

## Course Outline

### *College of Engineering*

### *Petroleum Engineering Department*

### *PETR443 / Produced Water Management*

### *PETR 22*

### *Bachelor of Engineering Technology - Petroleum*

- Prerequisites: PETR440
- Co-Requisites: NA
- Credit Hours: 3
- Course Coordinator:
- Instructors' Names:
- Instructors' Office Hours:
- Instructors' Office Location:
- Instructors' telephone extension:
- Instructors' email addresses:
- Classroom Location and timings<sup>1</sup>: As per EduGate (On-Campus)

**This course is part of the mentioned above program which is accredited by Engineers Australia.**

### **Catalog Description**

*This course is based on a project scenario that requires students to cover basic and practical topics related to water issues in oil and gas production. This project reflects a situation that is similar to situations engineering technologists find at the workplace, and it includes principles of water chemistry, and water analysis. The project requires also that students look into practical issues including corrosion and scaling problems, produced water treatment processes, and water injection and disposal technologies. In order to deliver a successful project, students work in teams and need to apply relevant software as well as professional project management concepts.*

### **Course Objectives and Student Learning Outcomes**

*Upon completion of this course, students should be able to:*

- L.O.1.** *Define key principles of water chemistry and recall fundamental concepts related to water issues in oil and gas production.*

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<sup>1</sup> Classroom timings and location are tentative, please refer to EduGate for the up to date information.

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- L.O.2.** Explain practical topics such as corrosion and scaling problems, produced water treatment processes, and water injection and disposal technologies.
- L.O.3.** Apply principles of water analysis to address practical issues in oil and gas production concerning produced water management.
- L.O.4.** Analyze the relevance of water treatment processes in managing produced water, considering sustainability implications.
- L.O.5.** Evaluate the effectiveness of water injection and disposal technologies in the context of the project, with a focus on sustainable practices.
- L.O.6.** Implement solutions using relevant software and project management concepts within teams to successfully manage produced water, incorporating sustainable wastewater treatment techniques.

### Engineers Australia Stage 1 Competencies

Achieving the student learning outcomes of this course partially fulfills the following EA Stage 1 Competencies for Engineering Technologist.

|                                 |                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Knowledge and Skills            | 1.1 Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain. |
|                                 | 1.2 Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the technology domain.      |
|                                 | 1.3 In-depth understanding of specialist bodies of knowledge within the technology domain.                                                                         |
|                                 | 1.4 Discernment of knowledge development within the technology domain.                                                                                             |
|                                 | 1.5 Knowledge of engineering design practice and contextual factors impacting the technology domain.                                                               |
|                                 | 1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the technology domain.                       |
| Engineering Application Ability | 2.1 Application of established engineering methods to broadly-defined problem solving within the technology domain.                                                |
|                                 | 2.2 Application of engineering techniques, tools and resources within the technology domain.                                                                       |
|                                 | 2.3 Application of systematic synthesis and design processes within the technology domain.                                                                         |
|                                 | 2.4 Application of systematic approaches to the conduct and management of projects within the technology domain.                                                   |
| Professional and                | 3.1 Ethical conduct and professional accountability.                                                                                                               |

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|                     |                                                                               |
|---------------------|-------------------------------------------------------------------------------|
| Personal Attributes | 3.2 Effective oral and written communication in professional and lay domains. |
|                     | 3.3 Creative, innovative and pro-active demeanor.                             |
|                     | 3.4 Professional use and management of information.                           |
|                     | 3.5 Orderly management of self, and professional conduct.                     |
|                     | 3.6 Effective team membership and team leadership.                            |

### Course Content

Below are the topics that will be covered during this course<sup>2</sup>. Please note that the topics are tentative to change.

| # | Topic                                                                                    | Resources required | Learning Outcome |
|---|------------------------------------------------------------------------------------------|--------------------|------------------|
| 1 | Produced Water Overview: Definition of Produced Water/ Characteristics of Produced Water |                    | LO1, LO2         |
| 2 | Role of Produced Water in Oil and Gas Production                                         |                    | LO1, LO2         |
| 3 | Produced Water Volume Estimates                                                          |                    | LO1, LO2         |
| 4 | Reusing oil and gas produced water                                                       |                    | LO2              |
| 5 | Water Quality check/Typical Water Report                                                 |                    | LO2, LO3         |
| 6 | Water Technologies and their possible impacts on water management options                |                    | LO4, LO5         |
| 7 | Produced Water Treatment Technologies                                                    |                    | LO4, LO5         |
| 8 | Leading industry practices case studies                                                  |                    | LO4, LO5, LO6    |
| 9 | Case study of Sustainable management of produced water supply chain system               |                    | LO4, LO5, LO6    |

### Methods of Delivery

Classroom-Based delivery. Lecture notes will be uploaded on EduLearn. Ungraded Homework will be uploaded for students on EduLearn. Any updates about the method of delivery will be communicated with the students via the official communication platforms.

<sup>2</sup> For the Summer Sessions, number of lectures per week is doubled and number of weeks is halved.

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### Extent and Nature of Use of Technology

All the lectures' slides, lab manual and other learning material for this course are available online on the PETR443 webpage on EduLearn. Students are required to visit this page regularly to check for any update.

Course related announcements are sent by email. Students are required to check their email daily.

### Textbook/s

For this course, the following textbook will be used:

1. Water Management in Oil and Gas Operations , World Bank research,2024, ISBN: 978-1-4648-2047-2.
2. Oil & Gas Produced Water Management, Eric M. V. Hoek , Jingbo Wang , Springer,2021, 978-3-031-79503-9.
3. Produced Water Environmental Risks and Advances in Mitigation Technologies, Jerry Neff, Springer,978-1-4614-0045-5.

### Attendance

The student is required to attend designated live sessions on campus. A student who fails to do so will be marked as absent from that class.

Please refer to the AU Student Attendance Policy and Procedure on the [AU portal](#).

### Submission of Work

Please refer to the AU Code of Academic Integrity on the [AU Portal](#).

### Assessment Plan

The assessments dates are subjected to change according to the material coverage pace.

| # | Assessment Title         | Method of Assessment              | Learning Outcomes Covered | Week                 | Weight |
|---|--------------------------|-----------------------------------|---------------------------|----------------------|--------|
| 1 | Midterm                  | Written Exam                      |                           | Midterm Exams Period | 25%    |
| 2 | Continuous Assessment*   | Quizzes & Assignment              |                           | TBA                  | 25%    |
| 3 | Attendance/Participation | In Class Participation/Attendance |                           | 1-14                 | 10%    |
| 4 | Final Exam               | Written Exam                      |                           | Final Exam Period    | 40%    |

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\* A student who misses an in-class assessment (quiz, in-class group work, in-class assignment, etc.) of a weight of 10% or less will not be eligible for makeup and will be automatically awarded a zero mark.

**Students must refer to the AU Student Assessment Policy on the [AU Portal](#) with regards to assessments and re-assessment.**

### **Grading Scale**

Please refer to the AU Grading Policy on the [AU Portal](#).