



UNSW Course Outline

PTRL5009 Well Drilling Equipment and Operations - 2024

Published on the 01 Feb 2024

General Course Information

Course Code : PTRL5009

Year : 2024

Term : Term 1

Teaching Period : T1

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 : Postgraduate

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 drilling equipment in well drilling operations. The combined lectures, workshops and laboratory experiments will provide students with a comprehensive understanding of the physical processes involved in drilling;

rotary drilling rigs for both land and offshore operations; drilling equipment including rig powering and transmission, hoisting, rotary systems, BOP equipment and hookup, drill pipes and collars, drilling fluid circulating systems including pumps, mud tanks, mud mixtures and mud cleaners; elements of rock mechanics and its application in drilling; selection of drill bits and optimization of penetration rate; rig sizing and selection and special marine equipment for offshore drilling and hands-on experience in drilling simulation laboratory, including drilling rig and equipment layout; rig systems and well control operations.

Course Aims

The course aims to enable students to acquire fundamental knowledge of well drilling physical process and equipment, and to apply the theory to streamline and optimize rig operations and provide cost-effective solutions to common rig problems associated with day to day operations. The course will reinforce students' understanding of the core aspects of well construction and the inter relationship between wellbore and reservoirs.

Relationship to Other Courses

This is the fundamental course for drilling technology, and a pre-requisite course for most of other drilling related PG courses.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Identify the functions and roles of key drilling equipment and apparatus
CL02 : Describe the physical processes involved in both on-shore and off-shore well drilling
CL03 : Select appropriate drilling rig components & equipment as to optimize costs for a given drilling operation (onshore or offshore)

Course Learning Outcomes	Assessment Item
CL01 : Identify the functions and roles of key drilling equipment and apparatus	<ul style="list-style-type: none">• Assignments• Midterm Exam• Lab• Final Exam
CL02 : Describe the physical processes involved in both on-shore and off-shore well drilling	<ul style="list-style-type: none">• Assignments• Midterm Exam• Lab• Final Exam
CL03 : Select appropriate drilling rig components & equipment as to optimize costs for a given drilling operation (onshore or offshore)	<ul style="list-style-type: none">• Assignments• Midterm Exam• Lab• Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360 | Blackboard Collaborate | Microsoft Teams

Learning and Teaching in this course

Face to face teaching mode in both lecturing and laboratory. The assessment contains assignments, laboratory reports, midterm exam 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	30%	Due Date: The 4 Assignments due on weeks 3, 5, 7 and 9, respectively; and the project due on week 10. Class exercises due weekly.
Midterm Exam Assessment Format: Individual	10%	Due Date: Week 7
Lab Assessment Format: Group	10%	Due Date: Two weeks after each lab session.
Final Exam Assessment Format: Individual	50%	Due Date: Exam period

Assessment Details

Assignments

Assessment Overview

There are 4 assignments which cover lecture topics of previous weeks:

1. Power System and Circulation System;
2. Hoisting System;
3. Drillstring;
4. Rotary Drill Bits.

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

- CL01 : Identify the functions and roles of key drilling equipment and apparatus
- CL02 : Describe the physical processes involved in both on-shore and off-shore well drilling
- CL03 : Select appropriate drilling rig components & equipment as to optimize costs for a given drilling operation (onshore or offshore)

Detailed Assessment Description

The first assignment is due on week 3 and the feedback will be provided before 10 March 2024

In addition to the 4 assignments, a design project will focus on the analysis and selection of one

or multiple drilling rig components & equipment in order to optimize the cost for a given drilling operation. The specification of the project and marking rubrics will be released on Week 6.

Assessment Length

N/A

Submission notes

Online submission

Assessment information

N/A

Assignment submission Turnitin type

Not Applicable

Midterm Exam

Assessment Overview

The midterm quiz covers lecture topics from W1 to W5. The duration of the quiz is 1.5 hrs. 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

- CL01 : Identify the functions and roles of key drilling equipment and apparatus
- CL02 : Describe the physical processes involved in both on-shore and off-shore well drilling
- CL03 : Select appropriate drilling rig components & equipment as to optimize costs for a given drilling operation (onshore or offshore)

Detailed Assessment Description

The midterm quiz will be hold in the face-to-face mode.

