

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Fundamentals of Petroleum Engineering		Module Delivery
Module Type	Core	☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	PE215		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2		Semester of Delivery
Administering Department	Petroleum Engineering	College	College of Engineering
Module Leader	Dr .Tuqa Abdulrazzaq	e-mail	Tuka-2023@coeng.uobaghdad.edu.iq
Module Leader's Acad. Title	Asst.prof	Module Leader's Qualification	Ph.D.
Module Tutor	Dr .Tuqa Abdulrazzaq	e-mail	Tuka-2023@coeng.uobaghdad.edu.iq
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Scientific Committee Approval Date	2025/10/5	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الاخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	



Module Aims, Learning Outcomes and Indicative Contents			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Objectives أهداف المادة الدراسية	By the end of this module, students will be able to:		
	1. Develop analytical and problem-solving skills through the application of petroleum engineering techniques. 2. Understand the role of petroleum engineering in hydrocarbon exploration, development, and production. 3. Gain foundational knowledge of petrophysical properties and measurement techniques, including bulk volume, grain volume, pore volume, and porosity. 4. Explore key reservoir properties such as permeability, capillary pressure, and wettability. 5. Perform and interpret subsurface logging techniques, including SP-log and gamma ray analysis. 6. Recognize the contribution of geophysics to geological interpretation through the study of Earth's physical properties.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Knowledge	A2	A2.1 Define and understand the basic principles of petroleum engineering A2.2 Classify and distinguishing all sub-branches of petroleum engineering Field A2.3 Identify the tools that used in oil well drilling and logging as Well as problems related of drilling or hydrocarbon exploration
		B1	B1.1 Function efficiently as an individual B1.2 Function as a member of multidisciplinary and multicultural teams
	skills	B2	B2.1 Communicate effectively – graphically with a range of audiences using contemporary tools. B2.2 Communicate verbally and in writing with a range of audiences using contemporary tools.
		C2	C.2.1 Plan engineering projects, taking into consideration other trades requirements C.2.2 Supervise and monitor engineering projects, taking into consideration other trades requirements.
	Ethics		

Indicative Contents المحتويات الإرشادية	1. Interpret porosity logs and understand their relevance to reservoir evaluation 2. Describe the process of petroleum exploration, including: • Direct indications • Geological methods • Geophysical methods 3. Explain physical measurements of subsurface conditions made from surface locations. 4. Identify and differentiate between the three main geophysical survey techniques: • Gravity survey • Magnetic survey • Seismic survey 5. Summarize the concept of petroleum migration and its significance in reservoir formation. 6. Discuss the key parameters controlling petroleum occurrence. 7. Describe the lithology of petroleum reservoirs and its impact on reservoir performance. 8. Classify different types of petroleum traps. 9. Distinguish between various reservoir fluid types. 10. Understand the components and functions of a modern rotary drilling rig, including: • Power system • Hoisting system • Rotation system 11. Circulation system 12. Explain well control mechanisms, including blowout prevention systems. 13. Define the concept and stages of well completion. 14. 15. Describe the process of petroleum exploration, including: • Direct indications • Geological methods • Geophysical methods
	This module provides essential foundational knowledge for students pursuing careers in subsurface resource exploration and development. It emphasizes the integration of scientific reasoning, data interpretation, and societal context in petroleum engineering practice. Students will: • Apply the scientific method to investigate subsurface phenomena and draw conclusions based on empirical, verifiable evidence. • Analyze the impact of scientific theories, technological advancements, and engineering discoveries on petroleum exploration and their broader implications for society. • Demonstrate critical thinking and analytical skills in evaluating geological and petrophysical data, including the ability to question assumptions and assess data reliability. • Recognize that real-world data often contain uncertainties and develop strategies to interpret such data using sound judgment, domain knowledge, and contextual understanding.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching/Learning Strategies include: 1- Direct Instruction in classroom, 2 hrs per week. 2- Classroom Discussions 3- tests, quizzes, class participation, projects, homework assignments, presentations. Methods of assessment for students. 1- Compulsory exercises 2- Quarterly exams. 3- Discussions and assignments for project.

