsw.edu.au |  |  |  |  |
|                 |   | Phone: | Email only              |  |  |  |  |
| Delivery        | <b>Tutorials and Review</b>                         |        |                         |  |  |  |  |

### 1.1. Course Description

This course gives students a thorough understanding of all aspects influencing the production of oil and gas wells.

### 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. We will be applying a competency rule for the final exam to have a hurdle of 50%. Failure to meet this will result in a FL or UF (where the student would otherwise pass), whichever is relevant.

### 1.3. Assumed Knowledge

NA

### 1.4. Attendance

To pass this course it is expected that you will attend at least 80% of tutorials and lectures. *If your attendance is below 80% you will not be admitted to the final exam.* Attendance will be recorded when applicable. Normally, there is no make-up work for poor attendance. If you have misadventure or ill-health, please contact your course coordinator soon as possible. The attendance requirement is not meant to be punitive. It is included because participation is an important part of achieving the course outcomes.

## 2. AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

### 2.1. Course Aims

The aim of this course is to provide insight on production engineering including the basic physics that governs the process and common problems associated with oil and gas production.

### 2.2. Learning Outcomes

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

- The production flow system from reservoir to surface
- The mechanical energy balance equation associated with production engineering
- Artificial lift (gas lift and various pumping methods)
- Problems associated with production of formation fluids
- Formation damage/production impairment prediction, prevention and removal
- Problem Diagnosis and workover

## 3. REFERENCE RESOURCES

### 3.1. Reference Materials

Support material for this course including, whenever available, copies of lecture notes, recommended readings, etc. can be found on Moodle.

The lecture note may be viewed and downloaded from the UNSW-Moodle <http://moodle.telt.unsw.edu.au/>.

### 3.2. Textbooks

Following are the recommended books for this course.

- *Petroleum Engineering Handbook* Volume IV “Production Operations Engineering” J.D. Clegg - Editor
- Other readings will be posted on Moodle.

### 3.3. Other Resources (if applicable)

Links to websites etc.

The University and the Faculty provide a wide range of support services for students, including:

- UNSW Learning Centre (<http://www.lc.unsw.edu.au>)
- Counselling support - <http://www.counselling.unsw.edu.au>
- Library training and support services - <http://www.library.unsw.edu.au/>
- OnePetro – (<http://www.onepetro.org>)

### 3.4. Online Resources

There are numerous articles / information sources on EOR on the web. Many of them are technically correct, but many are either very lightweight or contain errors. Be very careful in your choice of web

sources. Remember, UNSW librarians are usually happy to help you locate articles or make suggestions regarding possible material to help you in your academic work. You can also access basic online help at <http://www.library.unsw.edu.au/>

## **4. COURSE CONTENT AND LEARNING ACTIVITIES**

### **4.1. Course content**

1. Introduction to production engineering
2. Flow in Pipes
3. Multiphase flow
4. Inflow and outflow performance
5. Artificial lift
6. Well diagnosis and workover
7. Common production problems

## 4.2. Learning Activities Summary

| UNSW Wk | Activity                       | Content  | Presenter (optional) |
|---------|--------------------------------|--|----------------------|
| 1       | Lecture + In class activity    | <ul style="list-style-type: none"> <li>Introduction to Production Engineering</li> </ul>                         | RA<br>YDW            |
| 2       | Lecture + In class activity    | <ul style="list-style-type: none"> <li>Horizontal and Vertical Flow in Pipes</li> </ul>                          | RA<br>YDW            |
| 3       | Lecture + In class activity    | <ul style="list-style-type: none"> <li>Multiphase Flow in Pipes</li> </ul>                                       | RA<br>YDW            |
| 4       | Lecture + In class activity    | <ul style="list-style-type: none"> <li>Inflow and Outflow Performance</li> </ul>                                 | RA<br>YDW            |
| 5       | Lecture + In class activity    | <ul style="list-style-type: none"> <li>Artificial lift: Gas and Beam</li> </ul>                                  | RA<br>YDW            |
| 6       | Flexibility Week               | <ul style="list-style-type: none"> <li>Review Materials</li> </ul>   | YDW                  |
| 7       | Quiz                           | <ul style="list-style-type: none"> <li>Quiz week</li> </ul>  | YDW                  |
| 8       | Lecture + In class activity    | <ul style="list-style-type: none"> <li>Artificial lift: PCP and ESP</li> </ul>                                   | RA<br>YDW            |
| 9       | Lecture + In class activity    | <ul style="list-style-type: none"> <li>Problem well diagnosis and workover</li> <li>Integrated Design</li> </ul> | RT<br>YDW            |
| 10      | Review + Student Presentations | <ul style="list-style-type: none"> <li>Common production problems</li> <li>Review of materials</li> </ul>        | RA<br>YDW            |

Other UNSW Key dates: <https://student.unsw.edu.au/new-calendar-dates>

## 5. COURSE ASSESSMENT

### 5.1. Assessment Summary

| Assessment task | Due date / week | Weight | Assessment                                   |
|-----------------|-----------------|--------|--|
| 1               | Week 6          | 35%    | Exam 1                                       |
| 2               | Weeks 9-10      | 10%    | Student Presentations                        |
| 3               | Week 10         | 10%    | HW   |
| 4               | Exams Period    | 45%    | Final Exam<br>Administered by UNSW exam unit |



## 6. ASSESSMENT CRITERIA

### 6.1 Exams

An in-class exam will be conducted during Week 6. The exam will cover materials from Weeks 1-4. The final exam will be conducted by the UNSW exams unit. The final exam will cover all material from the course.

### 6.2 Student Presentations

Students need to address and explain one type of problem encountered during production. They should explain the causes of the problem, provide an analysis of the predictive tools available, and explain methods available for mitigation of the problem. Overall, they need to explain the **type, cause, prediction** and **mitigation**. Presentations will be 20 minutes plus an additional 10 minutes for questions. Each presentation will be a group project of 3-5 students.

Specific topics will be posted to Moodle.

### 6.3 HW

One HW assignment will be given.

## 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)

## 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

Full marks for an assignment are only possible when an assignment is received by the due date.

Late assignments will not be accepted except in rare cases of significant misadventures.

## 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 Convener 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 finalized.

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/](http://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](http://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/](http://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.