UNSW Course Outline

PTRL4017 Well Technology - 2024

Published on the 15 May 2024

General Course Information

Course Code : PTRL4017
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Minerals & Energy Resources Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

The course covers both the theory and practical applications of well design and well completion technology. The combined lectures, workshops and laboratory experiments will provide students with a comprehensive understanding of the following aspects:

Well Design - prediction of formation pore pressure and stress gradients; determination of safety

mud weight bounds for different in-situ stress conditions; design and planning well trajectory; surveying tools and methods; drilling methods and equipment for directional, horizontal and multilateral wells; design and evaluation of casing program under specific loading and downhole conditions.

Well Completion - well completion selection and design criteria; interval selection and productivity considerations; inflow performance and tubing performance analyses; tubing-packer movement and forces; tubing design; selection of downhole equipment, tubing accessories and wellhead equipment; basics of perforation, selection of equipment and procedure for perforating oil and gas wells; sand control and gravel packing.

Course Aims

The course aims to enable students to acquire fundamental knowledge of well systems design and well completion and to apply the theory to the design, evaluation and optimization of casing program, well trajectory and well completion. The course will reinforce students' understanding of the core aspects of well construction and well completion and the inter relationship between wellbore and reservoirs.

Relationship to Other Courses

This is a Level 4 core course of the program with a prerequisite of PTRL3015.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Design and evaluate casing programs and casing strings;
CLO2 : Plan and control well trajectory;
CLO3 : Choose well completion technology and well completion equipment;
CLO4 : Analyse well and tubing performance, tubing movement and design tubing string;
CLO5 : Design perforation and sand control for specific well conditions.

Course Learning Outcomes	Assessment Item
CLO1 : Design and evaluate casing programs and casing strings;	• Assignments • Midterm Exam • Final Exam
CLO2 : Plan and control well trajectory;	• Assignments • Final Exam
CLO3 : Choose well completion technology and well completion equipment;	• Midterm Exam • Assignments • Final Exam
CLO4 : Analyse well and tubing performance, tubing movement and design tubing string;	• Midterm Exam • Assignments • Final Exam
CLO5 : Design perforation and sand control for specific well conditions.	• Assignments • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System | Blackboard Collaborate | Echo 360

Learning and Teaching in this course

The course contains weekly lectures, in-class exercises and home works. The assessment includes assignments, midterm quiz and final exam.

Other Professional Outcomes

N/A

Additional Course Information

N/A

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignments Assessment Format: Individual Short Extension: Yes (7 days)	20%	Due Date: Assignments due at the end of Weeks 3, 7, 8, 10 respectively, practical exercises due weekly.
Midterm Exam Assessment Format: Individual	30%	Due Date: Midterm quiz due in Week 7
Final Exam Assessment Format: Individual	50%	Due Date: During the Exam Period

Assessment Details

Assignments

Assessment Overview

There are 4 parts to the assignment which cover lecture topics of previous weeks. Marking will be against specific criteria in a marking guide and Individual written feedback will be provided within ten days of the relevant submission date through the Learning Management System. Verbal class-wide feedback will be provided in class during assignment reviews.

Course Learning Outcomes

- CLO1 : Design and evaluate casing programs and casing strings;
- CLO2 : Plan and control well trajectory;
- CLO3 : Choose well completion technology and well completion equipment;
- CLO4 : Analyse well and tubing performance, tubing movement and design tubing string;
- CLO5 : Design perforation and sand control for specific well conditions.

Detailed Assessment Description

The first assignment is due on week 3 and the feedback will be provided before 22 June 2024

Assessment Length

No more than 10 pages

Submission notes

Online submission

Assessment information

The specifications and marking rubrics will be provided at the time of the assignment release.

Assignment submission Turnitin type

This is not a Turnitin assignment

Midterm Exam

Assessment Overview

The midterm exam covers lecture topics from W1 to W5. Marking will be against specific criteria in a marking guide and formal feedback will be provided within ten days of the quiz. Verbal class-wide feedback will be given during the quiz review.

Course Learning Outcomes

- CLO1 : Design and evaluate casing programs and casing strings;
- CLO3 : Choose well completion technology and well completion equipment;
- CLO4 : Analyse well and tubing performance, tubing movement and design tubing string;

Detailed Assessment Description

N/A

Assessment Length

1.5hrs

Assessment information

Guidelines for helping the preparation for the midterm quiz will be released on Moodle prior to the quiz.

Assignment submission Turnitin type

This is not a Turnitin assignment

Final Exam

Assessment Overview

Final exam covers all topics. Marking will be done with a rubric. Individual mark will be issued.

Course Learning Outcomes

- CLO1 : Design and evaluate casing programs and casing strings;
- CLO2 : Plan and control well trajectory;
- CLO3 : Choose well completion technology and well completion equipment;
- CLO4 : Analyse well and tubing performance, tubing movement and design tubing string;
- CLO5 : Design perforation and sand control for specific well conditions.

Detailed Assessment Description

N/A

Assessment Length

2 hrs

Assessment information

Guidelines for helping the preparation for the final exam will be released on Moodle prior to the exam.

Assignment submission Turnitin type

Not Applicable

General Assessment Information

The assessment includes assignments, midterm quiz and final exam.