Student Workload (SWL) الحمل الدراسي للطلاب محسوب ل 15 أسبوعا			
Structured SWL (hr/sem) الحمل الدراسي المنتظم للطلاب اسبوعيا الفصل	63	Structured SWL (hr/w) الحمل الدراسي المنتظم للطلاب اسبوعيا	4
Unstructured SWL (hr/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	87	Unstructured SWL (hr/w) الحمل الدراسي غير المنتظم للطلاب اسبوعيا	4
Total SWL (hr/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative Assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Project	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative Assessment	Midterm Exam	1 hr/1	10% (10)	7	LO #1 - #7
	Final Exam	3 hrs/1	50% (50)	16	All
Total assessment			100% (100)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	• Overview of the Oil & Gas Industry: Importance of Oil & Gas, Key Segments of the Industry (Upstream, Midstream, Downstream). • What is Petroleum Engineering? Definition & Role, Sub-Disciplines of Petroleum Engineering • The Oil & Gas Lifecycle: Exploration Phase, Development Phase, Production Phase, Abandonment & Decommissioning. • Challenges & Career Paths: Industry Challenges, Career Opportunities • Key Players in the Industry.
Week 2	Fundamentals of Oil & Gas Drilling Engineering • Drilling Rig System: Rig Types, Rig Components and Functions, Drillstring and Drill Bit.
Week 3	Fundamentals of Oil & Gas Drilling Engineering • Drilling Fluids: Drilling Fluid Functions, Types of Drilling Fluids, Drilling Fluid Properties.
Week 4	Fundamentals of Oil & Gas Drilling Engineering • Drilling Problems and Well Control: Lost Circulation, Stuck pipe, Shale and wellbore Stability, Pressure Control
Week 5	• Project Presentation Mini Quiz
Week 6 & 7	Fundamentals of Oil & Gas Reservoir Engineering • Introduction to Petroleum Reservoirs: – Definition and types of reservoirs (conventional & unconventional) – Reservoir rock properties (porosity, permeability, saturation)
Week 8	Fundamentals of Oil & Gas Reservoir Engineering • Reservoir Fluids: – Properties of oil, gas and water (PVT Analysis) – Phase behavior of hydrocarbons
Week 9	Fundamentals of Oil & Gas Reservoir Engineering • Natural Reservoir Drive Mechanisms: Solution gas drive, water drive, gas cap drive, gravity drainage • Fluid Flow in Porous Media: Darcy's Law (single-phase and multiphase flow), Basic well productivity concepts
Week 10	Project Presentation Mini Quiz
Week 11	Fundamentals of Oil & Gas Production Engineering • Overview of Oil & Gas Production – Reservoir to refinery flow path – Key components of a production system

Week 12	Fundamentals of Oil & Gas Production Engineering • Well Completion Basics – Casing, tubing, and wellhead equipment – Perforation and sand control techniques
Week 13	Fundamentals of Oil & Gas Production Engineering • Artificial Lift Methods – Purpose of Artificial Lift – Common Lift Methods: Rod pumps (sucker rod pumping), Electrical submersible pumps (ESP), Gas lift systems
Week 14	Project Presentation Mini Quiz
Week 15	Fundamentals of well logging • Introduction & Logging Tools – Definition & Purpose of Well Logging: Formation evaluation, Reservoir characterization – Types of Well Logs: Open-hole vs. Cased-hole logging records, Wireline vs. Logging While Drilling (LWD) – Common Logging Tools & Measurements: Resistivity logs, Spontaneous Potential (SP), Gamma Ray (GR), Sonic (Acoustic) logs

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	– Introduction to Petroleum Engineering, by John R. Fanchi and Richard L. Christiansen, 2017> – Fundamentals of Drilling Engineering, SPE Textbook Series VOL. 12, by Robert F. Mitchell and Stefan Z. Miska, 2011 – Composition and Properties of Drilling and Completion Fluids, Seventh Edition, by Ryen Caenn, H. C. H. Darley and George R. Gray, 2017 – Fundamentals of Reservoir Engineering, by LP. Dake, – Oil and gas production handbook. An introduction to oil and gas production, transport, refining, and petrochemical industry, edition 3.0 Oslo, August 2013, Håvard Devold	Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

Success Group (50 - 100)	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.