Assessment Length

1.5 hours

Submission notes

Paper submission

Assessment information

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

Assignment submission Turnitin type

Not Applicable

Lab

Assessment Overview

Four lab experiments involve drilling simulation using drilling simulator. Students will complete and submit class exercise and home work (typically 5 A4 pages long) within two weeks of each lab session. Written and verbal feedback will be provided for each student and an individual mark will be issued against specific criteria in a marking guide. Verbal class-wide feedback will be given during lab sessions.

Course Learning Outcomes

- CLO1 : Identify the functions and roles of key drilling equipment and apparatus
- CLO2 : Describe the physical processes involved in both on-shore and off-shore well drilling
- CLO3 : Select appropriate drilling rig components & equipment as to optimize costs for a given drilling operation (onshore or offshore)

Detailed Assessment Description

Attend all the lab sessions, complete and submit class exercise and home work.

Assessment Length

N/A

Submission notes

Online submission

Assessment information

Laboratory guidelines will be provided on Moodle prior to Lab sessions.

Assignment submission Turnitin type

Not Applicable

Final Exam

Assessment Overview

Final exam covers all topics. The duration of the exam is 2 hrs. Marking will be done with a rubric. Individual mark will be issued.

Course Learning Outcomes

- CLO1 : Identify the functions and roles of key drilling equipment and apparatus

- CLO2 : Describe the physical processes involved in both on-shore and off-shore well drilling
- CLO3 : Select appropriate drilling rig components & equipment as to optimize costs for a given drilling operation (onshore or offshore)

Assessment Length

2 hours

Assessment information

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

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Attendance at laboratory sessions is compulsory. Students are encouraged to complete the "Laboratory Safety Awareness" and "Green Lab Environment Compliance" online courses before access to the lab.

Grading Basis

Standard

Requirements to pass course

Students need to achieve 50 marks to pass the course.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Course introduction and expectations Power System
	Workshop	Power System
	Laboratory	Laboratory safety Induction and Lab Orientation
Week 2 : 19 February - 25 February	Lecture	Circulation System
	Workshop	Circulation System
	Laboratory	Lab1: Equipment layout on a typical rig floor
Week 3 : 26 February - 3 March	Lecture	Hoisting System
	Workshop	Hoisting System
Week 4 : 4 March - 10 March	Lecture	Supporting Structure
	Workshop	Supporting Structure
	Laboratory	Lab 2: Circulating system
Week 5 : 11 March - 17 March	Lecture	Drill String and its Components
	Workshop	Drill String and its Components
Week 6 : 18 March - 24 March	Project	Project consultation
Week 7 : 25 March - 31 March	Lecture	Rotary System
	Assessment	Midterm Quiz
	Laboratory	Lab3: Hoisting system
Week 8 : 1 April - 7 April	Lecture	Rotary Drilling Bits
	Workshop	Rotary Drilling Bits
Week 9 : 8 April - 14 April	Lecture	Offshore Drilling System
	Laboratory	Lab 4: Blowout preventer system and well control operation
Week 10 : 15 April - 21 April	Lecture	Blowout Preventers Final Review

Attendance Requirements

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

General Schedule Information

Lectures in Weeks 1-5 and 7-10.

Midterm Exam in Week 7.

Laboratory in Weeks 1, 2, 4, 7 and 9.

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:

- Applied Drilling Engineering AT Bourgoyne Jr, ME Chenevert, KK Millheim and FS Young Jr. SPE Textbook Series, Vol. 2, 2nd Edition (1991)
- Oil Well Drilling Engineering, Principles and Practice H. Rabia. Graham and Trotman Ltd (1985)

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		Office 211, Level 2, TETB	+61 2 9385 5182	Office hours	No	Yes
Lecturer	Sheik Rahman		Office 212, Level 2, TETB	0418 418 892	Office hours	No	No
Lab staff	Gopalarajah Sivapragasam				Lab time	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 policies. 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 Plagiarism

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.

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
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](#)