Grading Basis

Standard

Requirements to pass course

Students need to achieve at least 50 marks to pass the course.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 0 : 20 May - 26 May	Reading	Self-study: Course outline
Week 1 : 27 May - 2 June	Lecture	Course Introduction Lecture Part A: Casing Types and Physical Properties Lecture Part B: Well Completion Design, Well Performance Analysis
	Workshop	Part A: API casing classification Part B: Well Performance Analysis
Week 2 : 3 June - 9 June	Lecture	Part A: Casing Performance Properties under Load Conditions Part B: Well Performance Analysis
	Workshop	Part A: Load on casing Part B: IPR curve for oil reservoir
Week 3 : 10 June - 16 June	Lecture	Part A: Principles of Casing Design - Casing Setting Depth & Program (This is a pre-recorded lecture due to the public holiday). Part B: Well Performance Analysis
	Workshop	Part A: Casing setting depth & program Part B: Production index, IPR curve for gas reservoir
Week 4 : 17 June - 23 June	Lecture	Part A: Principles of Casing Design Part B:Tubing Performance Analysis, Pressure Gradient Analysis
	Workshop	Part A: Casing without liner Part B: Pressure gradient calculation
Week 5 : 24 June - 30 June	Lecture	Part A: Principles of Casing Design Part B: Tubing Performance Analysis, Pressure Gradient Analysis
	Workshop	Part A: Casing with liner, Review on Casing Design Part B: Pressure Gradient calculation, Review on Well and Tubing performance Analysis
	Tut-Lab	Computer Lab: VirtuWell • Pressure gradient analysis • IPR/TPC analysis
Week 6 : 1 July - 7 July	Other	Flexibility week. Self-study: review for midterm quiz.
Week 7 : 8 July - 14 July	Lecture	Part A: Well Planning Part B: Tubing Movement & Tubing Design
	Assessment	Midterm Exam: 2 hours
	Workshop	Part A: Well Trajectory Design
	Tut-Lab	Tut-Lab Computer Lab: VirtuWell • Pressure gradient analysis • IPR/TPC analysis
Week 8 : 15 July - 21 July	Lecture	Part A: Surveying Calculations Part B: Tubing Movement & Tubing Design; Well completion Equipment
	Workshop	Part A: Survey Calculations Part B: Tubing movement calculation
Week 9 : 22 July - 28 July	Lecture	Part A: Surveying Calculations, Surveying Methods & Tools Part B: Perforation of Oil and Gas Wells
	Workshop	Part A: Surveying calculations Part B: Perforation Design
Week 10 : 29 July - 4 August	Lecture	Part A: Directional Control, MWD & Rotary Steerable System, Downhole Tools and Motors Part B: Sand Control
	Workshop	Part A: Final Review Part B: Determination of Gravel and Liner Slot Size, Final Review

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

The course has weekly lectures (Part A and Part B); midterm quiz in Week 7 and final exam in the exam period. Assignments are due in Week 3, 7, 8 and 10 respectively.

Course Resources

Prescribed Resources

Support material for this course including, whenever available, copies of lecture notes, lecture slides, recommended readings, etc. can be found on Moodle. The lecture notes/slides may be viewed and downloaded from the UNSW-Moodle http://moodle.telt.unsw.edu.au/.

Recommended Resources

Followings are the recommended books for this course:

- Rahman S.S. and Chilingarian G.V.: Casing Design Theory and Practice, Elsevier Science B.V., Amsterdam, The Netherlands, 1995
- Inglis, T.A.: Directional Drilling, Petroleum Engineering and Development Studies, Vol. 2, Graham & Trotman, 1987.
- Bourgoyne A.T. Jr., Millheim K.K., Chenevert M.E. and Young F.S. Jr.: Applied Drilling Engineering, SPE Textbook Series, Vol. 2, Richardson, TX, USA, 1991.
- Buzarde L.E. Jr., R.L. Kastro, W.T. Bell and C.L. DePriester: Production operations, Course 1, Well Completions SPE Publications, 1972
- Allen T.O. and A.P. Roberts: Production Operations, Volumes I and II, Oil and Gas Consultants International Inc, 1989
- Reservoir Engineering Hand Book, Tarek Ahmed Gulf Publishing Company, 2000
- Michael J Economides, A Daniel Hill, Christine Ehlig Economides and Englewood Cliffs NJ.: Petroleum Production Systems, Prentice Hall 1994.

Additional Costs

N/A

Course Evaluation and Development

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.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Zhixi Chen		211 Level 2, TETB	402962708	Office hours	No	Yes
Lecturer	Sheik Rahman		212 Level 2, TETB	02 9385 5659	Office hours	No	No

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning

environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off 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. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

Course completion

Course completion requires submission of all assessment items. Failure to submit all assessment items may result in the award of an Unsatisfactory Failure (UF) grade for the Course unless special consideration has been submitted and approved.

Submission of Assessment Tasks

We encourage you to retain a copy of every assignment submitted for your own record, either in hardcopy or electronic form. All assessments must have an assessment cover sheet attached (if required).

Student Resources

The School has student resources section, containing useful advice and information to ensure you're able to focus on your studies.

Computing Resources and Internet Access Requirements

UNSW Minerals and Energy Resources Engineering provides blended learning using the online Moodle LMS (Learning Management System). Also see - Transitioning to Online Learning: www.covid19studyonline.unsw.edu.au

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

- Mining Engineering Students: OMB G48
- Petroleum Engineering Students: TETB LG34 & LG35

For more information about system requirements is available at www.student.unsw.edu.au/moodle-system-requirements

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

School Contact Information

School of Minerals and Energy Resources Engineering
Old Main Building, Level 1, 159 (K15)
UNSW SYDNEY NSW 2052 AUSTRALIA

For current students, all enquiries and assistance relating to enrolment, class registration, progression checks and other administrative matters, please see The Nucleus: Student Hub.

Web & Important Links:

School of Minerals and Energy Resources
The Nucleus Student Hub
Moodle
UNSW Handbook
UNSW Timetable
Student Wellbeing
Urgent Mental Health & Support
Equitable Learning Services