



PTRL3015

Well Drilling Equipment and Operations

Term One // 2021

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
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Lecturers

Name	Email	Availability	Location	Phone
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School Contact Information

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Course Details

Credit Points 6

Summary of the Course

The course comprises of 3 units of Lecture and Tutorial and 3 units of Laboratory work.

The lecture includes: Introduction to physical processes involved in drilling oil and gas wells. Rotary drilling rigs for both land and offshore operation. 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 penetration rate optimisation. Rig sizing and selection. Special marine equipment for offshore drilling.

The laboratory work involves: formulation of a basic drilling fluid and cement slurry and determine physical and chemical properties. Physical and chemical properties include density, viscosity, filtration, alkalinity, acidity, solid contents, and presence of oil, water, and gases in drilling fluids.

Course Aims

This course is taught from a practical view with the aim that students will learn how to streamline and optimize rig operations and gain the technical skills to provide cost-effective solutions to common rig problems associated with day to day operations. Students enrolled in this course will be given an in-depth view of the physical processes involved in drilling oil and gas wells, both on-shore and off-shore.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Learn the functions and roles of key drilling equipment and apparatus;	PE1.1, PE1.2, PE1.5, PE2.1, PE2.2, PE2.3, PE3.4
2. Be given an in-depth view of the physical processes involved in drilling oil and gas wells, both on-shore and off-shore;	PE1.1, PE1.3, PE1.2, PE2.1, PE2.3, PE3.4, PE2.4
3. Learn to select appropriate drilling rig components & equipment as to optimize costs for a given drilling operation (onshore or offshore).	PE1.3, PE2.1, PE2.3, PE2.4, PE3.4, PE3.6, PE2.2

Teaching Strategies

1. Weekly lectures are designed to provide students fundamental understanding through a series of topics on drilling equipment and operations.
2. The fundamental material covered in the lectures is supported by problem-solving exercises in tutorials and class discussions.
3. Learning during lectures is further supported by group based laboratory practices.
4. Online learning support is also available through Moodle.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Home work	25%	Assignments 1,2,3,4 due at the end of Weeks 3,5,7,9.	1, 2, 3
Final Assessment	40%	Exam period	1, 2, 3
Hands On	20%	Lab report due within 2 weeks after each lab session	1, 2, 3
Midterm Assessment	15%	Tuesday, Week 7	1, 2, 3

Assessment Details

Assessment 1: Home work

Start date: Not Applicable

Details:

4 individual assignments due at the end of Weeks 3,5,7,9 respectively; Tutorial exercises due weekly.

Additional details:

Ass1 covers Power System and Circulation System; Ass2 covers Hoisting System; Ass3 covers Drillstring; Ass4 covers Rotary Drill Bits.

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

Submission notes: Online Moodle Submission

Turnitin setting: This is not a Turnitin assignment

Assessment 2: Final Assessment

Length: 2 hrs

Details:

A 2 hours final exam during exam period covers topics from Weeks 1 to 10.

Additional details:

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

Submission notes: Online Moodle submission

Turnitin setting: This is not a Turnitin assignment

Assessment 3: Hands On

Start date: Not Applicable

Details:

Activity involves preparation of drilling fluids and cement slurry and measurement of their properties in the laboratory. Individual lab report due after each lab session.

Additional details:

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

Submission notes: Online Moodle submission

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 4: Midterm Assessment

Details:

One hour quiz in Week 7 covers topics from Weeks 1 to 5

Additional details:

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

Submission notes: Online Moodle submission

Turnitin setting: This is not a Turnitin assignment

Attendance Requirements

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

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
O Week: 8 February - 12 February		
Week 1: 15 February - 19 February	Lecture	<ul style="list-style-type: none"> • Course introduction and expectations • Power System
	Tut-Lab	<ul style="list-style-type: none"> • Tutorial of Power System • Laboratory safety Induction and Lab Orientation
Week 2: 22 February - 26 February	Lecture	<ul style="list-style-type: none"> • Circulation System
	Tut-Lab	<ul style="list-style-type: none"> • Tutorial of Circulation System • Lab 1 Mud weight calculation and preparation
Week 3: 1 March - 5 March	Lecture	<ul style="list-style-type: none"> • Hoisting System
	Tut-Lab	<ul style="list-style-type: none"> • Tutorial of Hoisting System
Week 4: 8 March - 12 March	Lecture	<ul style="list-style-type: none"> • Supporting Structure
	Tut-Lab	<ul style="list-style-type: none"> • Tutorial of Supporting Structure • Lab 2 Control and measurement of rheological properties of drilling mud
Week 5: 15 March - 19 March	Lecture	<ul style="list-style-type: none"> • Drill String and its Components
	Tut-Lab	<ul style="list-style-type: none"> • Tutorial of Drill String and its Components
Week 6: 22 March - 26 March	Homework	<ul style="list-style-type: none"> • Flexibility week
Week 7: 29 March - 2 April	Lecture	<ul style="list-style-type: none"> • Rotary System
	Assessment	<ul style="list-style-type: none"> • Midterm Quiz
	Tut-Lab	<ul style="list-style-type: none"> • Lab 3 Control and measurement of water loss of drilling fluid
Week 8: 5 April - 9 April	Lecture	<ul style="list-style-type: none"> • Rotary Drilling Bits
	Tut-Lab	<ul style="list-style-type: none"> • Tutorial of Rotary Drilling Bits
Week 9: 12 April - 16 April	Lecture	<ul style="list-style-type: none"> • Offshore Drilling Systems
	Tut-Lab	<ul style="list-style-type: none"> • Tutorial of Offshore Drilling Systems • Lab 4 Preparation and test of cement slurry
Week 10: 19 April - 23 April	Lecture	<ul style="list-style-type: none"> • Blowout Preventers • Final Review
	Tut-Lab	Tutorial of Blowout Preventers

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)

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.

Laboratory Workshop Information

Laboratory activities will be conducted in LG29 and LG31, TETB.

Please prepare yourself before attending the lab session by reading through Lab notes, Safe Working Procedures, Risk management form and Safety Data Sheet and watching pre-recorded video clips.

Submission of Assessment Tasks

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.

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. Please note, a competency hurdle of 50% is applied to the final assessment.

Late Submission of an Assignment

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

We understand that at times you may not be able to submit an assignment on time, and the School will accommodate any fair and reasonable extension. We would recommend you review the UNSW Special Consideration guidelines – see section below.

Late submission will not be accepted and will be considered as no submission.

Special Consideration

You can apply for special consideration through [The Nucleus Student Hub](#) 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

Student Support

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

- Library training and support services - www.library.unsw.edu.au

- UNSW Learning Centre - www.lc.unsw.edu.au
- Counselling support - www.counselling.unsw.edu.au

Equitable Learning Services aims to provide all students with a free and confidential service that provides practical support to ensure that your health condition doesn't adversely affect your studies.
<https://student.unsw.edu.au/els>

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.

Academic Information

Course Results

For details on UNSW assessment policy, please visit: 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:

- LE – indicates you have not completed one or more items of assessment; or
- WD – indicates 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.

Studying a course in the School of Minerals and Energy Resources Engineering at UNSW

Report writing guide

The School has a [Report Writing Guide \(RWG\)](#) available. A copy of this is available on the course Moodle site.

Computing Resources and Internet Access Requirements

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

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
- Petroleum Engineering Students: TETB LG34 & LG 35

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

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

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 instructions on how to redirect your UNSW emails: "[How can I forward my emails to another account?](#)"

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/web-forms/>
- Course inquiries should be directed to the Course Convenor

Image Credit

UNSW SYDNEY

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	✓